Final Report
Site IN5A
Milk Production Facility

for the

NATIONAL AIR EMISSIONS MONITORING STUDY

to

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July 2, 2010

Citation

R.H. Grant and M.T. Boehm. 2010. National Air Emissions Monitoring Study: Data from the eastern US milk production facility IN5A. Final Report to the Agricultural Air Research Council. Purdue University, West Lafayette, IN, June 4.

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Acknowledgments

This project was supported by the National Milk Producers Federation and the Agricultural Air Research Council.

Contents

1 Overview

1.1 Introduction

The primary goals of the National Air Emissions Monitoring Study (NAEMS) were to: 1) quantify aerial pollutant emissions from dairy, pork, egg, and broiler production facilities, 2) provide reliable data for developing and validating emissions models for livestock and poultry production and for comparison with government regulatory thresholds, and 3) promote a national consensus on methods and procedures for measuring emissions from livestock operations. NAEMS consists of two components: a barn component and an open source component. Open source emissions measurements were conducted at a total of 10 different farms in the continental US. Farms chosen for monitoring were selected based on the location (relative to climate and typical practice), method of manure collection, manure storage and physical configuration of the buildings and lagoons/ basins relative to the surrounding terrain.

The NAEMS was managed by Purdue University, in its role as Independent Research Contractor (IRC) to the Agricultural Air Research Council (AARC). The Purdue Applied Meteorology Laboratory (PAML) maintained and calibrated equipment, collected samples, conducted all other on-site activities, and analyzed the data for all open sources.

The objective of this report is to present the quality-assured measurements of ammonia (NH_3) and hydrogen sulfide (H_2S) emissions from the wastewater lagoon open source at the Midwestern dairy facility. Within that objective, this report will:

- Describe the farm and the lagoon/basin monitored for the NAEMS
- Describe the monitoring methods and quality assurance
- Present tabulated daily averages of emissions

1.2 Procedures

To meet these objectives, gaseous emissions of NH_3 and H_2S from open sources were measured at a number of farm operations with a range of characteristics. Emissions were measured at a total of 10 farms over the course of two and one-half years.

The emissions from the lagoon were measured to determine the variation in emissions with time of year, stability of the atmosphere, and facility operation. Emissions were measured using models that rely on concentration and wind flow measurements. Lagoon emissions were measured continuously for about one year. The DQO for completeness stipulates 75% completeness of 10 d per quarter.

Atmospheric concentrations of NH_3 around the area sources were measured using narrow-bandwidth open path tunable-diode laser absorption spectroscopy (TDLAS). Atmospheric measurements of H_2S concentrations were made using pulsed fluorescence (PF) technology from air collected from 50 m synthetic open path systems (S-OPS) and sampled from a gas sampling system (GSS) that drew the air through the S-OPS. Emissions of NH_3 were determined from the difference in upwind and downwind concentration measurements from the TDLAS open path systems using two emissions models: a Gaussian plume fit model (Radial Plume Mapping: *RPM*; Arcadis Inc,, Denver, CO) and a backward Lagrangian Stochastic (bLS) model (*WindTrax*; Thunder Beach Scientific, http://www.thunderbeachscientific.com). Emissions of H_2S were determined using the concentration measurements from the PF analyzer from air sampled by the

air inlets of the S-OPS using two emissions models: a Ratiometric model using the ratio of these concentrations to NH_3 concentrations along the same path with the corresponding *RPM* NH_3 emissions measurement, and the bLS model. The critical measurements needed to make the emissions measurements are described in Table 1-1.

Measurements of the lagoon pH, oxidation-reduction potential (ORP), and temperature at 0.3 m depth were also measured from a float located at least 30 m from the lagoon inlet (Table 1-2). Measurements of the atmospheric temperature, relative humidity, barometric pressure, solar radiation and wetness were measured and recorded at an automated weather station established on the lagoon berm.

Table 1-1: Critical measurements

Measurement	Method/ Instrument	Required operating range	MDL	Minimum sample frequency	Final data-aggregation
NH_3	TDLAS/ Boreal Laser, Inc. GasFinder2™	1-800 ppb	5 ppm-m	1.2 s dwell	30 min & 24 h
H_2S	PF/Thermo Environmental 450i analyzer	1-800 ppb	2 ppb	60 s averaging	30 min & 24 h
Wind speed	3D Sonic anemometer/ RM Young 81000	0-60 ms^{-1}	0.01 ms^{-1}	160 Hz sampling/ 16 Hz averaging	30 min & 24 h
Wind direction	3D Sonic anemometer/ RM Young 81000	0^o -360^o	0.1^o	160 Hz sampling/ 16 Hz averaging	30 min & 24 h
3D Turbulence wind components	3D Sonic anemometer/ RM Young 81000	0-40 ms^{-1}	0.01 ms^{-1}	160 Hz sampling/ 16 Hz averaging	30 min
Temperature variability	3D Sonic anemometer/ RM Young 81000	-50 to +50^{o}C	0.01^{o}C	160 Hz sampling/ 16 Hz averaging	30 min
GSS sample flow rate	GSS/S-OPS	10 L min^{-1}	0.1 L min^{-1}	30 s	30 min
GSS sampling manifold pressure	GSS/S-OPS	±60,000 Pa	±500 Pa	30 s	30 min
NH_3 emissions	Radial Plume Mapping Model	N/A	N/A	30 min	30 min, 24 h
H_2S emissions	Backward Lagrangian Stochastic Model	N/A	N/A	30 min	30 min, 24 h
NH_3 emissions	Backward Lagrangian Stochastic Model	N/A	N/A	30 min	30 min, 24 h
H_2S emissions	Ratiometric to *RPM* Model	N/A	N/A	30 min	30 min, 24 h

All measurements from around the lagoon (TDLAS, barometric pressure, air temperature and relative humidity, wetness, solar radiation, lagoon pH, lagoon oxidation-reduction potential, lagoon temperature, and wind) were telemetered to an instrumentation trailer on site via radio communications. The instrumentation trailer also housed the GSS (with associated pressure, flow, temperature and humidity measurements) and PF analyzer for the measurement of H_2S in the S-OPS collected air and two computers that controlled the two TDLAS scanners and collected measurements made by the two TDLAS units. All measurements were then stored on a computer in the trailer that was downloaded daily by file transfer protocol (FTP) via the internet to a computer located at the PAML.

Table 1-2: Non-critical measurements.

Measurement	Method/ Instrument	Required Operating range	MDL	Minimum sample frequency	Final data-aggregation
Ambient temperature	Thermistor/ Campbell Scientific Inc HMP45C (Vaisala)	-40 to 50 ^{o} C	0.1 ^{o} C	5 min	30 min, 24 h
Relative humidity	Hygrometer/ Campbell Scientific Inc HMP45C (Vaisala)	0-100%	5%	5 min	30 min, 24 h
Barometric pressure	Aneroid barometer/ Setra 278	600 to 1100 hPa	600 hPa	5 min	30 min, 24 h
Surface wetness	VAC resistance grid/ Campbell Scientific Inc.	(binary)	(binary)	5 min	30 min & 24 h
Solar radiation	Silicon pyranometer/ LiCOR 190SB	0- 1200 W/m^2	10 Wm^{-2}	5 min	30 min & 24 h
Lagoon solids depth	Sludge level detector/ Sludge Gun 10HD, Markland Specialty Eng.	0-10 m	0.05 m	1/ measurement period	1 time
Lagoon/basin pH	Campbell Scientific Inc CSIM11 (Innovative Sensors, Inc)	0-14 units	0.2 unit	5 min	30 min & 24 h
Lagoon/ basin oxidation-reduction potential	Campbell Scientific Inc CSIM11-ORP (Innovative Sensors, Inc)	-800 - +1100 mV	20 mV	5 min	30 min & 24 h
Lagoon/ basin temperature	Thermistor/ Campbell Scientific Inc 107-L	-35 - +50 ^{o}C	0.5 ^{o}C	5 min	30 min & 24 h

1.3 Farm description and operation

The Midwestern dairy lagoon facility was located in Indiana. The elevation at the farm was 238 m. The dairy consisted of three barns, a feed storage area, special needs barn, milking parlor, an office, and tool and repair shops (Fig. 1-1). The facility had a capacity of 2600 cows. Construction of the dairy was completed in 2002.

Manure was vacuumed from the lactating cow barns and special needs barn every 12 hrs and placed in basins near the barns. Manure was flushed from the holding area and milking parlor every ½ hr. Manure from the barns was scraped into pits that are located at the end of each barn (Fig. 1-1). A small fraction of scraped waste was held in a slurry tank. The wastewater (flush) from the holding area and milking parlor was transferred into a rectangular settling basin south of the road then into the waste lagoon south of the road. The inlet to the lagoon was located at its north end. The clay-lined waste lagoon was 85 m wide and 116 m long, and is oriented north-south. The lagoon bank has a berm slope of 2.5:1. At maximum capacity, the liquid depth was 5 m with a volume of 48,212 m^3 and surface area of 9884 m^2. Sludge had never been removed from the lagoon. Since the lagoon was inherently a source of gases emanating from manure and effluent residing in the lagoon for multiple months, and the lagoon being monitored at this farm received effluent from the parlor and holding area, it was assumed that the number of animals contributing to the lagoon was the maximum capacity of the farm.

Figure 1-1: Configuration of the IN5A farm.

1.4 Measurement layout

The NH_3 emissions from the lagoon were monitored continuously for one year using scanning Tunable Diode Laser Absorption Spectrometer (TDLAS) open-path instruments and 3-dimensional (3D) sonic anemometers, in conjunction with meteorological measurements and the radial plume mapping (*RPM*) and backward Lagrangian Stochastic (bLS) emissions models. The H_2S emissions from the lagoon were monitored using pulsed-florescence (PF) of air sampled through a Synthetic Open Path System (S-OPS) and 3-dimensional (3D) sonic anemometers, in conjunction with meteorological measurements and both the bLS emissions model and the *RPM* emissions model in combination with the ratiometric relationships of measured NH_3 and H_2S concentrations.

The path-integrated concentrations (PICs) of NH_3 were measured by TDLAS along optical paths defined by TDLAS/scanner systems and retro-reflectors. The scanning TDLAS instruments (TDLAS/scanner) were mounted at 1-m height above the lagoon berm (abl) at the northwest and southeast corners (Figure 1-2). Towers for mounting retro-reflectors were located off the northeast and southwest corners of the lagoon (Figure 1-2). A description of the position and path length of the optical paths along each side of the lagoon follows:

- North side: Retro-reflectors were located on anchored tripods at 1 m abl at distances of 41.5 m and 67 m from the northwest TDLAS/scanner. Three retro-reflectors were mounted on the northeast tower 106 m from the TDLAS/scanner at heights of 0.9 m, 7.9 m, and 15.4 m abl.

- East side: Retro-reflectors were located on anchored tripods at 1 m abl at distances of 53.5 m and 96.5 m from the southeast TDLAS/scanner. Three retro-reflectors were mounted on the northeast tower 139 m from the TDLAS/scanner at heights of 0.9 m, 7.9 m, and 15.4 m abl.
- South side: Retro-reflectors were located on anchored tripods at 1 m abl at distances of 36.5 m and 74.5 m from the southeast TDLAS/scanner. Three retro-reflectors were mounted on the southwest tower 109 m from the TDLAS/scanner at heights of 0.9 m, 7.4 m, and 14.9 m abl.
- West side: Retro-reflectors were located on anchored tripods at 1 m abl at distances of 49 m and 90 m from the northwest TDLAS/scanner. Three retro-reflectors were mounted on the southwest tower 138 m from the TDLAS/scanner at heights of 0.9 m, 7.4 m, and 14.9 m abl.

Two synthetic PICs of H_2S were measured by PF from air sampled from linear S-OPS positioned at 1-m abl. A 50-m long S-OPS path was parallel to and 5 m north of the north berm and began 5 m east of northwest berm corner and extended east (Figure 1-2). The second 50-m long S-OPS was parallel to and 5 m south of the south lagoon berm and began 5 m west of southwest corner of berm (in the drainage swale) and extended west (Figure 1-2). The flow through the S-OPS was maintained and sampled by a gas sampling system (GSS) located in the on-site instrumentation trailer. The temperature and humidity of the air flowing through the GSS, as well as the flow rate through and the suction in the negative-pressure portion of the GSS were measured and recorded on a data logger (Model CR800, Campbell Scientific, Logan, Utah).

Meteorological measurements, including barometric pressure, air temperature, relative humidity, solar radiation, and surface wetness were made 5 m west and 30 m north from the southwest berm corner. The data from these meteorological measurements were collected by a data logger (Model CR1000, Campbell Scientific, Logan, Utah) and telemetered to the on-site instrumentation trailer. The 3D sonic anemometers were located on the meteorological tower at 2.5 m height, and on the southwest corner tower (Fig. 1-2) at 4.4 m and 16.2 m heights above ground level and also telemetered to the on-site instrumentation trailer.

Lagoon measurements (pH, oxidation-reduction potential, and temperature) were made from a float located in the southwest corner of the lagoon.

Figure 1-2: Locations of instrumentation around the lagoon under measurement. Retro-reflectors are indicated according to side (north, south, east, and west) with 345 indicating the location of a tower. TDLAS/scanner locations are indicated by TS. The locations of the two S-OPS lines are indicated by the solid yellow lines. The instrumentation trailer was located in the northeast corner of the lagoon.

2 Monitoring activities

2.1 Measurement periods

Measurements were made continuously between 9/11/2008 and 8/17/2009 at this location (Table 2.1-1). The equipment was on site a total of 337 d over four measurement periods. Calibrations reduced the number of measurement days from the total number of days on site. NH_3 emissions were measured 321 d and H_2S emissions were measured 322 d.

Table 2.1-1: Days on site

Period	Start date	End date	# days
6- Fall	9/11/2008	11/30/2008	80
7- Winter	12/1/2008	2/28/2009	89
8- Spring	3/1/2009	5/31/2009	91
9- Summer	6/1/2009	8/17/2009	77

Measurements of H_2S commenced on 9/11/2008 with the TDLAS established around 9/16/2008. The later TDLAS establishment was due to the scanner problems that resulted in the brass to steel scanner upgrade for the entire network. Internet (DSL) communication was established on 9/11/2008. The proximity of this site to PAML resulted in substitution of equipment from this site to maintain operational capabilities for the two roving teams. As a result many equipment repair and/or replacement trips were made to solve problems.

2.2 Site visits

The field operation team visited this farm 53 d during the study (Table 2.2-1). Since this site was the second-year long-term fixed location site, the set-up and take-down occurred only once. Most site visits were either for calibration verifications or equipment replacement.

Table 2.2-1: Dates of site visits

Year	Spring	Summer	Fall	Winter
2008		Aug 21,22	Sep 10,11,16,18,24 Oct 8,9,10,22,27,28 Nov 19,20	Dec 9,10,11,29,30,31 Jan 12,21,23,29 Feb 9,13,25
2009	Mar 11 Apr 7,8,16,30 May 5,20,22,26,28	Jun 9,15,16,23 Jul 2,8,9,10,15,16,20,22,23 Aug 12,18		

2.3 Instrumentation QA/QC

Calibration verification checks of the instruments making the critical measurements and some of the non-critical measurements most susceptible to deterioration were generally conducted within 21 d intervals on site. Instruments checked during these visits (with indication of Section documenting the instrument performance and calibration verification check results) included:

- GasFinder2™ NH_3 TDLAS serial number (s/n) 1029, 1031 and 1032 (Section 6.1)
- TEC 450i H_2S Analyzer s/n 0733825130 (Section 6.2)
- RM Young 81000 3D sonic anemometers s/n 1925, 1926, 1928 and 1938 (Section 6.3)
- lagoon pH probes s/n 005 and 006 (Section 6.4)
- lagoon ORP probe s/n 080 (Section 6.5)
- GSS/ S-OPS s/n 4-0019 (Section 6.6)

In addition, the instruments making the critical measurements were calibrated at least semi-annually. During the semi-annual calibrations, multipoint calibrations were conducted on the TDLAS (Section 6.1) and TEC 450i (Section 6.2) instruments and an inter-comparison conducted on the sonic anemometers (Section 6.3) with three unused 'standard' anemometers. A further QA check was made by inter-comparing TDLAS units: on July 10, 2009 three TDLAS units were inter-compared on site (s/n 1027, 1031, and 1032).

2.4 Audits

An internal audit was conducted on July 8, 2008, with particular attention to the S-OPS operation verification and the calibration checks made of the meteorological sensors.

2.5 Repair trips

Four major repair trips were made to this location: September 24, 2008, October 22, 2008, December 31, 2008, and June 16, 2009. In addition, many trips were made to this location to swap out equipment needed for the continued operation of the many outlying NAEMS measurement locations.

2.6 Remote site checks

Over the course of measurements there were 151 remote checks made from PAML through the computer for instruments operating at this location.

2.7 Measurement data acquisition

Data from the TDLAS units (Model GasFinder2™ NH3-OP, Boreal Laser Inc., Spruce Grove, Alberta, Canada) were acquired using the Boreal Laser *GasView MP* software (Boreal Laser Inc., Spruce Grove, Alberta, Canada) program running on laptops dedicated to this purpose (one laptop per TDLAS unit). The TDLAS units sent back data through 2.4 GHz wireless modems about every 1.2 s. This software also controlled the movements of the scanner (Model PTU-D300, Directed Perception Inc., Burlingame, CA) that aimed the TDLAS units.

Weather and lagoon data were saved to the internal memory of the data logger (Model CR1000, Campbell Scientific Inc, Logan, UT) at 5-min intervals. Optimally, these data were transferred to the trailer through 2.4 GHz wireless modem at intervals of 10 min using *Loggernet* software (Campbell Scientific Inc, Logan, UT). However, communications interference at a number of sites significantly impeded this regular data transfer. Thus, it was sometimes necessary to download data directly to a laptop during site visits. The data were then transferred from the laptop to the trailer computer using a USB thumb-drive. As a backup, all data were also stored on a compact flash memory card that was brought back to Purdue and downloaded after each period.

Data from the gas sampling system (GSS) were saved to a data logger (Model CR800, Campbell Scientific Inc, Logan, UT) located in the trailer at intervals of 30 s. These data included the line

currently being sampled and the mass flow rate. The data were transferred through a serial cable to the trailer computer every 10 min using *Loggernet*.

Data from the H_2S analyzer (Model 450i, Thermo Fisher Scientific, Franklin, MA) were downloaded in real-time through a serial cable to the trailer computer using the *iPort* (Thermo Fisher Scientific, Franklin, MA) software program. The *iPort* software frequently disconnected from the analyzer, so that during our daily status checks from PAML it was frequently necessary to reconnect *iPort* to the analyzer, download data back to the time when *iPort* had crashed and stopped collecting data, and restart real-time data collection

Data from the 3D sonic anemometers (Model 81000, RM Young Inc., Traverse City, MI) were downloaded to the data acquisition computer in the trailer using custom built *Visual Basic* software. Binary data from up to four anemometers were transferred at 16 Hz through 900 MHz wireless modems to a single polling modem connected to the data acquisition computer in the trailer. The software time stamped and stored each 16 Hz data point and calculated 100-s and 300-s averages, variances, and covariances for each component of the wind and the sonic anemometer temperature.

Files were transferred from the instrument trailers to the PAML FTP server using the program *rsync* in the *cygwin* environment (open source programs). This transfer took place every six h, as long as the internet connection was available. The program was set up so that only new or modified files were transferred each time, so that only the updated data were transferred. A log of each file transferred was produced by the *rsync* program. The *rsync* program was used to transfer data daily from the PAML FTP server to the PAML data computer. This transfer was performed early each morning before the automated quality control software runs. Two copies of the data were stored on the Data computer. One copy was placed in the directory “FTP” and was never modified. This copy represents the original data as transferred from the trailers. The other copy of the data was placed in the directory “Data”. The data processing and quality control programs used this copy of the data, and modifications and corrections were made to this copy of the data as needed to allow the data to be processed. These modifications will be described below. It is important to note that no actual data numbers were changed during these modifications.

In addition to the copies of the data transferred over the internet, a copy of the data for each period was produced on a CD and DVD. To ensure complete and accurate data transfer, a data comparison program was used to compare the data on the CD/DVDs with the data in the “FTP” directory.

3 Data Processing and analysis

Before final data processing, the data files were examined to ensure that they were ready to be processed. Modifications to the files were required due to human error, issues related to changing from one site or period to another, and bugs in the data collection software. None of the actual data were modified in this file preparation, only filenames and/or the file in which the data appeared were changed. A detailed log was kept of each modification.

Deleting empty files: Data files created but not filled with data occurred as a byproduct of the data collection systems. The sonic anemometer data collection program was set up to start automatically when the trailer LAN server computer (hereafter termed LAN) was started. As a result, when the LAN was started at a new location empty files were often created because the sonic anemometers were not yet in place. If the location and/or period were not adjusted in the sonic anemometer parameter input file before the computer was shut down at the previous site, these empty files would be present in the directory from this previous location or period. These empty files contain no data and were deleted. Empty files also sometimes occurred for the TDLAS units if the TDLAS laptop was still logging but no data were being transferred from the TDL. These empty files were generally deleted, although they were sometimes retained since empty files can be handled by the data analysis and QC software. Even if deleted from the "data" directory, these empty files will still be present in the "FTP" directory, and in some cases these empty files will be useful in determining whether missing TDLAS data are due to problems with the TDLAS unit itself or with the TDLAS data collection laptop computer. Empty files in other data sets were also deleted.

Moving/deleting data from surrounding periods: When moving from one site to another or switching periods during a "back-to-back" site visit, several changes needed to be made for the data to be saved in the directories for the new site or period. If these changes were not made when the LAN was first started or before the computer was shut down at the preceding site , data for the new site was often saved in the directory for the preceding site. Data were moved from the file for one site to the file for the correct site. Data to be moved were identified by breaks in the data timestamps corresponding to the period when the equipment was shut down and in transit from one site to the next. Data were most often moved in the files for the CR1000 data logger and GSS (CR800 data logger), as these data files started adding new data immediately when the LAN was turned on, and it was easy to forget to immediately make the directory and file name change in *Loggernet*.

Combining data files: The *iPort* software that was used to collect data from the H_2S analyzer occasionally lost its connection with the analyzer and caused the data collection to stop. These events were noticed during the daily site checks from PAML at which time the missing data were filled from the internal memory on the analyzer and a new data file was started to collect the data in real-time. To allow the quality control software to run most efficiently, these multiple data files were combined into a single file at the conclusion of the period. The files that were included in this single file were placed in a subdirectory of the H_2S data folder named "Pieces". On isolated occasions, the CR1000-logged or CR800-logged data for a period were split into more than one file, and these data files were generally combined into a single file for the period, unless a change was made to the data stream in between the files (e.g. adding temperature and relative humidity probe to the gas sampling system output).

Renaming files: On some occasions, files had to be renamed due to human error in naming the files or, in the early days of the project, because of the lack of a finalized file structure in which the field operations staff had been trained. These changes were primarily to the TDLAS data files, when the files on the TDLAS laptops were not named appropriately or else TDLAS1 and TDLAS2 were reversed. Various files for other instruments also had to be renamed for a variety of reasons.

Data Processing and Quality Control Input Files: The data processing and quality control software programs require inputs that describe the data to be analyzed. The input parameters for a given site and period are in a single *Excel* workbook consisting of a separate worksheet for each component of the data processing software. These parameter files were produced and then independently double-checked for errors.

3.1 QA/QC software procedures

The valid data times were produced by examining the data in a preliminary run through the data and finding in the records the times when the instrument was calibrated and times when the instrument was known to be malfunctioning. The data excluded as being from a calibration or period of instrument malfunction were placed in separate columns in the output files and plotted in a different color on the output graphs.

Because measurements were acquired on various data acquisition systems, time synchronization of the various systems was critical. The time synchronization data were obtained from the remote site visits conducted as part of the daily status checks. Time corrections were only included if the instrument time was more than one minute off from the LAN. In the end, corrections were made only to the TEC 450i H_2S analyzer as this instrument would infrequently be out of sync by several minutes due to issues with its automatic time updates. The time synchronization is especially important for the TEC 450i because it samples from lines located on both sides of the lagoon and the time difference could lead to H_2S concentrations being recorded for the wrong S-OPS line (side of source).

One worksheet in the *Excel* parameter workbook for each site contains a list of the times of valid data for each data stream and one worksheet indicates when an instrument was out of time synchronization with the LAN as well as the time correction required to bring the data stream into time synchronization with the LAN.

Once the data files were prepared for final processing and the input parameter files were produced for each site and period, the data were processed through the custom designed software for this purpose. Through the duration of the project, each data stream was processed through a separate program, but in preparation for the final data processing these individual programs were combined into a single program to allow for more efficient data processing and easier debugging, as processes that were previously done multiple times in the earlier software versions are now done only once.

The order in which the various data streams were processed was determined by the dependencies in the data processing and quality control between the various instruments: a given data stream may depend on one or more of the preceding streams, but not on following data streams. For

each data stream, the data were first loaded into arrays and any corrections for time synchronization applied. The flags were then assigned based on the QAPP. After this, the data exclusion times were applied and the data appropriately broken up into columns. Finally, the data were loaded into *Excel*, plots were produced, and the final data files were saved.

3.2 Data exclusions

Data were excluded from processing due to equipment and calibration failures, and because calibration checks were in progress. Periods of invalidated measurements associated with the calibration check failures are documented in the calibration reports in Section 6. Significant data exclusions of greater than one-day duration are indicated below by instrument with all time references in Coordinated Universal Time (UTC):

TDLAS measurement exclusions: Excluded measurements are summarized in Table 3.2-1.

Table 3.2-1: TDLAS measurement exclusions

Begin		End		Reason
9/16/2008	18:58	10/8/2008	15:08	TDLAS 2 reading very low; had been wet at a previous location
10/14/2008	23:40	10/22/2008	16:24	TDLAS 1 laptop locked up
10/14/2008	05:54	10/22/2008	16:25	TDLAS 2 laptop locked up
11/17/2008	11:39	11/19/2008	19:57	TDLAS 1 laptop locked up
11/17/2008	11:06	11/19/2008	19:53	TDLAS 2 laptop locked up
12/28/2008	06:20	12/31/2008	17:17	TDLAS 1 condensation inside unit
1/19/2009	23:47	1/23/2009	19:02	TDLAS 1 power failure
1/19/2009	23:57	1/23/2009	19:03	TDLAS 2 power failure
1/29/2009	21:00	2/9/2009	15:25	TDLAS 2 scanner failure; placed on single path
2/5/2009	14:22	2/9/2009	15:47	TDLAS 1 shutter failure
4/4/2009	05:58	4/6/2009	12:10	TDLAS 1 laptop locked up
4/4/2009	05:56	4/6/2009	12:10	TDLAS 2 laptop locked up
4/27/2009	17:53	4/30/2009	18:31	TDLAS 1 laptop locked up
4/27/2009	17:54	4/30/2009	18:37	TDLAS 2 laptop locked up
5/5/2009	17:22	6/17/2009	15:12	TDLAS 1 removed to replace unit in west trailer
5/20/2009	23:24	5/22/2009	15:03	TDLAS 2 laptop locked up
6/18/2009	11:32	6/23/2009	16:26	TDLAS 2 laptop locked up
7/11/2009	07:45	7/13/2009	17:33	TDLAS 1 laptop locked up
7/14/2009	23:57	7/15/2009	14:30	TDLAS 1 laptop locked up
7/22/2009	16:19	8/11/2009	15:14	TDLAS 1 removed to replace unit in east trailer

TEC 450i measurement exclusions: None.

Air temperature and relative humidity measurement exclusions: Excluded measurements are summarized in Tables 3.2-2 and 3.2-3

Table 3.2-2: Air temperature measurement exclusions

Begin		End		Reason
2/25/2009	14:30	3/11/2009	17:00	6-month Calibration Check
5/16/2009	02:25	5/28/2009	17:50	Instrument malfunction

Table 3.2-3: Relative humidity measurement exclusions

Begin		End		Reason
2/25/2009	14:30	3/11/2009	17:00	6-month Calibration Check

Solar radiation measurement exclusions: Excluded measurements are summarized in Table 3.2-4.

Table 3.2-4: Solar radiation measurement exclusions

Begin		End		Reason
2/25/2009	14:30	3/11/2009	17:00	6-month Calibration Check

Wetness measurement exclusions: Excluded measurements are summarized in Table 3.2-5.

Table 3.2-5: Wetness measurement exclusions

Begin		End		Reason
9/10/2008	19:30	12-10/2008	16:20	Instrument failure
2/25/2009	14:30	3/11/2009	17:00	6-month Calibration Check

Barometric Pressure measurement exclusions: Excluded measurements are summarized in Table 3.2-6.

Table 3.2-6: Barometric pressure measurement exclusions

Begin		End		Reason
2/25/2009	14:30	3/11/2009	17:00	6-month Calibration Check

Sonic anemometer measurement exclusions: Sonic anemometers experienced communications interference throughout the study. Excluded measurements are summarized in Table 3.2-7.

Table 3.2-7: Sonic anemometer measurement exclusions

Begin		End		Reason
9/18/2008	14:29	9/18/2008	20:10	Calibration check
10/8/2008	19:50	10/9/2008	18:50	Calibration check
10/27/2008	14:35	10/28/2008	16:20	Calibration check
11/19/2008	15:04	11/20/2008	18:15	Calibration check
12/9/2008	15:24	12/11/2008	16:45	Calibration check
12/17/2008	01:45	12/18/2008	17:45	Communications failure, sonic anemometer 1
12/29/2008	18:50	12/30/2008	21:24	Calibration check
1/6/2009	17:40	1/9/2009	20:10	Communications failure, sonic anemometer 1
1/23/2009	14:20	1/23/2009	17:40	Calibration check
2/9/2009	15:00	2/9/2009	19:05	Calibration check
2/25/2009	14:15	03/11/2009	18:45	6 Month Cal check
5/5/2009	15:20	5/5/2009	19:50	Calibration check
5/25/2009	11:30	5/26/2009	19:35	Calibration check
5/28/2009	15:44	5/28/2009	16:00	Period Break
6/2/2009	14:40	6/3/2009	15:50	Data logging failure
6/2/2009	11:30	6/8/2009	18:45	Inclement weather
6/9/2009	13:54	6/9/2009	18:10	Calibration check
6/16/2009	13:45	6/20/2009	15:50	Inclement weather
6/20/2009	15:55	6/22/2009	12:30	Data logging failure
7/10/2009	14:09	7/10/2009	19:40	Calibration check

Lagoon temperature, pH, and ORP measurement exclusions: Lagoon measurements stopped on 11/20/08 due to expected lagoon freezing before next 20 d visit. No lagoon measurements due to lagoon freezing conditions until 3/2009. Excluded measurements are summarized in Table 3.2-8.

Table 3.2-8: Lagoon temperature, pH, and ORP measurement exclusions

Lagoon Temperature Exclusion Times				
Begin		**End**		**Reason**
10/9/2008	16:30	10/9/2008	18:35	Calibration check
10/27/2008	15:40	5/28/2009	18:05	Probe was not in water
6/16/2009	14:10	6/19/2009	17:50	Calibration check
7/9/2009	16:30	7/9/2009	17:55	Calibration check
7/30/2009	16:55	7/30/2009	17:25	Calibration check
Lagoon pH Exclusion Times				
Begin		**End**		**Reason**
10/9/2008	16:30	10/9/2008	18:35	Calibration check
10/27/2008	15:40	5/28/2009	18:05	Probe was not in water

6/16/2009	14:10	6/17/2009	17:50	Calibration check
7/9/2009	16:30	7/9/2009	17:55	Calibration check
7/30/2009	16:55	7/30/2009	17:25	Calibration check

Lagoon ORP Exclusion Times				
Begin		**End**		**Reason**
10/9/2008	16:30	10/11/2008	17:05	Calibration check
10/27/2008	15:40	5/28/2009	18:05	Probe was not in water
6/16/2009	14:10	6/17/2009	17:50	Calibration check
7/9/2009	16:30	7/9/2009	17:55	Calibration check
7/30/2009	16:55	7/30/2009	17:25	Calibration check

GSS/S-OPS measurement exclusions: Excluded measurements are summarized in Table 3.2-9.

Table 3.2-9: GSS/S-OPS measurement exclusions

Begin		**End**		**Reason**
9/18/2008	16:15	9/18/2008	18:15	Calibration check
10/9/2008	14:45	10/9/2008	16:45	Calibration check
10/28/2008	19:45	10/28/2008	20:45	Calibration check
11/19/2008	19:15	11/19/2008	21:15	Calibration check
12/9/2008	14:45	12/10/2008	18:15	Calibration check
12/30/2008	18:15	12/30/2008	19:45	Calibration check
1/21/2009	16:45	1/21/2009	19:45	Calibration check
2/13/2009	15:45	2/14/2009	00:00	Calibration check
2/25/2009	12:00	2/26/2009	00:00	Calibration check
3/11/2009	18:35	3/12/2009	00:00	Calibration check
4/8/2009	15:00	4/8/2009	19:00	Calibration check
5/5/2009	16:15	5/5/2009	18:45	Calibration check
5/28/2009	14:15	5/28/2009	17:15	Calibration check
6/15/2009	13:45	6/15/2009	18:45	Calibration check
6/23/2009	16:15	6/23/2009	20:45	S-OPS modification
6/24/2009	15:00	6/24/2009	17:00	S-OPS modification
6/30/2009	13:45	6/30/2009	17:45	S-OPS modification
7/2/2009	14:30	7/02/2009	15:00	S-OPS modification
7/8/2009	15:45	7/8/2009	18:15	Calibration check
7/15/2009	14:45	7/15/2009	17:15	S-OPS modification
7/22/2009	14:30	7/22/2009	18:30	S-OPS modification
7/23/2009	15:15	7/23/2009	19:15	Calibration check
7/30/2009	18:00	7/30/2009	19:30	Calibration check
8/5/2009	16:00	8/5/2009	20:30	S-OPS modification
8/6/2009	17:00	8/6/2009	19:30	S-OPS modification
8/11/2009	17:00	8/11/2009	18:30	S-OPS modification

Begin		End		Reason
8/17/2009	15:00	8/17/2009	17:30	Calibration check

3.3 Data correction procedures

Calibration adjustments based on the multipoint calibrations and calibration verifications were made to the NH_3 and H_2S gas concentration measurements. All concentration measurements were normalized to 101.325 kPa and 20^{o}C (STP) within the instruments. The measured system response corrections used the entire record of calibration verifications and adjusted for a bias associated with the sampling system defined by the EPA Method 301 S-OPS validation by using a correction factor of 0.98. No corrections were required for the sonic anemometer measurements.

3.4 Data validation procedures

3.4.1 NH_3 concentration measurements

Because of the nature of the TDLAS data, the TDLAS routine is the most complicated portion of the data processing and quality control software. It is broken into several subroutines. The first subroutine flags pan/tilt locations that are likely to be in super-saturated "holes" in the retro-reflector array. The TDLAS instrument contains a sensor that detects the intensity of the energy returned from the retro-reflector in arbitrary units. Light levels of between 500 and 12000 are required for data to be considered valid. The light level sensor in the TDLAS instrument has a maximum value of 16368 (arbitrary units). Additional returned energy causes the light level to decrease. This creates a super-saturated condition in which the light levels appear valid, but in reality the returned energy is much greater than the allowable threshold for a valid reading. This leads to erroneous instrument readings, frequently indicated by low r^2 values that are associated with large path integrated concentrations (PICs). The term "hole" refers to a region of light levels that appear valid surrounded by maximized light levels. A hole is a region where the instrument will give faulty data, even though the light levels appear valid. The hole-finding algorithm goes through all the data points defined in "optimize" strings output by the instrument each time the scanner moves to a new location and determines data points that either have maximized light levels (16368) on the current day or else are surrounded above and below or to the left and to the right by points that have maximized light levels on the current day. The routine produces a list of locations (pan and tilt) and days that are probably super-saturated.

The next subroutine inputs all the concentration data and calculates averages over each dwell on a retro-reflector array. A scanner moved the TDLAS from one retro-reflector to another, dwelling for about 15 s on each retro-reflector array. The *GasView MP* program produced a flag that indicated when the scanner was moving. Once this flag indicated that the scanner had stopped its movement, one additional 1-s value was ignored, and then the remaining points were averaged to produce the dwell averages. The additional ignored value helped reduce the occurrence of data from the preceding path leaking into the current path because of communications delays.

On the next pass, concentration data from pan/tilt locations and days that were determined to be super-saturated were flagged as super-saturated. However, it was found that simply using the light levels as the super-saturation criteria resulted in the removal of much data that was clearly not super-saturated. To determine which points truly were super-saturated and which were not, a

threshold curve of PIC as a function of r^2 was produced (for valid data, r^2 generally increases as PIC increases). As part of the determination of this PIC vs. r^2 threshold, a record was kept for each retro-reflector array of the ten largest PIC corresponding to each r^2 value from pan/tilt locations that were not determined from the initial hole-finding routine to be super-saturated. Based on this top-ten record, the PIC vs. r^2 threshold was determined by searching for outlying values that might indicate a PIC value that should have been indicated as super-saturated but were not.

Once the PIC vs. r^2 threshold curve was determined, a final pass was made through the data, this time comparing the PIC value for each data point with the threshold value at the current r^2. This resulted in four categories of points depending on whether or not super-saturation was indicated by the hole-finding algorithm and whether or not super-saturation was indicated by the hole-finding routine.

In a final pass through the data, data from the individual dwells was averaged up to the 30-min time intervals required by the *WindTrax* and *RPM* emissions models.

3.4.2 H_2S concentration measurements

The H_2S data processing routine first loaded all the H_2S data into an array. Based on the GSS data array, the data were then sorted by source side and a determination was made whether the GSS had been sampling that side long enough and whether enough time remained until the end of sampling that side for the H_2S data to be considered valid. The data were then sorted and averaged into 30-min intervals for placement into the *WindTrax* input file.

3.4.3 S-OPS sampling

The GSS software routine imported the CR800 data and produced two separate arrays of the data. The time grid for one array was based on when the S-OPS changed from one line to the other line. This array was later used when separating the H_2S data according to which S-OPS line was being measured and determining whether enough time had elapsed since the previous line-switch and enough time remained before the next line switch to consider the data valid. The other array was based on a regular 30-min grid. This array was used to produce output over the intervals required as input to *WindTrax*. Output from the GSS were also used to ensure that adequate flow was present for the instruments, that condensation was not a problem inside the GSS, and that there were no major issues with the S-OPS lines (leaks, etc.).

3.4.4 Wind component measurements

The sonic anemometer software imported the 300-s sonic anemometer data files and produced the final sonic anemometer QC output file and also arrays of data at 30-min intervals for use by the *WindTrax* and *RPM* emissions models. The *WindTrax* arrays contain the turbulence statistics required as inputs to *WindTrax* and also flags used for characterizing the output from the *WindTrax* or else the reason that sonic anemometer data were not suitable for use by *WindTrax* during a particular data interval. The *RPM* arrays contained the wind direction and wind speed averaged over a 30-min interval and interpolated to 10 levels from the surface to 20 m above the surface.

At some sites and during some periods one or more sonic anemometers experienced intermittent communications interference. This interference reduced the number of 16-Hz data points recorded in the trailer and also led to some spurious data points that resulted in some outlying,

unphysical data points. These spurious data had little impact on the mean wind speeds, but did impact the variances, sometimes significantly. It was found that the spurious variances were nearly always associated with sonic anemometer temperature variance of greater than 2.5 K^2, while realistic variances never exceeded this same value. To be considered a valid 300-s period, at least 90% (4320) of the possible 4800 16-Hz values had to be present and the sonic temperature variance had to be less than 2.5 K^2. To be considered a valid 30-min interval, at least 3 of the 6 possible 300-s intervals were required to be valid. This acceptance scheme caught most of the unacceptable variances.

3.5 Emission calculations

3.5.1 NH_3 emissions by RPM

The *RPM* model was used to estimate the NH_3 emission rates based on the TDLAS and sonic anemometer data. Running the supplied version of *RPM* was very time consuming and inefficient and produced data at short intervals on the order of several minutes (time for a scan through all the paths). To make *RPM* processing much quicker and efficient, the sonic anemometer and TDLAS data processing programs were used to skip the first two stages of *RPM* data processing by producing data in the proper format and with the proper filenames for level 3 processing by the *RPM*. These files were produced at an interval of 30 min with all the data for a site and period contained in a single *RPM* input file. This allowed an entire period of data to be *RPM* processed with just a few clicks of the mouse, instead of with many clicks just for each individual day. The 30-min time interval was appropriate because the focus of the NAEMS study is on the long-term emissions over the course of the day rather than on the minute-by-minute emissions. In addition, the 30-min interval also allowed for a higher percentage of data capture since not all paths were necessarily required to be present for the entire 30-min interval.

3.5.2 NH_3 emissions by bLS

Data input into the *WindTrax* model were produced by combining output from the sonic anemometer and TDLAS portions of the data processing software. The *WindTrax* program was run by a portion of the data processing software that assigned values to the concentrations and wind statistics required by the model and told the model to run depending on whether or not the u_* and L values were acceptable.

GoogleEarth® was used extensively in producing the site maps required by *WindTrax*. By the end of the project, each site had a high-resolution image on *GoogleEarth*® sufficient to see the outline of the source area. A GPS was used to obtain precise latitudes and longitudes for the TDLAS units and each of the retro reflectors. Labeled location markers were then placed at these coordinate locations. When the locations were obviously wrong (the accuracy indicated by the GPS was generally on the order of 4 m or so), either because the path crossed the lagoon or because it was not correctly placed relative to the corner, the markers were moved slightly to the approximate proper location. The image was then saved and loaded into *WindTrax*, where it was used to define the source areas and measurement paths.

All data required for post-processing the *WindTrax* output were placed into the *WindTrax* output file.

3.5.3 Validation of bLS emissions model

All ½ hourly emissions calculated using the *WindTrax* bLS emissions model in which there was a corresponding *RPM* emissions measurement were compared by pairs using EPA Method 301. The precision of the bLS method for each pair of bLS and *RPM* measurements of emissions was assessed assuming the *RPM* method was the reference. The F-test was used to determine if the precision of the bLS method was significantly different from that of the *RPM* method under a range of meteorological conditions. The experimental *F*-value was calculated according to

$$F = \frac{S_{bLS}^2}{S_{RPM}^2}$$

where S^2_{bLS} is the variance of the bLS measurement method determined from all PICs, and S^2_{RPM} is the variance of the *RPM* measurement method determined from five to ten PICs (depending on the incidence angle) on a given downwind side (and possibly an upwind side) for the paired 30-min measurement periods. The experimental *F*-value was compared to the critical range of *F* at a 95% confidence level for the appropriate degrees of freedom associated with the number of measurements used in the variance calculations in both the numerator and denominator. If the experimental *F* was above the critical range, the precision of the bLS method was significantly greater than the *RPM* method. If the experimental *F* was below the critical range, the precision of the bLS method was accepted as equivalent to the *RPM* method.

The bias of the bLS method was determined from the measurement periods and beam lines used in the precision determination. Bias was determined by t-test of the mean differences in emissions calculations for each meteorological condition evaluated for precision. An 80% confidence interval was used (t=1.397). The correction factor was calculated if the difference was significant. If the correction factor was more than 1.10 or less than 0.90, then the bLS method was considered biased accordingly relative to the *RPM* emissions measurements for the location but not invalidated.

3.5.4 H_2S emissions by Ratiometric

Ratiometric H_2S emissions were determined by first finding 30-min intervals for which all the following conditions were satisfied: the *RPM* calculated a valid emission, one of the S-OPS lines was downwind (angle < 60 degrees) and both S-OPS lines had valid H_2S readings, and the TDLAS path corresponding to the downwind H_2S path had a valid concentration. An upwind TDLAS concentration was not used in the calculations. If the preceding conditions were met, then the H_2S emission was estimated as:

$$Flux_{H2S} = Flux_{RPM-NH3}\frac{34.0818\left(\left[H_2S\right]_{downwind} - \left[H_2S\right]_{upwind}\right)}{17030.4\left[NH_3\right]_{downwind}}$$

The yield for the Ratiometric method for determining H_2S emissions was limited significantly by the generally poor yield for the *RPM* emissions method for NH_3.

3.5.5 H_2S emissions by bLS

Data input into the *WindTrax* model were produced by combining output from the sonic anemometer, GSS, and H_2S portions of the data processing software. The *WindTrax* program was run by a portion of the data processing software that assigned values to the concentrations

and wind statistics required by the model and told the model to run depending on whether or not the u_* and L values were acceptable.

GoogleEarth® was used extensively in producing the site maps required by *WindTrax*. By the end of the project, each site had a high-resolution image on *GoogleEarth*® sufficient to see the outline of the source area. A GPS was used to obtain precise latitudes and longitudes for the ends of the S-OPS lines. Labeled location markers were then placed at these coordinate locations. When the locations were obviously wrong (the accuracy indicated by the GPS was generally on the order of 4 m or so), either because the path crossed the lagoon or because it was not correctly placed relative to the corner, the markers were moved slightly to the approximate proper location. The image was then saved and loaded into *WindTrax*, where it was used to define the source areas and measurement paths. All data required for post-processing the *WindTrax* output were placed into the *WindTrax* output file.

4 Results

4.1 Farm activity

The only pertinent activity associated with the lagoon was the cleaning of the separator pit located to the north of the lagoon (Table 4.1-1). Animal inventories for the calculation of lagoon loading rates are indicated in Table 4.1-1.

Table 4.1-1: Producer activities

Period	Activity	Animal Inventory
6: 9/11/2008 -11/30/2008	Clean Separator Pit 9/20/2008 9:00am-12:30pm Clean Separator Pit 10/30/2008 10:00am-1:00pm Clean Separator Pit 11/28/2008 9:00am-1:00pm	2971
7: 12/1/2008 - 2/28/2009	Clean Separator Pit 12/20/2008 11:00am-2:30pm Clean Separator Pit 1/30/2009 10:30am-2:00pm	2995
8: 3/1/2009 - 5/31/2009	Clean Separator Pit 3/6/2009 9:30am-12:30pm Clean Separator Pit 4/14/2009 10:00am-1:00pm	3312
9: 6/1/2009 - 8/17/2009	Clean Separator Pit 6/4/2009 9am-12pm Clean Separator Pit 7/16/2009 9am-1pm Clean Separator Pit 8/25/2009 9am-1pm	3298

4.2 Weather conditions

4.2.1 Synoptic weather events

Weather conditions during the measurement periods varied widely as expected for midlatitude climates (Table 4.2-1). Between 20% and 25% of the days had extra-tropical frontal systems overhead while 75% to 80% of the days were under the general influence of extra-tropical high pressure. The Daily Weather Maps for the measurement days are found in Section 6.9.

Table 4.2-1: Synoptic weather events during measurements

Measurement period	# days	# warm front passages	# cold front passages	# days stationary front	# days tropical storms
6- fall	80	1	19	0	0
7- winter	89	5	17	1	0
8- spring	91	8	14	4	0
9- summer	77	2	13	6	0

4.2.2 Variation in barometric pressure, solar radiation, air temperature and wetness

Over the course of the measurement periods, the mean daily air temperature varied from -24.5 ^{o}C to 27.3^{o}C while the barometric pressure varied from 96.6 kPa to 100.9 kPa (Section 6.10). Sky conditions ranged from clear skies with maximum ½ hr solar irradiance of 1235 W m^{-2} to overcast conditions with maximum ½ hr solar irradiance of 34 W m^{-2} (Section 6.10). The wetness sensor failed frequently due to corrosion issues.

4.2.3 Variation in air temperature and relative humidity

The relationship between the daily mean air temperature and humidity compared with the monthly climatology is indicated in Figure 4-1. Temperatures during the spring, summer and fall measurements were near normal while those during the winter were slightly below normal. Daily mean relative humidity was greater during the winter than spring, summer and fall.

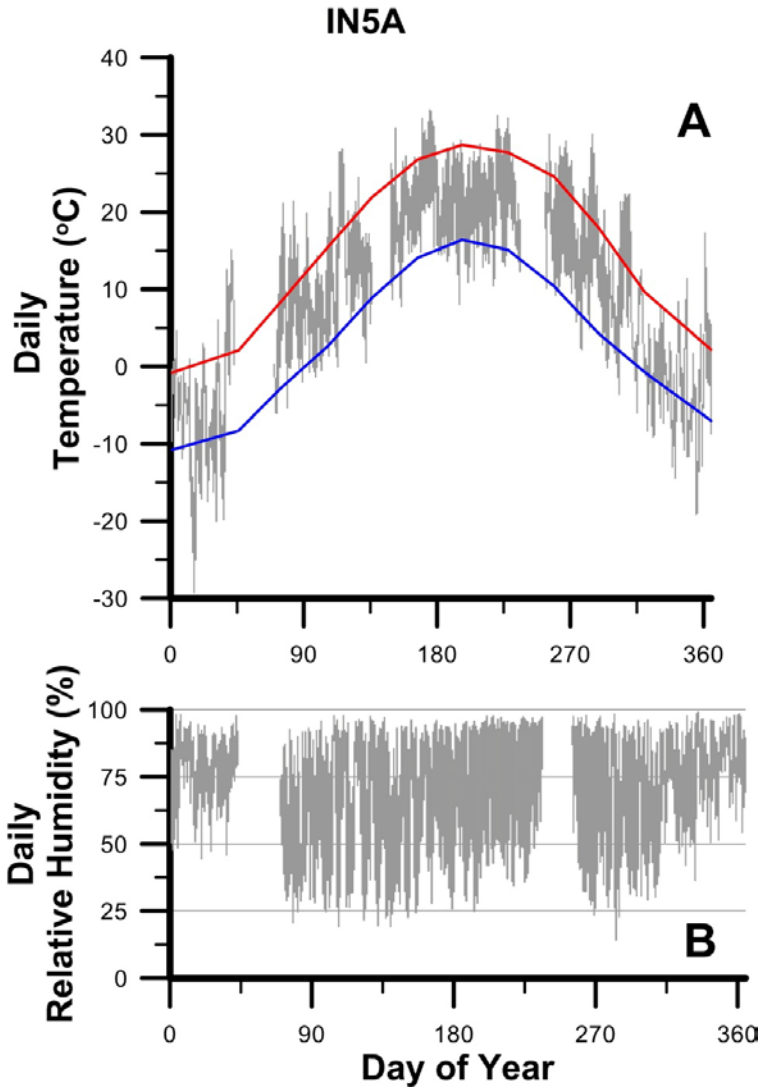

Figure 4-1: Variation in daily temperatures and relative humidity during measurements. The mean monthly climatological maximum (red solid line) and minimum (blue solid line) temperature are compared against the daily maximum and minimum temperatures for measurement days (grey bars) in panel A. The maximum and minimum relative humidities for measurement days are indicated by the grey bars in panel B.

4.2.4 Wind conditions

Wind conditions for each measurement period are illustrated in Figure 4-2. Winds were mostly from the northeast and east during Period 6, from the west during Period 7, and from the

southwest, east or north in Periods 8 and 9. The frequency of light winds ($\leq$ 1 ms^{-1}) was greatest during the summer and fall (Periods 9 and 6).

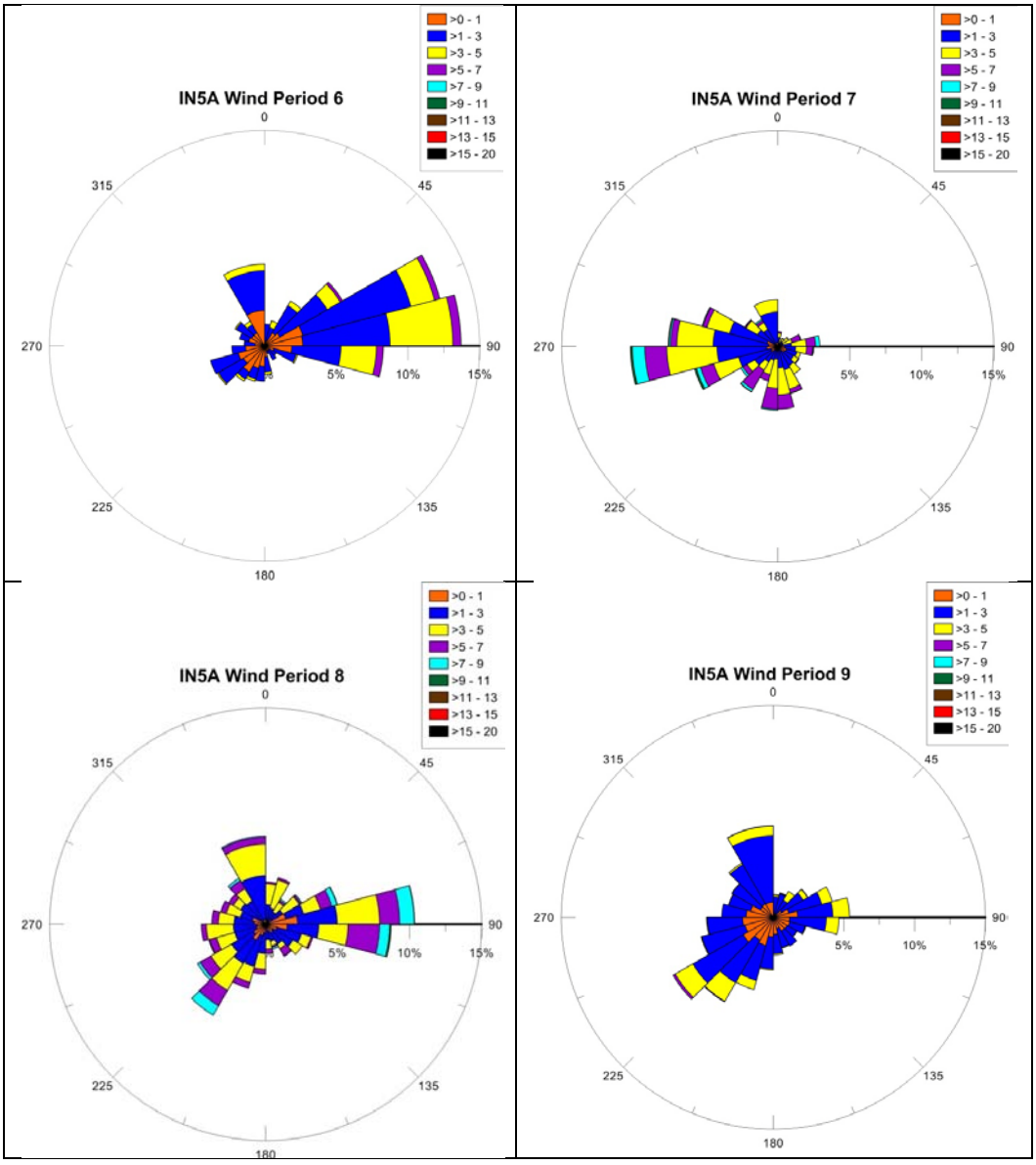

Figure 4-2: Wind roses for ½ hourly wind measurements during the measurement periods. The four periods in which measurements were made are indicated. The relative portion of time in which the wind was from a given direction is indicated by the length of the triangle pointing in that direction. The fraction of time in which the winds were in the binned speed ranges (units of ms^{-1}) is indicated by colors within each triangle.

4.3 Lagoon conditions

4.3.1 Lagoon appearance, liquid depth and sludge depth

The appearance of the lagoon was recorded on almost every site visit (Table 4.3-1). The lagoon generally appeared brown and crust-free.

Table 4.3-1: Lagoon physical characteristics

Period	Date, Appearance (Color/Crust)
6: 09/11/2008 - 11/30/2008	9/11/08 - Brown/No Crust, 9/16/08 - Brown/No Crust, 9/24/08 - Brown/No Crust, 10/8/08 - Brown/No Crust, 10/9/08 - Brown/No Crust, 10/10/08 - Blackish/No Crust 10/22/08 - Brown/No Crust, 10/27/08 - Brown/No Crust, 10/28/08 - Brown/No Crust, 11/19/08 - Brown/No Crust, 11/20/08 - Brown/No Crust
7: 12/1/2008 - 12/28/2009	12/9/08 - Frozen, 12/10/08 - 90% Frozen 12/11/08 - Frozen 12/29/08 - Frozen 12/30/08 - Frozen 1/12/09 - Frozen 1/21/09 - Frozen 1/23/09 - Frozen 1/29/09 - Frozen 2/9/09 - Frozen 2/13/09 - 40% Frozen 2/25/09 – Frozen
8: 03/01/2009 - 05/31/2009	3/11/09 - Brown/Black 4/7/09 - Brown 4/8/09 - Brown 4/16/09 - Brown 4/30/09 - Brown 5/5/09 - Brown 5/22/09 - Blackish 5/26/09 - Blackish/60% Scum 5/28/09 - Brown/40% Scum and foam

Period	Date, Appearance (Color/Crust)
9: 06/01/2009 - 08/17/2009	6/9/09 - Brown/20% Crust 6/15/09 - Brown/15% Crust 6/16/09 - Blackish/20% Crust 6/23/09 - Brown/10% Crust 7/2/09 - Brown/5% Crust 7/8/09 - Brown/25% Scum 7/9/09 - Brown/10% Scum 7/10/09 - Brown/10% Scum 7/15/09 - Brown/5% Crust 7/16/09 - Brown/5% Crust 7/20/09 - Brown/10% Crust 7/22/09 - Blackish/No Crust 7/23/09 - Brown/No Crust 8/12/09 - Brown/2% Crust 8/18/09 - Brown/5% Crust

4.3.2 Temperature, pH and Oxidation-reduction potential

The measured daily average lagoon liquid temperature varied from 11^{o}C to 27^{o}C, with the high temperatures when the lagoon level was very low (Section 6.11). The measured lagoon pH varied from 7.0 during the summer to 8.4 during the previous fall (Section 6.11). The corresponding oxidation-reduction potentials varied from -395 mV to -506 mV during the fall and -301 mV to -509 mV during the summer (Section 6.11). Significant losses to the record limit the utility of these measurements in relating conditions in the lagoon to the emissions from the lagoon.

4.4 Emissions measurements

Emissions data were calculated on a ½ hour basis since this was the interval over which the S-OPS system sampled both sides of the lagoon and since this interval was in the range over which turbulence statistics are often calculated. To account for the longer term manure storage of the lagoon, emissions reported on a head basis were scaled by the animal population for which the facility was designed and not the animal population at the time of measurements. Emission reported on an animal unit (AU) basis (1 AU = 500 kg) assumed the typical animal weight values reported by the producer. Emissions reported on an area basis are based on the surface area of the lagoon.

Comparison of RPM and bLS emissions models

The comparison between the RPM and bLS emissions models was conducted according to the USEPA Method 301 'Field Validation of Pollutant Measurement Method' using NH_3 emissions measurements. The comparison was based on 2507 half-hour measurement periods over the entire measurement time at this location. Results showed that the bLS emissions had a significantly different precision (F=2.65, critical F=1.0) and a significant bias over the *RPM* emissions (t=4.84, $t_{0.2}$=1.29) with a corresponding correction factor for the bLS of 1.06 (Table 4.4.1-1). Consequently, the ½ hour bLS emissions measurements were biased high by 6% compared with the *RPM* measurements.

Table 4.4.1-1: Comparison of the bLS and RPM NH_3 emissions

	RPM	bLS	bLS-RPM
Mean emission (gs^{-1})	0.311	0.331	0.020
Standard deviation (gs^{-1})	0.173	0.281	
Variance of the mean (g^{-2} s^{-2})	0.030	0.080	

4.4.1 NH_3 Emissions

4.4.1.1 Mean daily emissions

A distinct annual trend in NH_3 emissions based on the *RPM* model was evident (Figure 4.4.1-1). Negative emissions during the winter were likely a result of near MDL concentrations around the lagoon in combination with NH_3 transported to the lagoon from the barns to the North. Emissions during the winter when the lagoon is frozen averaged approximately 5 g NH_3 $d^{-1}hd^{-1}$. But this may be an artifact of the high threshold in PICs for processing the PIC measurements into *RPM* emissions. There was wide day-to-day variability in NH_3 emissions during the summer (Figure 4.4.1-1). Maximum NH_3 emissions during the summer were approximately 20 g NH_3 $d^{-1}hd^{-1}$ although there were few days during the summer during which there were at least 75% of the measurements valid for a given day. The daily NH_3 emissions and the number of valid measurements used in the mean daily emissions estimate calculated using the *RPM* model are listed in Section 6.12.1.

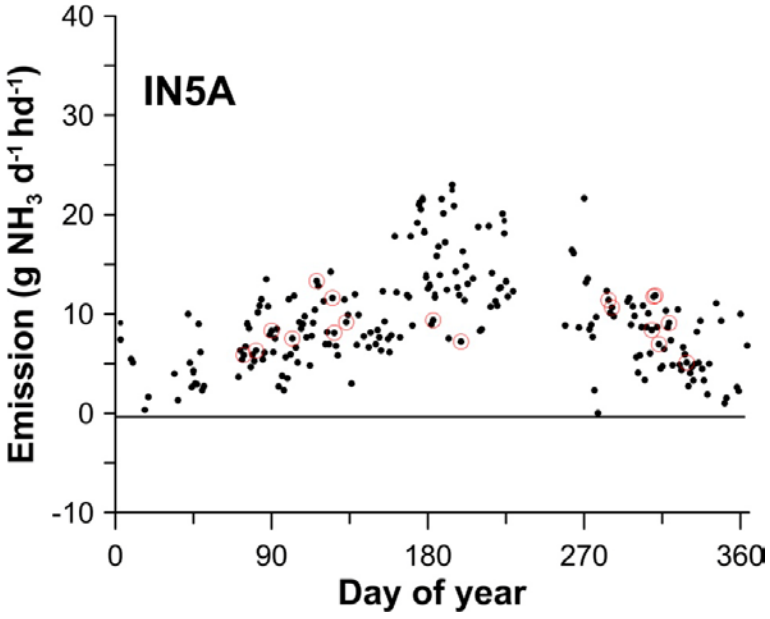

Figure 4.4.1-1: Annual variation in *RPM*-calculated daily NH_3 emissions. Days with a red circle indicate there are measurements for greater than 75% of the continuous day.

A distinct annual trend in NH_3 emissions based on the bLS model was evident (Figure 4.4.1-2). The bLS emissions model provided not only more daily estimates of the NH_3 emissions, but also more days in which more than 75% of the day had valid NH_3 measurements (Table 4.4.1-2). Comparing the standard deviation of the ½ hr emissions estimates of the daily emission rate with the range of partial-day estimates of the daily emission rate shows that the wide range of emission measurements during the summer are due to both day-to-day variability and estimates made on incomplete measurement days (having less than 75% of the possible ½ hrs with valid measurements). There was less day-to-day variability in the bLS-modeled NH_3 emissions values (Figure 4.4.1-2) than the *RPM*-modeled NH_3 emissions values (Figure 4.4.1-1). Negative emissions during the winter were likely a result of near MDL concentrations around the lagoon in combination with NH_3 transported to the lagoon from the barns to the north. Emissions during the winter when the lagoon is frozen were not however always zero. Maximum NH_3 emissions during the summer were between 20 and 30 g NH_3 $d^{-1}hd^{-1}$. There was however wide variability in NH_3 emissions from day to day during the summer (Figure 4.4.1-2). Both the daily NH_3 emissions and the number of valid measurements used in the mean daily emissions estimate calculated using the bLS model are listed in Section 6.12.2.

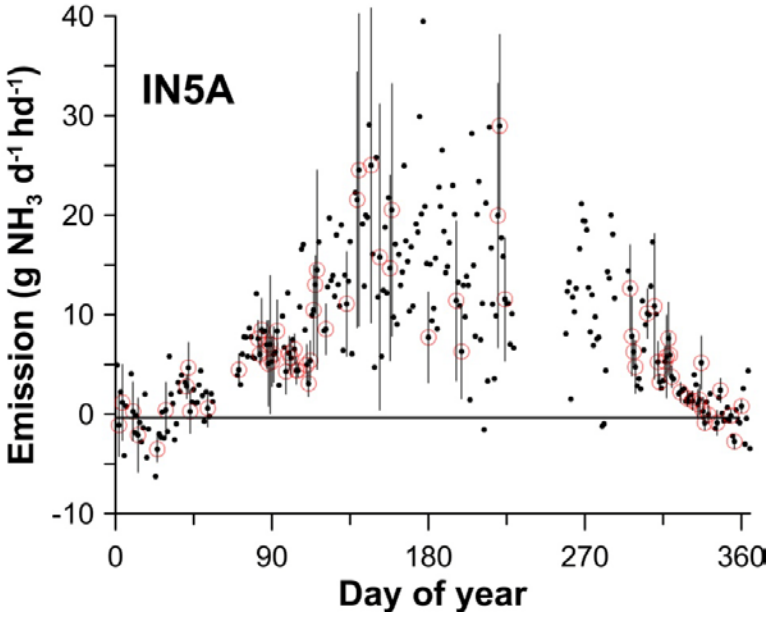

Figure 4.4.1-2: Annual variation in bLS-computed daily NH_3 emissions. Days with a red circle indicate there are measurements for greater than 75% of the continuous day. The bars represent the standard deviation of emissions based on individual ½ hr values when at least 75% of the day had valid measurements.

The bLS model was influenced by the calculated background concentrations. Results indicate that the background concentration of NH_3 was generally less than 0.05 ppm (Figure 4.4.1-3). The greatest background concentrations occurred around day of year 270. Given that the typical

path length around the lagoon was 50 m to 100 m, this translates to a background concentration for a given PIC of 2.5 to 5 ppm-m. This is approximately the MDL for the TDLAS instruments of 2 ppm-m (Section 6.1) and therefore represents essentially no background concentration. Consequently the relatively large background values around day of year 270 may represent emissions from the settling basin to the north of the lagoon.

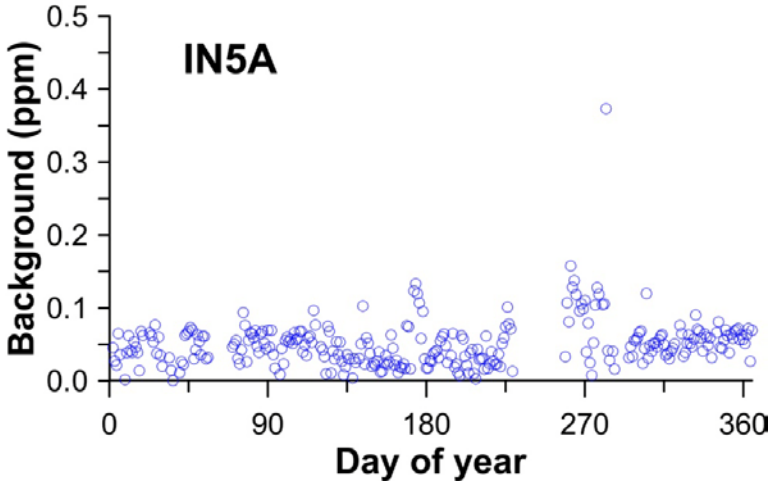

Figure 4.4.1-3: Annual variation in bLS-computed mean daily background concentration of NH_3.

4.4.1.2 Diurnal variation in NH_3 emissions

The NH_3 emissions were generally higher during the day at the night (Figure 4.4.1-4). During the winter when no significant emissions of NH_3 occurred there was no evident diurnal variation. The greatest diurnal variation occurred during the summer. The wide range of ½ hr measurements of the daily emission rate during the summer supports the wide standard deviations of ½ h emission measurements within a single day emission estimate (Figure 4.4.1-2).

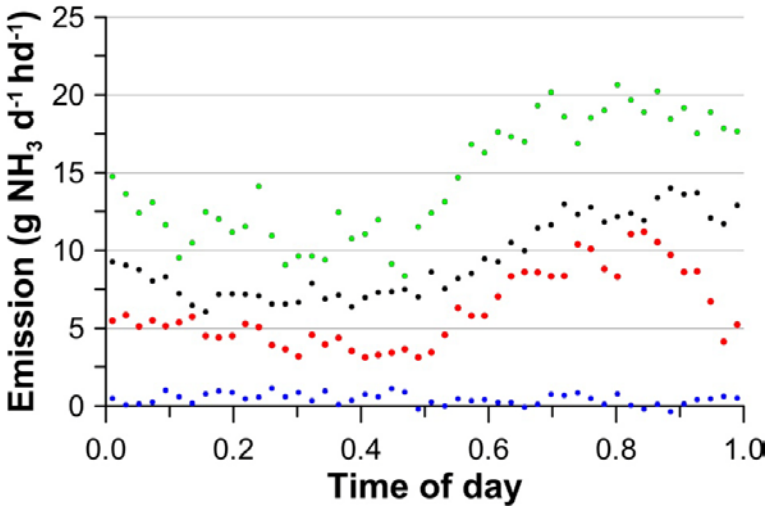

Figure 4.4.1-4: Diurnal variation in bLS-computed NH_3 emissions. Time based on Universal Time Coordinates. The mean emission for each half-hour of the day within a given measurement period (Period 6-Fall (red), Period 7-Winter (blue), Period 8-Spring (black), and Period 9-Summer (green)) are indicated.

4.4.1.3 NH_3 emissions data completeness

Unless otherwise indicated, emissions completeness and failure totals are given in number of days corresponding to the total number of ½ hour intervals for which the indicated condition was true. This number of days does not indicate the data completeness for any individual day. Therefore, an additional value giving the total number of days with at least 36 valid ½ hour periods (corresponding to 75% completeness on a daily basis) is given. There was no wind direction exclusion region at IN5A, so no data were excluded solely based on wind direction. The completeness statistics are summarized in Table 4.4.1-2.

Table 4.4.1-2: Completeness statistics for NH_3 emissions measurements

Parameter	RPM model	bLS model
Valid ½ hr measurements (d)	77.0	155.5
Measurements excluded due to wind direction (d)	0	0
Measurements excluded because touchdown fraction < 0.1		14.3
Measurements excluded because at least one downwind path is missing or invalid (d)	165.4	
Measurements excluded because $u_* < 0.15$ ms^{-1} or $\|L\|<2$ m: (d)		68.1
Number of days (d) with ≥ 36 valid ½ hour periods:	18	73

In total, 77.0 d of valid NH_3 emissions were determined from the 337 measurement days using the *RPM* model, with 18 d having at least 36 valid ½ hour NH_3 emissions. The absence or invalidation of at least one downwind path led to 165.4 d for which emissions could not be calculated.

Valid NH_3 emissions for 155.5 d were determined from the 337 measurement days using the bLS model, with 73 d having at least 36 valid ½ hour NH_3 emissions. Invalid turbulence statistics ($u_* < 0.15$ ms^{-1} or $|L| < 2$ m) led to 68.1 d for which emissions could not be calculated. These invalid turbulence statistics were most prevalent during the night when light winds were more predominant. A touchdown fraction of less than 0.1 led to the exclusion of 14.3 d of data. Low touchdown fractions indicated that little, if any, downwind data was available. This corresponded to either when the downwind TDL was not present or else the downwind paths were lost because of invalid light levels.

The *RPM* model requires all 5 or 10 (depending on the wind direction) downwind paths to have valid concentration readings for at least a portion of the ½ hour interval. This contrasts with the bLS model which requires only 1 downwind surface path to have valid concentration readings. This difference is largely responsible for the much greater completeness for the bLS model than the *RPM* model. The *RPM* model uses ½ hour mean wind speed and direction, in contrast with the bLS model that requires extensive turbulence statistics over this same period. As a result, there are times that the *RPM* model produces valid emissions when the bLS model does not. However, these times are overwhelmed by the times that the *RPM* model is missing concentration data for one or more paths, while the bLS model is able to run.

4.4.2 H_2S Emissions

4.4.2.1 Mean daily emissions

An annual pattern in H_2S emissions was suggested from measurements based on the Ratiometric emissions model (Figure 4.4.2-1). Since only one day had valid measurements during at least 75% of the day using this calculation method, the correct interpretation of the annual variability in H_2S emissions is doubtful. In general there were low H_2S emissions during the winter when the lagoon was frozen. Emissions increased during the spring to approximately 5 g H_2S $d^{-1}hd^{-1}$. By day 120, the emissions decreased and remained low throughout the summer at approximately 1 g H_2S $d^{-1}hd^{-1}$. There was however wide variability in H_2S emissions from day to day during the spring (Figure 4.4.2-1). Emissions declined from the spring maximum to a relatively steady 5 g H_2S $d^{-1}hd^{-1}$ until the lagoon froze. A minimum emission during the summer (day of year 180 through approximately 220) was evident in the results. The daily H_2S emissions and the number of valid measurements used in the mean daily emissions estimate calculated using the Ratiometric model are listed in Section 6.12.3.

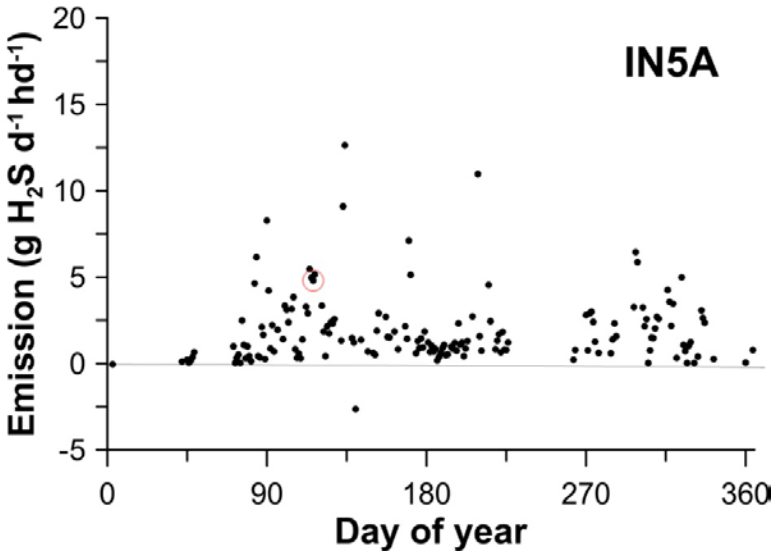

Figure 4.4.2-1: Annual variation in Radiometric-computed daily H_2S emissions. Days with a red circle indicate there are measurements for greater than 75% of the continuous day.

A distinct peak in H_2S emissions during the spring was evident in the annual variability derived from measurements based on the bLS emissions model (Figure 4.4.2-2). The bLS emissions model provided not only more daily estimates of the H_2S emissions, but also more days in which more than 75% of the day had valid H_2S measurements (Table 4.4.2-1). Comparing the standard deviation of the ½ hr emissions estimates of the daily emission rate to the range of partial-day estimates of the daily emission rate shows that the wide range of emission measurements during the spring are due to both day-to-day variability and estimates made on incomplete measurement days (having less than 75% of the possible ½ hrs with valid measurements). There was less day to day variability in the bLS-modeled H_2S emissions values (Figure 4.4.2-2) than the Ratiometric-modeled H_2S emissions values (Figure 4.4.2-1). There were no H_2S emissions during the winter when the lagoon was frozen. Maximum H_2S emissions, occurring during the spring, were approximately 20 and 30 g H_2S $d^{-1}hd^{-1}$. There was, however, wide variability in H_2S emissions from day to day during the spring (Figure 4.4.2-2). Emissions declined from the spring maximum to a relatively steady 5 g H_2S $d^{-1}hd^{-1}$ until the lagoon froze. A minimum emission during the summer (day of year 180 through approximately 220) was evident in the results. The daily H_2S emissions and the number of valid measurements used in the mean daily emissions estimate calculated using the bLS model are listed in Section 6.12.4.

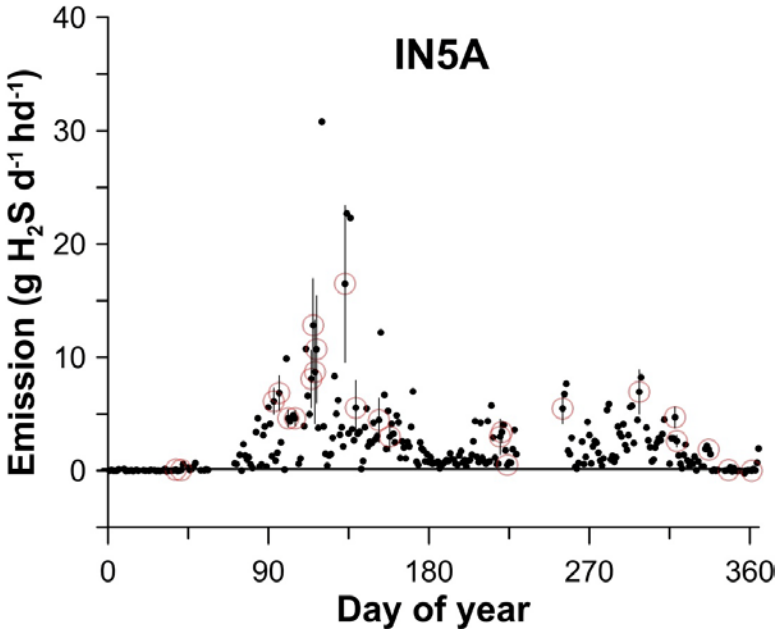

Figure 4.4.2-2: Annual variation in bLS-computed daily H_2S emissions. Days with a red circle indicate there are measurements for greater than 75% of the continuous day. The bars represent the standard deviation of emissions based on individual ½ hr values when at least 75% of the day had valid measurements.

The bLS emission model depends on good estimates of the background H_2S concentration. Results indicate that the background concentration was generally less than ± 2.5 ppb (Figure 4.4.2-3). This background is consistent with an equivalent zero value where the instrument MDL was 3.4 ppb (Section 8.2). The largest background concentrations were observed around day of year 270. While it is possible that these values are overestimated by the bLS model, the frequent disturbance of the settling basin may have significantly contributed to higher background levels under northerly winds.

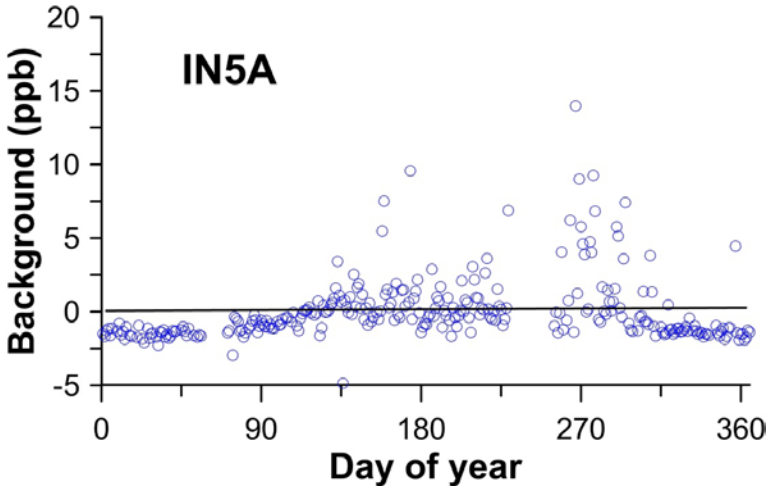

Figure 4.4.2-3: Annual variation in bLS-computed mean daily background concentration of NH_3.

4.4.2.2 Diurnal variation in H_2S emissions

There was no evident diurnal variation in H_2S emissions regardless of season (Figure 4.4.2-4).

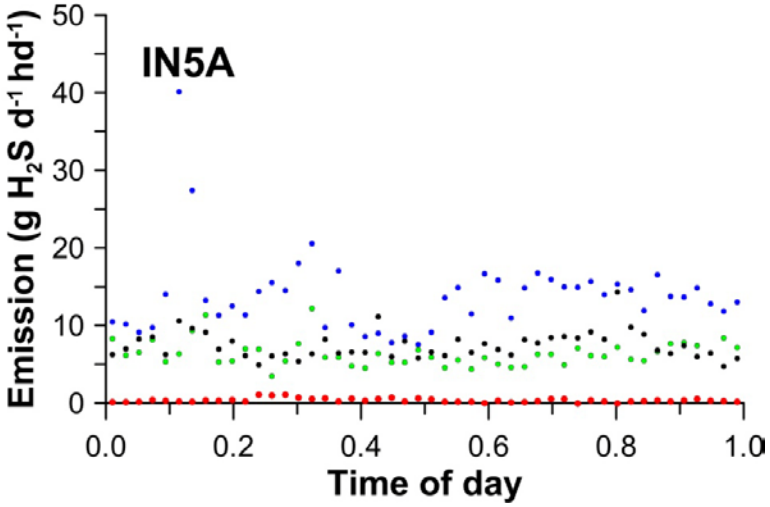

Figure 4.4.2-4: Diurnal variation in bLS-computed H_2S emissions. Time based on Universal Time Coordinates. The mean emission for each half-hour of the day within a given measurement period (Period 6-Fall (black), 7-Winter (red), Period 8-Spring (blue), and Period 9-Summer (green) are indicated.

4.4.2.3 H_2S emissions data completeness

As described for the NH_3 emissions, emissions completeness and failure totals are given in number of days corresponding to the total number of ½ hour intervals for which the indicated condition was true. This number of days does not indicate the data completeness for any individual day. The completeness statistics are summarized in Table 4.4.2-1.

Table 4.4.2-1: Completeness statistics for H_2S emissions measurements

Parameter	Ratiometric model	bLS model
Valid ½ hr measurements (d)	36.6	107.3
Measurements excluded due to wind direction (d)	0	
Measurements excluded because angle of attack > 60° (d)		76.0
Measurements excluded because $u_* < 0.15$ ms^{-1} or $\|L\| < 2$ m (d)		80.1
Number of days (d) with ≥ 36 valid ½ hour periods (d):	1	24

In total, 36.6 d of valid H_2S emissions were determined using the Ratiometric emission method, with 1 day having at least 36 valid ½ hour H_2S emissions. The poor yield is a result of two factors. One factor is that this method requires a valid NH_3 emission calculation by the *RPM* model. As indicated, the *RPM* model itself has relatively low completeness. The other factor is that the lack of S-OPS lines on the east and west sides of the lagoon limits the range of wind directions for which the Ratiometric method can be used due to the requirement of a valid downwind H_2S concentration reading.

Valid H_2S emissions for 107.3 d were determined using the bLS model, with 24 d having at least 36 valid ½ hour H_2S emissions. Invalid turbulence statistics ($u_* < 0.15$ ms^{-1} or $|L| < 2$ m) led to 80.1 d for which emissions could not be calculated. These invalid turbulence statistics were most prevalent during the night when light winds were more predominant. An angle of attack greater than 60° led to the exclusion of 76.0 d of data. The absence of S-OPS lines on the east and west sides of the lagoon is largely responsible for these large angles of attack, as winds from the east or west were more or less parallel to the S-OPS lines on the north and south sides, leading to poorly defined inputs to the bLS models and invalid results.

4.4.3 Estimation of emission measurement errors

4.4.3.1 Error in RPM-measured NH_3 emissions

Tracer releases studies indicated that the RPM emissions measurement has an error in accuracy of approximately ±15% (Hashmonay et al., 2001; Verma et al., 2005; USEPA, 2007). The TDLAS measurement error was 10% (Section 6.1). Combining errors results in an expected error in the RPM-measurement of NH_3 emissions of ± 18%. In addition, the NH_3 measurements made using the TDLAS units with moisture interference had a bias of -40%.

4.4.3.2 Error in bLS-measured NH_3 and H_2S emission

Tracer studies using TDLAS concentration measurements in combination with the bLS emissions model averaged over roughly two hour periods indicated the bLS method error for a given 15-min period varied with stability: overestimated by 12% under near neutral conditions, underestimated by 13% under unstable conditions, and overestimated by 38% under stable conditions (Flesch et al., 2004). Under conditions when Monin Obukhov similarity theory was

valid, the bLS-calculated emission rate was biased 6% high with a standard deviation of 16%. Laubach and Kelliher (2005) evaluated the theoretical errors of the bLS model. The breakdown of their 22% model error included a 12% error for the estimate of the Monin-Obukov Length (L) derived from measurements, a 5% error in turbulence statistics (10% error for the normalized variability statistics in the x and y directions and 5% in the z direction), a 15% error associated with the roughness length (z_o) estimate, and a 10% error due to the stochastic methodology. This was consistent with tracer-estimated errors of the bLS emission calculation method, when constrained by the data quality indicators of the bLS method, of between 5% and 36%.

For this study, we assumed the above theoretical random error of 22% for the bLS emissions measurements. The TDLAS measurement error was 10% (Section 6.1). At this location the daily mean bLS emissions bias from the RPM emissions measurement was +6% (from the RPM/bLS method comparison in Section 4.4). As previously stated, the TDLAS units with moisture interference had a bias of -40%. Combining errors resulted in an expected error in the RPM-measurement of NH_3 emissions of ± 24% with a bias of -34% for TDLAS NH_3 measurements made by units with moisture interference and a bias of +6% for TDLAS NH_3 measurements made by units without moisture interference.

The H_2S PF instrument measurement error was 10% (Section 6.2). Given the expected error in the bLS measurement of emissions of 22%, the H_2S emissions error was estimated as ± 24%

4.4.3.3 Error in Ratiometric-measured H_2S emission

The Ratiometric method of H_2S emissions measurement depends on the RPM measurement of NH_3 emissions. The RPM emissions measurement had an error of approximately ±15%. Since the Ratiometric method ratios the emissions and concentrations of NH_3, there was no affect of the moisture interference in the TDLAS measurement on the H_2S emissions calculation. Given the H_2S PF instrument measurement error of 10% (Section 6.2), the combined error for the Ratiometric measurement of H_2S emissions was ± 18%.

5 References

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6 Appendices

6.1 TDLAS NH_3 calibrations

Three TDLAS units (Model GasFinder2^{TM} NH3OP, Boreal Laser Inc., Spruce Grove, Alberta, Canada) were used at this location: TDLAS 1029, TDLAS 1031, and TDLAS 1032.

TDLAS 1029 was multipoint calibrated seven times (Table 6.1-1). The response is non-linear and consequently a third-order polynomial was used to correct the raw data for the instrument response. Table 6.1-1 indicates the multipoint calibrations used during different periods in the study.

Table 6.1-1: Multipoint calibration application

Period of applicability (mm/dd/yyyy)		
Begin	**End**	**Multipoint calibration**
06/24/2007	03/01/2008	05/24/2007
03/24/2008	07/15/2008	03/24/2008
07/31/2008	08/03/2009	03/04/2009
08/04/2009	12/02/2009	12/29/2009

The offsets of the calibration equations were determined from a least squares fit of the appropriate period (Table 6.1-1) of calibration verifications made at 50 ppm-m applied to the first, second, and third order terms derived from the multipoint calibrations. The regression equations were:

05/24/2007: ppm-m = -1.48 + 0.967 * X + 4.842E-005 * X^2 - 7.312-009 * X^3

03/24/2008: ppm-m = -2.58 + 0.998 * X - 1.611E-004 * X^2 + 7.449E-008 * X^3

03/04/2009: ppm-m = 4.36 + 1.069 * X + 1.128-004 * X^2 - 1.206E-007 * X^3

12/29/2009: ppm-m = 5.48+ 1.268 * X - 6.072E-005 * X^2

where X is the instrument response. In July 2008 factory representatives adjusted the response of this unit. Adjustments made on the instrument at this time did not appear to affect the calibration (conducted before and after adjustments).

A zero concentration is not reportable by this instrument because the concentration is based on the correlation of the measured NH_3 absorption to a reference gas. No measured absorption at zero concentration results in no correlation and consequently no reportable measurement. The MDL of the instrument was determined from the mean of the variability (3 times the standard deviation) experienced at the verification concentration during each calibration verification. Since the calibration verifications were conducted in a very short path length, the water vapor effect on the instrument response was generally not detectable. The MDL was calculated to be 2.74 ppm-m prior to the July 2008 modification and 1.66 ppm-m after the modification. The

instrument performance was within the MDL DQI that required the MDL to be less than 10 ppm-m. The MDL prior to the July 2008 modification was greater than the offset in the calibration regression equations but less than the offset in the calibration equations after the modification. The calibration equation offset was less than the requisite DQI MDL.

Instrument performance calibration checks (Figure 6.1-2) were made at the beginning and end of each measurement period. The majority of calibration checks were made within 21 d (Figure 6.1-3). The large fraction of checks made within 7 d is the result of calibration checks made at the end and beginning of sequential measurement periods. The standard deviations of the verifications about that predicted by the calibration equations were 4.65, 4.15, 5.23, and 4.27 ppm-m respectively. The precision DQI was ±10% RSD at 100 ppm-m. All verifications resulted in less than 10% RSD for 50 ppm-m (Figure 6.1-2) and well within the precision DQI. The accuracy DQI was ±10% of the 1000 ppm-m range of the measurements. A negative bias exceeding the DQI threshold occurred on two dates (Figure 6.1-2). No positive bias exceeding the DQI threshold occurred. In all cases subsequent calibration verifications did not indicate the same exceedance bias and it is concluded that operator error resulted in the exceedances rather than instrument failure.

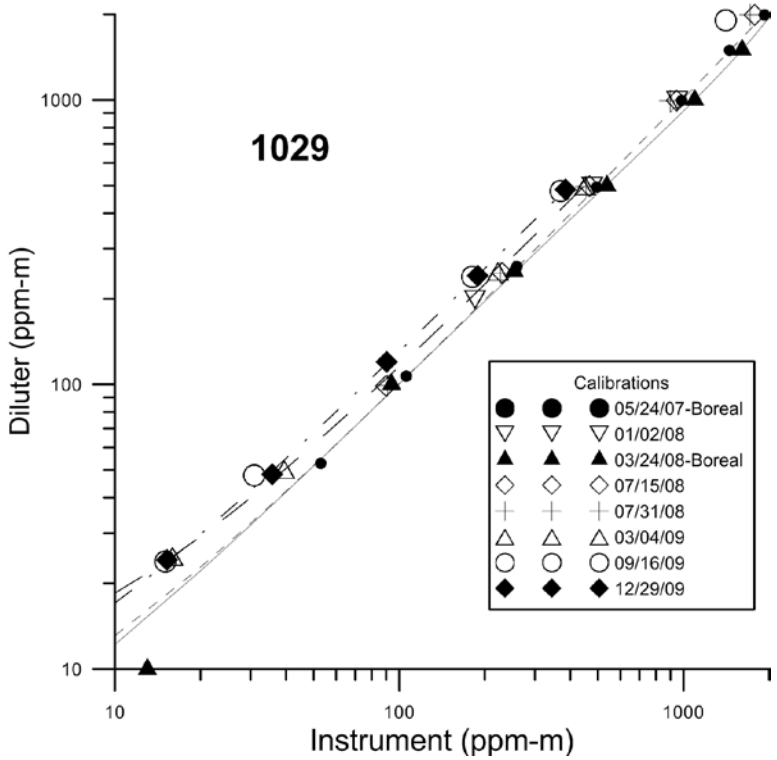


Figure 6.1-1: Multipoint calibrations of the GasFinder2™ s/n NH3OP-1029. The solid (5/24/07), dotted (3/24/08), dashed (3/4/09) and dash-dot (12/29/09) lines are the 3rd order polynomial regressions for the chosen multipoint calibration.

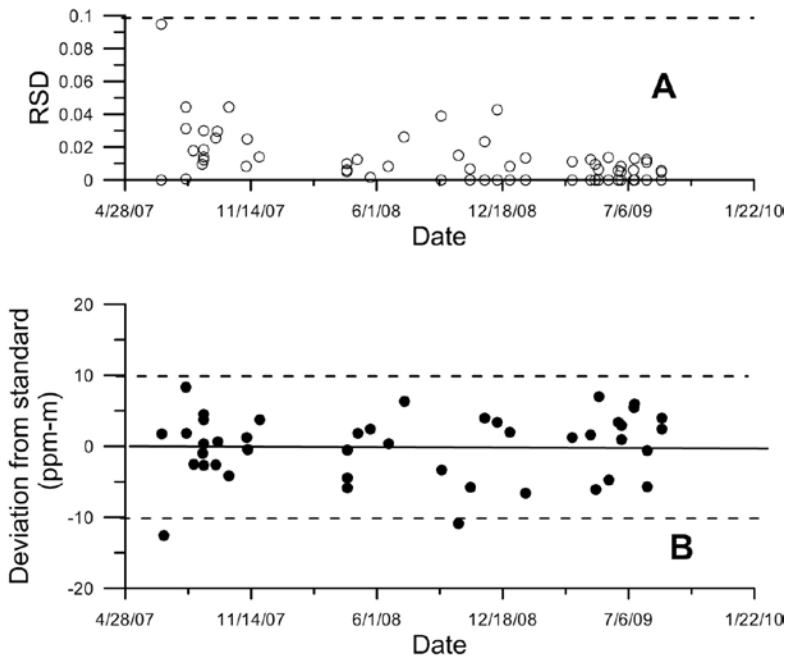


Figure 6.1-2: Control charts of the GasFinder2™ s/n NH3OP-1029

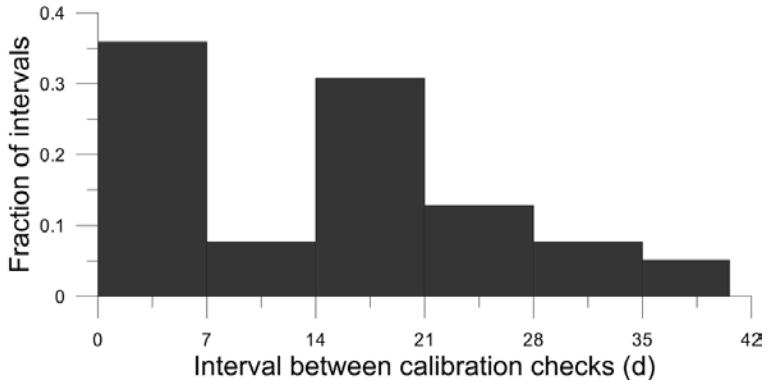


Figure 6.1-3: Calibration check intervals of the GasFinder2™ s/n NH3OP-1029

TDLAS 1031 was multipoint calibrated six times (Figure 6.1-4). The response was non-linear and consequently a third-order polynomial was used to correct the raw data for the instrument response. The multipoint calibration on 5/30/07 was used for the entire study. The offset of the equation was determined from a least squares fit of the entire record of calibration verifications made at 50 ppm-m applied to the first, second, and third order terms derived from the multipoint calibration. The regression equation was:

$$ppm\text{-}m = -4.43 + 1.0120 * X - 5.7496E\text{-}005 * X^2 + 6.0196E\text{-}008 * X^3$$

where X is the instrument response. In July 2008 factory representatives adjusted the response of this unit. Adjustments made on the instrument at this time did not appear to affect the calibration (conducted before and after adjustments).

A zero concentration is not reportable by this instrument because the concentration is based on the correlation of the measured NH_3 absorption to a reference gas. No measured absorption at zero concentration results in no correlation and consequently no reportable measurement. The MDL of the instrument was determined from the mean of the variability (3 times the standard deviation) experienced at the verification concentration during each calibration verification. Since the calibration verifications were conducted in a very short path length, the water vapor effect on the instrument response was generally not detectable. The MDL was calculated to be 5.70 ppm-m prior to the July 2008 modification and 1.92 ppm-m after the modification. The instrument performance was within the MDL DQI that required the MDL to be less than 10 ppm-m. The average MDL was approximately equal to the offset indicated in the calibration regression. The calibration equation offset was less than the requisite DQI MDL.

Instrument performance calibration checks (Figure 6.1-5) were made at the beginning and end of each measurement period. The majority of calibration checks were made within 21 d (Figure 6.1-6). The large fraction of checks made within 7 d is the result of calibration checks made at the end and beginning of sequential measurement periods. The standard deviation of the verifications about that predicted by the calibration equation was 15.60 ppm-m. The precision DQI was ±10% RSD at 100 ppm-m. All verifications resulted in less than 10% RSD for 50 ppm-m (Figure 6.1-5) and well within the precision DQI. The accuracy DQI was ±10% of the 1000 ppm-m range of the measurements. A negative bias exceeding the DQI occurred in the calibration verifications between 8/2/07 and 9/18/07 (Figure 6.1-5). Positive DQI bias exceedances occurred on 6/28/2007, 9/11/2008, 4/8/2009 and 8/12/2009. Verification failures in the 6/28/07 to 9/18/07 interval were a result of un-anticipated optical noise in the calibration procedure which was later corrected. The 4/8/2009 exceedance was preceded and followed by DQI-compliant verifications and the 8/12/2009 verification was preceded by a compliant verification and followed by a multipoint indicating no problem with instrument performance. The instrument was taken out of service between 9/11/2008 and 12/31/2008 due to problems associated with moisture in the instrument.

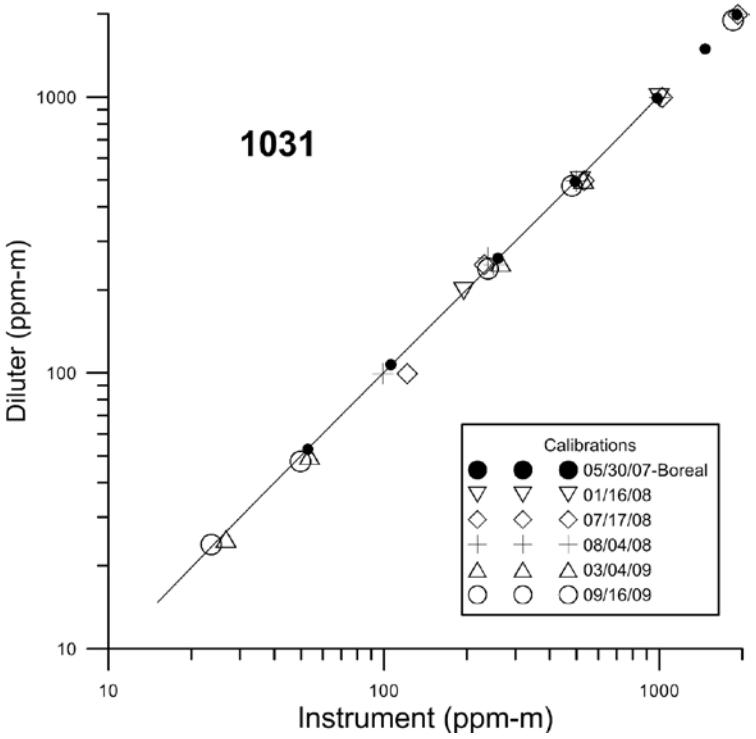


Figure 6.1-4: Multipoint calibrations of the GasFinder2™ s/n NH3OP-1031. The solid line is the 3rd order polynomial regression for the chosen multipoint calibration.

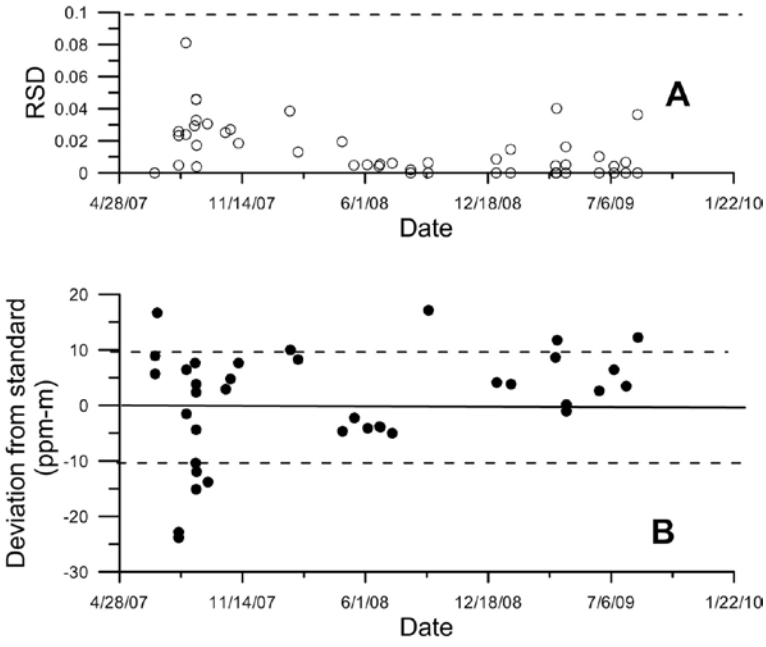


Figure 6.1-5: Control charts of the GasFinder2™ s/n NH3OP-1031

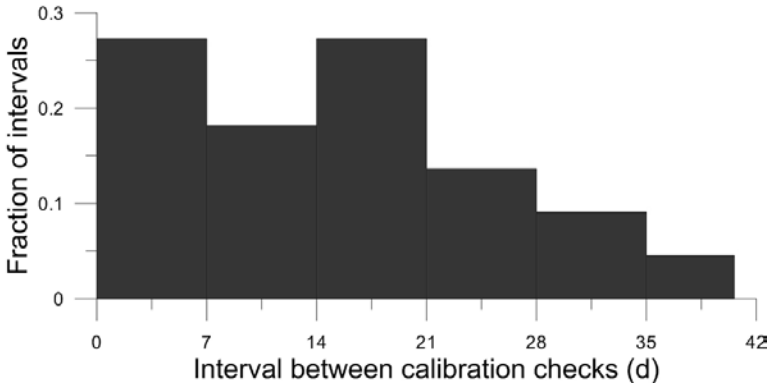


Figure 6.1-6: Calibration check intervals of the GasFinder2™ s/n NH3OP-1031

TDLAS 1032 was multipoint calibrated six times (Figure 6.1-7). The response was non-linear and consequently a third-order polynomial was used to correct the raw data for the instrument response. Table 6.1-2 indicates the multipoint calibrations used during different periods in the study.

Table 6.1-2: Multipoint calibration application

Period of applicability (mm/dd/yyyy)		
Begin	**End**	**Multipoint calibration**
09/21/2007	08/01/2008	09/12/2007
08/27/2008	08/18/2009	03/04/2009

The offset of the calibration equation was determined from a least squares fit of the appropriate period (Table 6.1-2) of calibration verifications made at 50 ppm-m applied to the first, second, and third order terms derived from the multipoint calibrations. The regression equations were:

9/12/07: $ppm\text{-}m = -4.35 + 1.005 * X + 3.563\ E\text{-}005 * X^2 - 2.618\ E\text{-}008 * X^3$

3/4/09: $ppm\text{-}m = -0.69 + 0.995 * X - 2.3298\ E\text{-}004 * X^2 + 2.891\ E\text{-}007 * X^3$

where X is the instrument response. In July 2008 factory representatives adjusted the response of this unit. Adjustments made on the instrument at this time did not appear to affect the calibration (conducted before and after adjustments). The laser was found on 7/21/08 to not be internally grounded properly, resulting is the inclusion of responses at very low light levels. The no-measurement light levels were above the minimum light level threshold considered for a valid instrument measurement.

A zero concentration is not reportable by this instrument because the concentration is based on the correlation of the measured NH_3 absorption to a reference gas. No measured absorption at zero concentration results in no correlation and consequently no reportable measurement. The MDL of the instrument was determined from the mean of the variability (3 times the standard deviation) experienced at the verification concentration during each calibration verification. Since the calibration verifications were conducted in a very short path length, the water vapor effect on the instrument response was generally not detectable. The MDL was calculated to be 2.60 ppm-m prior to the July 2008 modification and 1.36 ppm-m after the modification. The instrument performance was within the MDL DQI that required the MDL to be less than 10 ppm-m. The MDL was greater than the offset in the calibration equation for measurements prior to July 2008 and less than that after July 2008. The calibration equation offset was less than the requisite DQI MDL.

Instrument performance calibration checks (Figure 6.1-8) were made at the beginning and end of each measurement period. The majority of calibration checks were made within 21 d (Figure 6.1-9). The large fraction of checks made within 7 d is the result of calibration checks made at the end and beginning of sequential measurement periods. The standard deviations of the verifications about that predicted by the calibration equation were 6.13 and 5.61 ppm-m respectively. The precision DQI was ±10% RSD at 100 ppm-m. All verifications resulted in

less than 10% RSD for 50 ppm-m (Figure 6.1-8) and well within the precision DQI. The accuracy DQI was ±10% of the 1000 ppm-m range of the measurements. A positive bias exceeding the DQI occurred on 3/26/2008 and 9/10/2008 (Figure 6.1-8). These exceedances were preceded and followed by valid calibration verifications and it is assumed that since no modifications of the instrument were made that the exceedances are due to operator error. A negative bias exceeding the DQI was indicated in the calibration verifications on 5/6/2008 (Figure 6.1-8). The grounding problem found on 7/21/08 (described above) may have been the cause for the period of consistently negative verifications after 4/21/08 when the background light levels exceeded the minimum acceptable light level. However since the 5/6/2008 exceedance was followed by compliant verifications (although low) without correction of the grounding problem it is assumed that the measurements are valid throughout the period of the grounding problem.

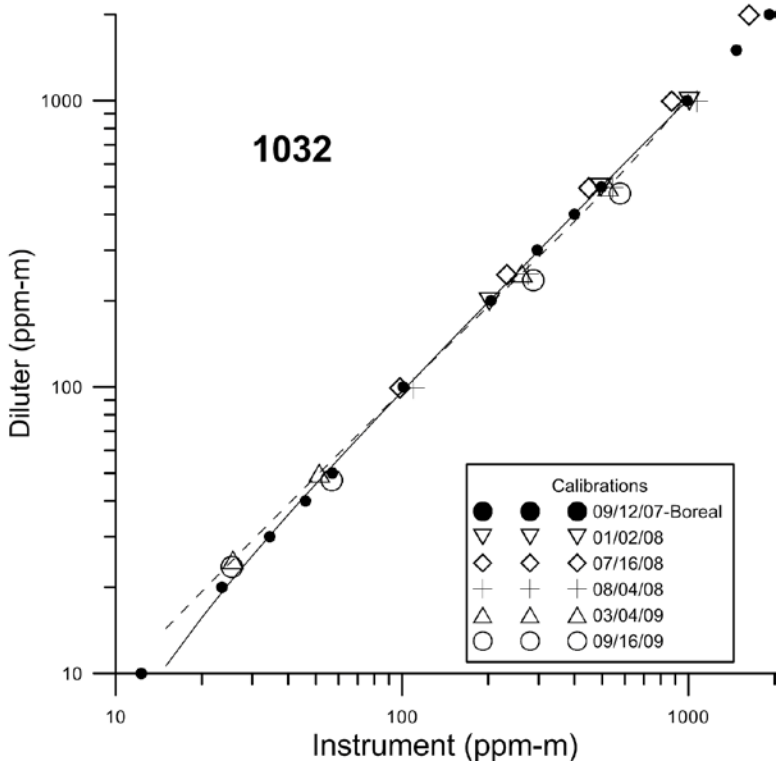


Figure 6.1-7: Multipoint calibrations of the GasFinder2™ s/n NH3OP-1032. The solid (9/12/07) and dashed (3/4/09) lines are the 3rd order polynomial regressions for the chosen multipoint calibration.

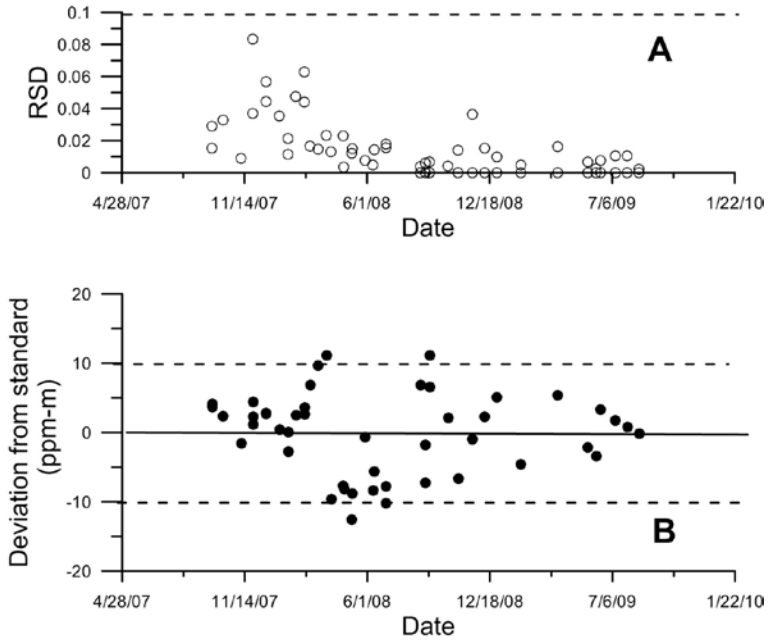


Figure 6.1-8: Control charts of the GasFinder2™ s/n NH3OP-1032

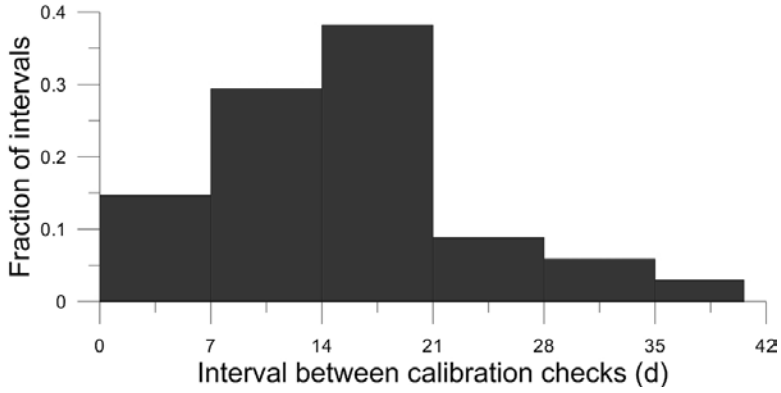


Figure 6.1-9: Calibration check intervals of the GasFinder2™ s/n NH3OP-1032

6.2 TEC 450i analyzer H_2S calibrations

The H_2S Analyzer (Model TEC 450i, Thermo Fisher Scientific, Franklin, MA) with serial number 0733825130 was multipoint calibrated twelve times (Figure 6.2-1). The coefficient of determination (r^2) for linear fits to the calibration values was never less than 0.990 although the slope of the linear regression equation varied from 0.73 to 1.20 (Table 6.2-1). The initial multipoint calibration was conducted prior to the complete burn-in of the converter and consequently differs greatly from the other calibrations. Part of the variation in slope was a result of the H_2S calibration cylinders used.

Table 6.2-1: Multipoint H_2S calibrations

Date	Slope (ppb response^{-1})	Intercept (ppb)	r^2
12/12/2007	1.20	0.0018	0.999
05/21/2008	0.95	-0.0031	0.999
07/28/2008	0.74	0.0051	0.999
09/24/2008	1.08	-0.0643	0.991
10/28/2008	0.98	0.0049	0.999
10/30/2008	0.98	0.0019	0.999
11/19/2008	0.80	-0.0077	0.999
12/09/2008	0.87	-0.0008	0.999
12/10/2008	0.83	0.0026	0.999
03/11/2009	0.92	0.0112	0.999
04/30/2009	0.80	0.0124	0.999
09/09/2009	0.73	0.0014	0.999

The standard deviation of instrument response with CEM zero air measured over a one hour period was 1.13 ppb (10/19/2009). The instrument MDL, defined as 3σ was 3.4 ppb and is indicated in Figure 6.2-2A with dashed lines. This is much less than the mean absolute value of the multipoint calibration intercept of 10.5 ppb.

Instrument performance calibration checks (Figure 6.2-2, 6.2-3) were made at the beginning and end of each measurement period. The majority of calibration checks were made within 28 d (Figure 6.2-4). Instrument response was converted into measured concentrations by multiplying the instrument response by the long-term mean ratio of diluted calibration gas by instrument reading. The long-term mean ratio for this instrument was 0.819. The mean zero concentration was -1.3 ppb, less than the MDL.

The instrument measurement accuracy DQI was 10% of full scale (FS; 1 ppm). Based on the correlation of instrument performance and the calibration cylinder used, it was determined that the concentration of H_2S in the FF44447 cylinder (expiration date 5/13/2009), which was inter-compared with other H_2S calibration cylinders on 8/28/2009 and observed to have been less

significant than the indicated specification. This resulted in unusually high ratios of diluter concentration versus instrument response on 3/11/2009 and a post-study calibration failure.

The instrument measurement precision DQI was 10% of FS. Precision DQI exceedances (Figure 3) occurred on 1/31/2008 and 10/28/2008. The 1/31/2008 failure was due to the burn-in of the converter and signals changes in the instrument response as the instrument was conditioned. The 10/28/2008 DQI failure was likely due to the use of a different calibration tank for one check. Although it cannot be confirmed, the cylinder (SA15346) was likely either not within certification specifications or at the opposite end of the valid certification bound as the cylinder used before (FF20675) and after (LL34303) the date the cylinder was used resulted in valid calibration verifications.

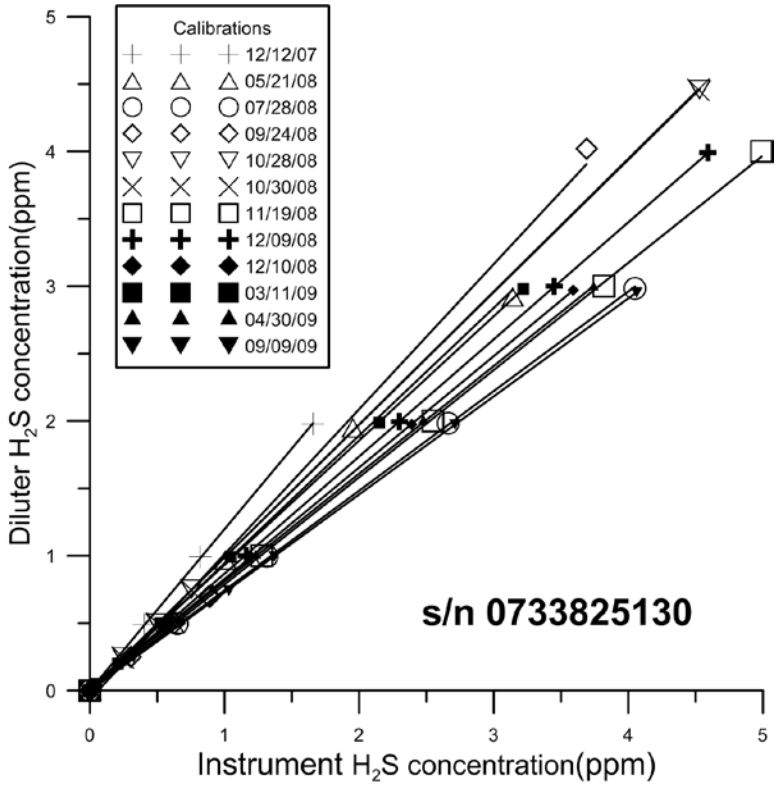


Figure 6.2-1: Multipoint calibrations of the 450i SO_2/H_2S Analyzer

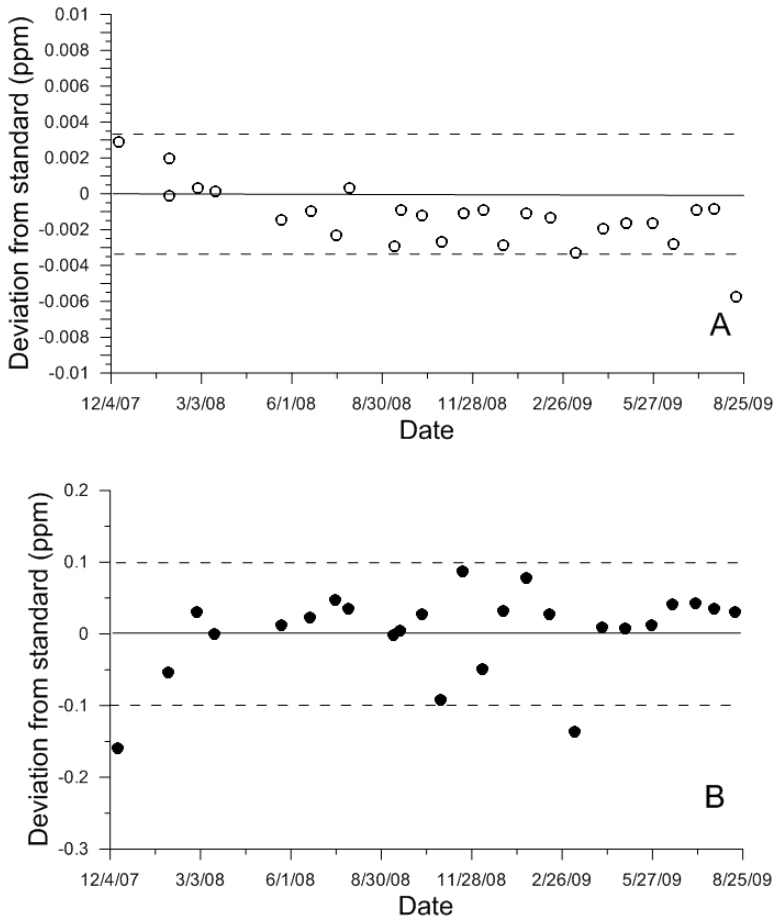


Figure 6.2-2: Instrument Control Charts

The zero check (panel A) and span check (panel B) are indicated. The dashed lines in panel A represent the MDL. The dashed lines in panel B represent 10% of the Full Scale value (1 ppm).

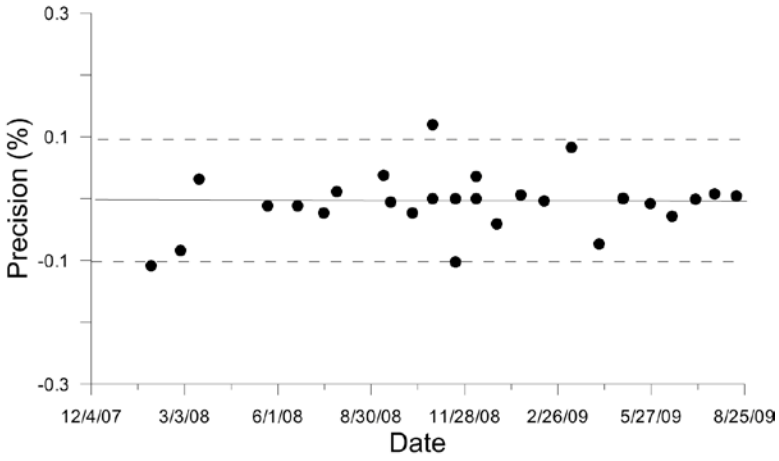


Figure 6.2-3: Instrument Precision

The precision of span checks are indicated. The dashed lines in panel A represent the MDL. The dashed lines represent 10% of the Full Scale value (1 ppm).

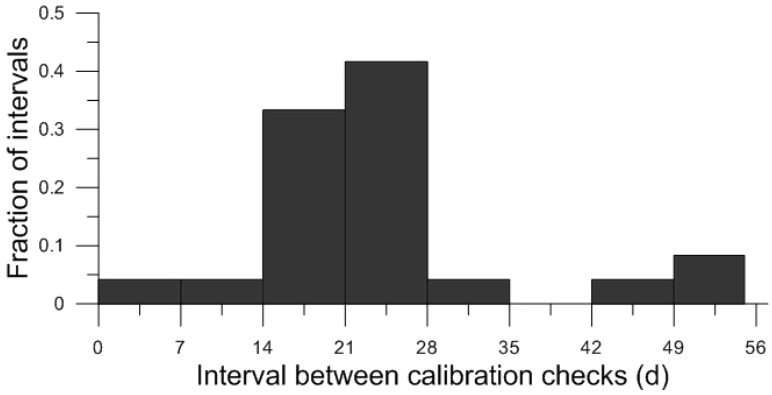


Figure 6.2-4: Calibration check intervals

6.3 Sonic anemometer calibrations

Four sonic anemometers (Model 81000, RM Young Inc, Traverse City, MI) were used at this location: serial numbers 1925, 1926, 1928, and 1938.

Sonic anemometer 1938 was inter-compared with three standard anemometers of identical design five times (Table 6.3-1). No absolute turbulence calibration is possible with this instrument. To assure proper performance and comparability in the wind measurements, an anemometer was inter-compared on-site with those used during a given measurement period at the beginning and end of a measurement period. This instrument was inter-compared with the co-located anemometer sensors on site 26 times (Figure 6.3-1). The majority of calibration checks were made within 21 d (Figure 6.3-2). The large fraction of checks made within 7 d is the result of calibration checks made at the end and beginning of sequential measurement periods.

The accuracy DQI for the on-site inter-comparisons required the individual instruments to have the mean wind speed within 0.2 ms^{-1} of the grand mean value of the three (or four) on-site instruments (Figure 6.3-1B). This instrument passed this check at all times. The last standard inter-comparison (1/2010) failed due to loss of communications.

The precision DQI for the on-site inter-comparisons required each wind component (x, y, and z) of the individual instruments to be within 0.3 ms^{-1} of zero (Figure 8.3-1A). Records of the zero checks made before 12/2007 were recorded as pass/fail- not indicating the actual measurements. The instrument always passed this DQI.

Table 6.3-1: Sonic anemometer inter-comparisons (s/n 1938)

Calibration periods		Mean difference from reference anemometers (ms^{-1})	
Alignment 1	**Alignment 2**	**Alignment 1**	**Alignment 2**
06/08-12/2007	06/12-14/2007	-0.013	+0.011
01/21/2008	01/23/2008	+0.002	-0.036
07/16-17/2008	07/17-18/2008	-0.005	+0.010
03/06-07/2009	03/08-09/2009	-0.007	+0.002
01/07-09/2010	01/21-25/2010	-3.730	-3.940

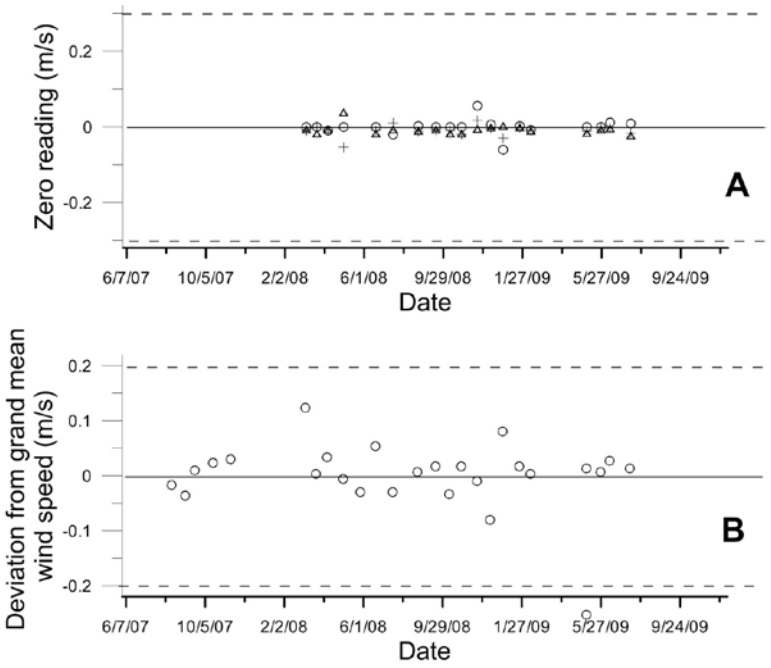


Figure 6.3-1: On-site quality assurance for s/n 1938. The DQI for the zero and inter-comparisons are indicated by the dashed lines. The zero check in the x (open circle), y (open triangle) and z (cross) components are indicated in panel A.

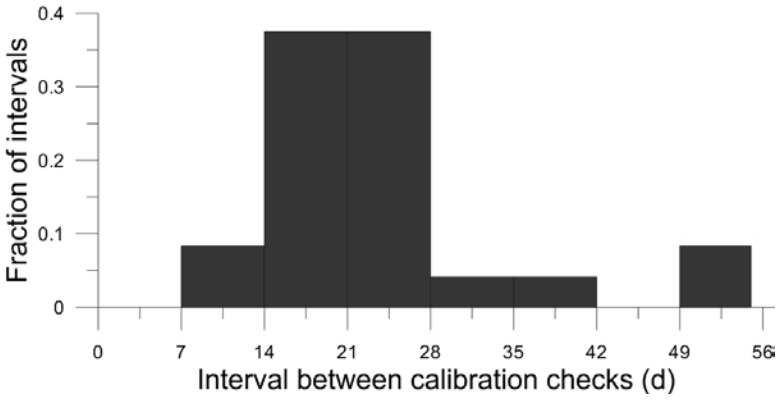


Figure 6.3-2: Inter-comparison check intervals, s/n 1938.

Sonic anemometer 1926 was inter-compared with three standard anemometers of identical design five times (Table 6.3-2). No absolute turbulence calibration is possible with this instrument. To assure proper performance and comparability in the wind measurements, and anemometer was inter-compared on-site with those used during a given measurement period at the beginning and end of the period. This instrument was inter-compared with the co-located anemometer sensors on site 35 times (Figure 6.3-3). The majority of calibration checks were made within 21 d (Figure 6.3-4). The large fraction of checks made within 7 d is the result of calibration checks made at the end and beginning of sequential measurement periods.

The accuracy DQI for the on-site inter-comparisons required the individual instruments to have the mean wind speed within 0.2 ms^{-1} of the grand mean value of the three (or four) on-site instruments (Figure 6.3-3B). This instrument passed this check at all times.

The precision DQI for the on-site inter-comparisons required each wind component (x, y, and z) of the individual instruments to be within 0.3 ms^{-1} of zero (Figure 6.3-3A). Records of the zero checks made before 12/2007 were recorded as pass/fail, and did not include the actual measurements. The instrument always passed this DQI.

Table 6.3-2: Sonic anemometer inter-comparisons, s/n 1926

Calibration periods		**Mean difference from reference anemometers (ms^{-1})**	
Alignment 1	**Alignment 2**	**Alignment 1**	**Alignment 2**
06/19-22/2007	06/29-07/02/2007	-0.005	-0.033
01/17-18/2008	01/20-21/2008	-0.013	-0.032
07/16-17/2008	07/17-18/2008	+0.037	+0.059
03/06-07/2009	03/07-09/2009	+0.004	+0.048
09/16-17/2009	09/17-18/2009	+0.059	+0.001

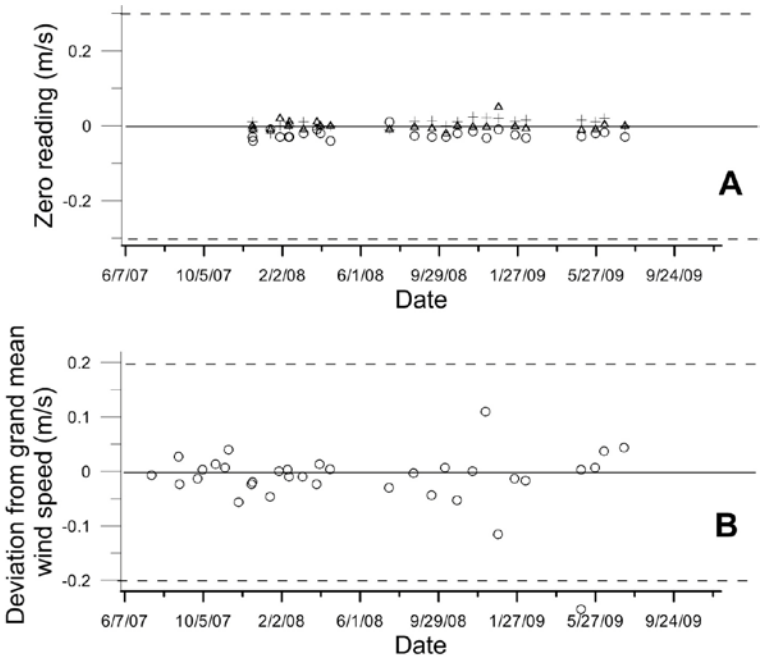


Figure 6.3-3: On-site quality assurance, s/n 1926. The DQI for the zero and inter-comparisons are indicated by the dashed lines. The zero check in the x (open circle), y (open triangle) and z (cross) components are indicated in panel A.

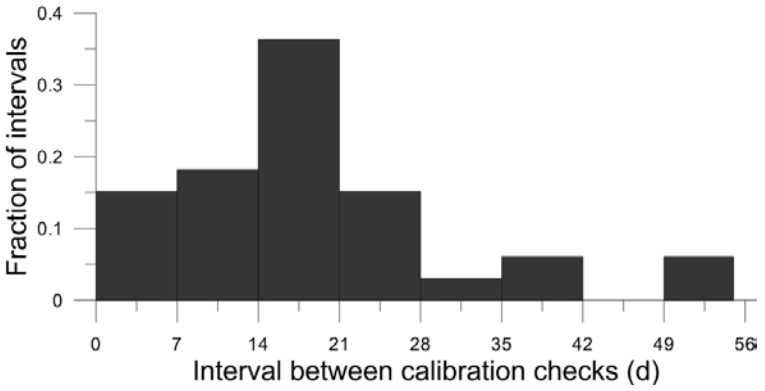


Figure 6.3-4: Inter-comparison check intervals, s/n 1926.

Sonic anemometer 1925 was inter-compared with three standard anemometers of identical design six times (Table 6.3-3). No absolute turbulence calibration was possible with this instrument. To assure proper performance and comparability in the wind measurements, and anemometer was inter-compared on-site with those used during a given measurement period at the beginning and end of a measurement period. This instrument was inter-compared with the co-located anemometer sensors on site 26 times (Figure 6.3-5). The majority of calibration checks were made within 21 d (Figure 6.3-6). The large fraction of checks made within 7 d is the result of calibration checks made at the end and beginning of sequential measurement periods.

The accuracy DQI for the on-site inter-comparisons required the individual instruments to have the mean wind speed within 0.2 ms^{-1} of the grand mean value of the three (or four) on-site instruments (Figure 6.3-5B). This instrument passed this check at all times.

The precision DQI for the on-site inter-comparisons required each wind component (x, y, and z) of the individual instruments to be within 0.3 ms^{-1} of zero (Figure 6.3-5A). Records of the zero checks made before 12/2007 were recorded as pass/fail- not indicating the actual measurements. The instrument always passed this DQI.

Table 6.3-3: Sonic anemometer inter-comparisons, s/n 1925

Calibration periods		**Mean difference from reference anemometers (ms^{-1})**	
Alignment 1	**Alignment 2**	**Alignment 1**	**Alignment 2**
06/08-12/2007	06/12-14/2007	-0.013	-0.022
01/21-22/2008	01/23/2008	-0.053	-0.075
07/16-17/2008	07/17-18/2008	+0.023	+0.004
03/06-07/2009	03/07-09/2009	-0.018	-0.058
09/08-14/2009	09/15-16/2009	-0.013	-0.022
12/18-19/2009	12/21-23/2009	+0.095	-0.084

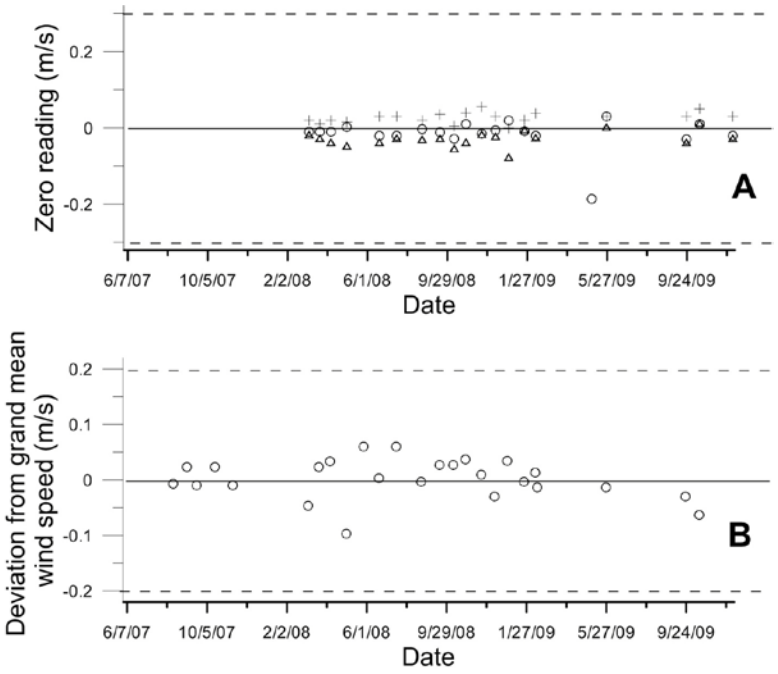


Figure 6.3-5: On-site quality assurance, s/n 1925. The DQI for the zero and inter-comparisons are indicated by the dashed lines. The zero check in the x (open circle), y (open triangle) and z (cross) components are indicated in panel A.

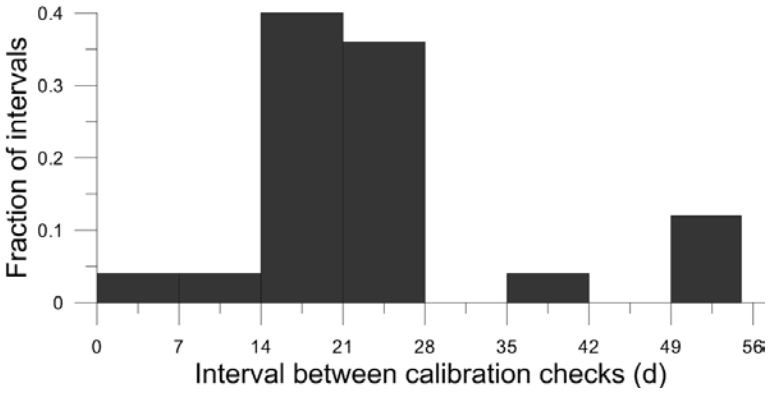


Figure 6.3-6: Inter-comparison check intervals, s/n 1925.

Sonic anemometer 1928 was inter-compared with three standard anemometers of identical design six times (Table 6.3-4). No absolute turbulence calibration is possible with this instrument. To assure proper performance and comparability in the wind measurements, an anemometer was inter-compared on-site with those used during a given measurement period at the beginning and end of a measurement period. This instrument was inter-compared with the co-located anemometer sensors on site 48 times (Figure 6.3-7). The majority of calibration checks were made within 21 d (Figure 6.3-8). The large fraction of checks made within 7 d is the result of calibration checks made at the end and beginning of sequential measurement periods.

The accuracy DQI for the on-site inter-comparisons required the individual instruments to have the mean wind speed within 0.2 ms^{-1} of the grand mean value of the three (or four) on-site instruments (Figure 6.3-7B). This instrument passed this check all but one time. On this one date, the inter-comparison was rerun and the instrument passed the check.

The precision DQI for the on-site inter-comparisons required each wind component (x, y, and z) of the individual instruments to be within 0.3 ms^{-1} of zero (Figure 6.3-7A). Records of the zero checks made before 12/2007 were recorded as pass/fail- not indicating the actual measurements. The instrument always passed this DQI.

Table 6.3-4: Sonic anemometer inter-comparisons, s/n 1928

Calibration periods		**Mean difference from reference anemometers (ms^{-1})**	
Alignment 1	**Alignment 2**	**Alignment 1**	**Alignment 2**
6/15-18/2007	6/18-19/2007	+0.004	+0.019
12/27-28/2007	12/29-31/2007	+0.003	-0.005
7/10-11/2008	7/11-14/2008	+0.022	+0.007
3/03-04/2009	3/05-06/2009	+0.070	-0.027
9/16-17/2009	9/17-18/2009	+0.056	+0.022
12/18-19/2009	12/21-23/2009	+0.094	-0.077

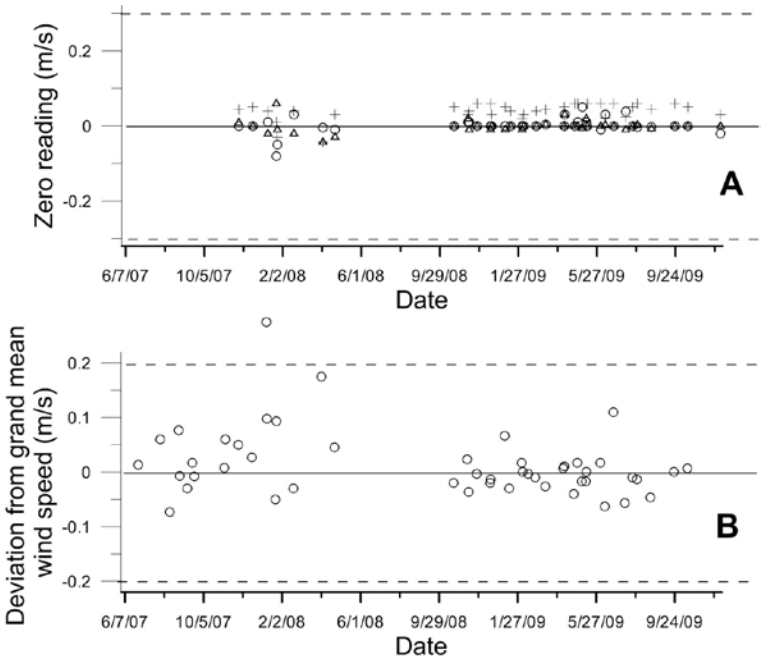


Figure 6.3-7: On-site quality assurance, s/n 1928. The DQI for the zero and inter-comparisons are indicated by the dashed lines. The zero check in the x (open circle), y (open triangle) and z (cross) components are indicated in panel A.

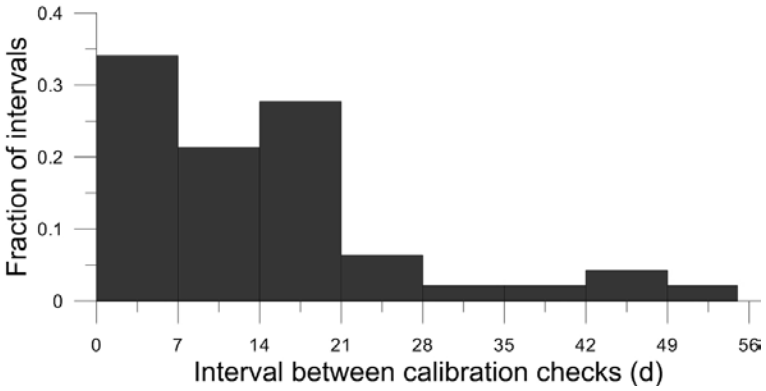


Figure 6.3-8: Inter-comparison check intervals, s/n 1928.

6.4 pH probe calibrations

Two pH probes (Model CSIMM-ph, Innovative Sensors Inc., Anaheim, California) were used at this location: serial numbers 005 and 006.

Probe 005 was used between 7/22/2008 and 11/20/2008. The probe was calibrated five times. The pH probe DQI specified an accuracy of ±0.3 pH units, corresponding to a difference between the calculated and measured pH of 17.7 mV of signal. Figure 6.4-1A illustrates the control chart for the three pH standards used (pH 4, 7, and 10) relative to the mV error. Each sensor was also checked for stability using QCCS solution, with the requirement that the sensor be within 0.05 pH units, or 3 mV. The history of the probe stability check is illustrated in Figure 6.4-1B. Problems with freezing of the electrolyte in the reference electrode during the winter reduced the frequency of these checks. The probe always passed the stability check but failed the accuracy DQI for pH 7 on 6/9/2008. Subsequent accuracy checks after 6/9/2008 indicated no problem with the sensor thus operator error was assumed for this check. The probe failed the DQI for all pH solutions on 11/20/08 whereupon it was removed from service.

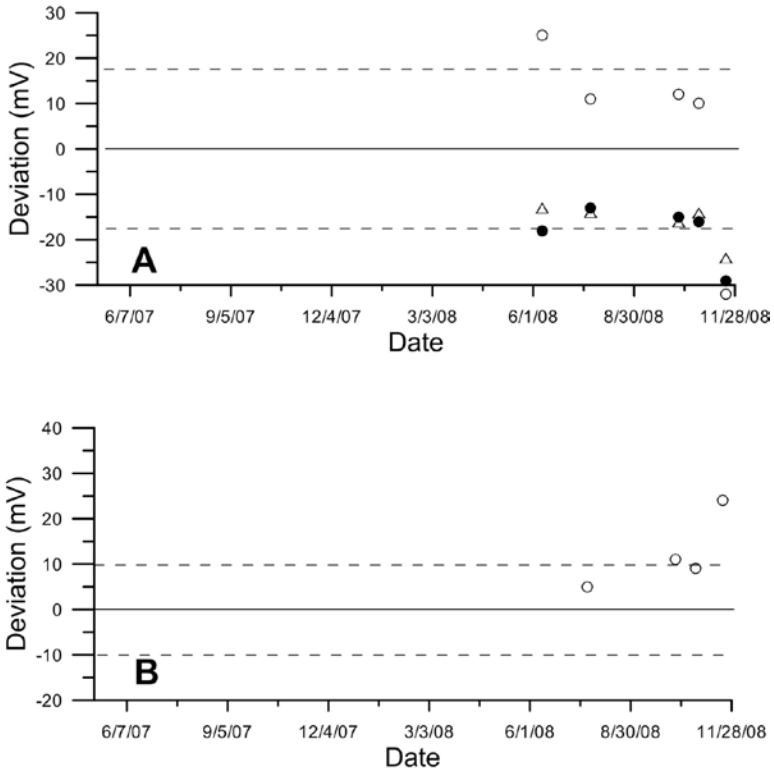


Figure 6.4-1: Accuracy and stability calibration checks of pH probe 005. The absolute deviation in mV of the pH 4 (closed circle), pH 7 (open circle), and ph 10 (solid triangle) tests are indicated in panel A. The dashed lines define the DQI limits. The time history of the absolute stability is indicated in panel B where the dashed lines indicate the desired bounds of the stability.

Probe 006 was used between 8/18/2008 and 7/30/2009. The probe was calibrated six times. The pH probe DQI specified an accuracy of ±0.3 pH units, corresponding to a difference between the calculated and measured pH of 17.7 mV of signal. Figure 6.4-2A illustrates the control chart for the three pH standards used (pH 4, 7, and 10) relative to the mV error. Each sensor was also checked for stability using QCCS solution, with the requirement that the sensor be within 0.05 pH units, or 3 mV. The history of the probe stability check is illustrated in Figure 6.4-2B. Problems with freezing of the electrolyte in the reference electrode during the winter reduced the frequency of these checks. The probe always passed the stability check and accuracy DQI.

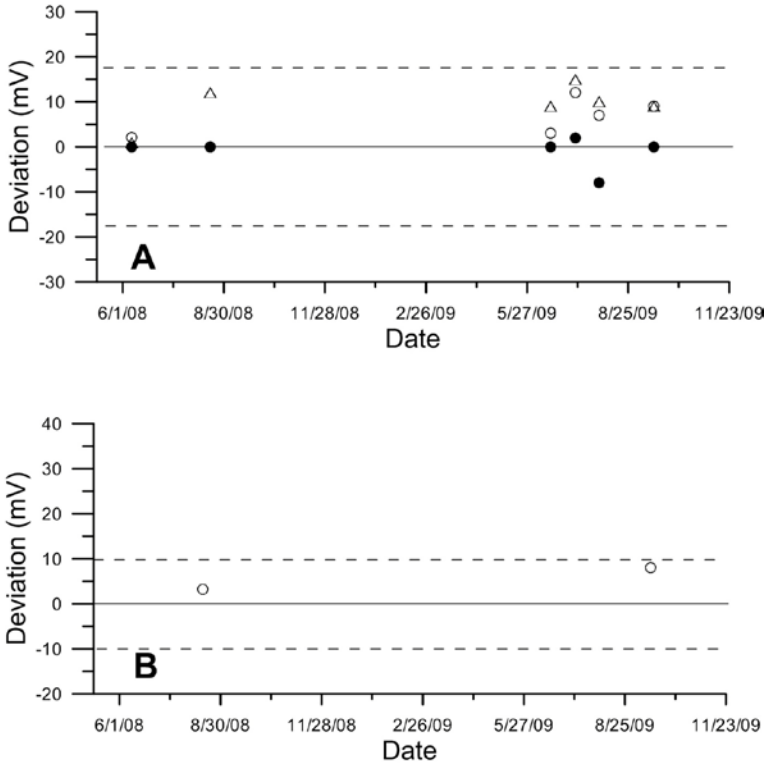


Figure 6.4-2: Accuracy and stability calibration checks of pH probe 006. The absolute deviation in mV of the pH 4 (closed circle), pH 7 (open circle), and ph 10 (solid triangle) tests are indicated in panel A. The dashed lines define the DQI limits. The time history of the absolute stability is indicated in panel B where the dashed lines indicate the desired bounds of the stability.

In general, the probe calibrations were conducted about every 20 d. Since freezing conditions damaged the probes, the probes were not used during the winter.

6.5 ORP probe calibrations

Two oxidation-reduction potential (ORP) probes (Model CSIM11-ORP, Innovative Sensors Inc., Anaheim, California) were used at this location: serial numbers 040 and 080.

Probe 080 was first used 5/7/2009 and last used 8/18/2009. The probe was calibrated nine times. The ORP probe DQI specified an accuracy of ± 20 mV (Figure 6.5-1A). Each sensor was also checked for stability using a KCl solution, with the requirement that the sensor be within 1 mV of the reference solution. The history of the probe stability check is illustrated in Figure 6.5-1B. Problems with freezing of the electrolyte in the reference electrode during the winter reduced the frequency of these checks. The checks exceeded the DQI on three dates, but the probe accuracy check passed the DQI (although near the upper bound) on dates between the check failures. Therefore it was determined that the DQI failures were a result of operator error and not probe failure.

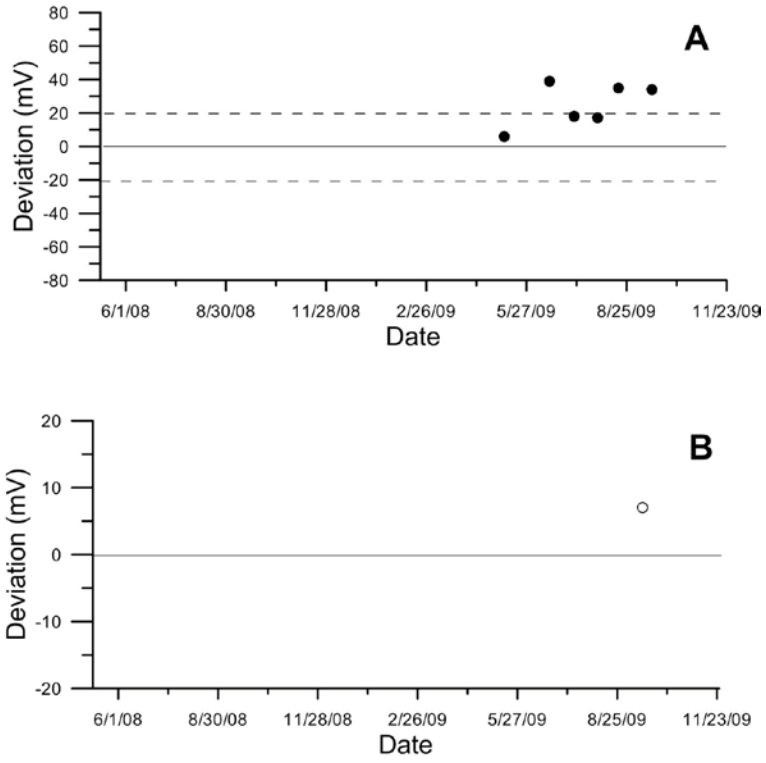


Figure 6.5-1: Accuracy and stability calibration checks of ORP probe 080. The stability check of the probe (Panel B) and the absolute deviation in mV of the probe (panel A) are indicated. The dashed lines define the DQI limits in panel A.

Probe 040 was used between 7/18/2007 and 4/7/2008. The probe was calibrated six times. The ORP probe DQI specified an accuracy of ± 20 mV (Figure 6.5-2A). Each sensor was also checked for stability using a KCl solution, with the requirement that the sensor be within 1 mV of the reference solution. The history of the probe stability check is illustrated in Figure 6.5-2B. Problems with freezing of the electrolyte in the reference electrode during the winter reduced the frequency of these checks. The probe always passed the accuracy check DQI and the stability check indicated excellent probe stability.

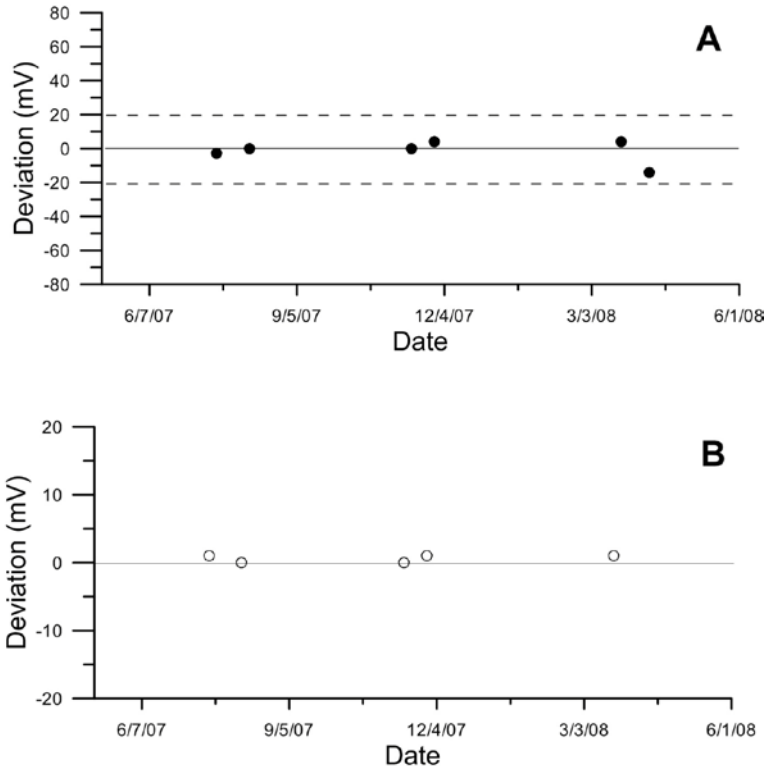


Figure 6.5-2- Accuracy and stability calibration checks of ORP probe 040. The stability check of the probe (Panel B) and the absolute deviation in mV of the probe (panel A) are indicated. The dashed lines define the DQI limits in panel A.

In general, the probe calibrations were conducted about every 20 d. Since freezing conditions damaged the probes, the probes were not used during the winter.

6.6 S-OPS operational checks

The Synthetic Open Path Systems (S-OPS; s/n A and C) and the Gas Sampling System (GSS: s/n 4-0019) used at this location were checked about every 20 d. A leak check and maximum flow check were made for both the S-OPS in combination with the GSS and for the GSS alone. In addition, the balance of flow into each inlet in the S-OPS was checked before and after each measurement period.

Results of the leak tests for both the GSS and the Combined GSS/S-OPS are indicated in Table 6.6-1. Leaks in the GSS with check failures commonly corresponded with S-OPS leak check failures. During most of these checks when both GSS and S-OPS failed the check, the difference in flow between the GSS only and S-OPS/GSS check were within specifications (10% of maximum flow). Details of the leak check failures follow:

- S-OPS leak check failure of 8/22/2008 was associated with leaks in the initial setup of the S-OPS.
- GSS leak check failures from 9/11/2008 through 2/13/2009 appeared as a result of post-correction of the mass flow meter and did not appear to be failing during the measurements. No evidence of the failures occurred at the S-OPS leak check. Consequently it is assumed that the failures do not require the invalidation of measurements.
- GSS and S-OPS leak check failures of 2/25/09 through 4/8/2009 were due to a failure of the mass flow meter. The meter was replaced on 4/8/2009.
- GSS leak check failure for solenoid 2 on 6/15/2009 appears to be a result of operator error as no changes were made to the GSS to cause acceptance during the following check.
- GSS and S-OPS leak check failures from 7/23/2009 to 7/30/2009 were a result of a pump diaphragm failure. Consequently the leak check failure of the GSS was the cause of the leak check failure of the S-OPS.

The impact of leak check failures in the S-OPS lines (with the exception of those at the GSS inlet filters) was minimal as the leaks were at junctions of tubing and tubing/inlet filters and would allow air into the lines that differ only from height above the berm from the air sampled along the inlets themselves. The impact of GSS leak check failures associated with pump diaphragm failures would only influence the volume of flow available to the H_2S analyzer and the time required to draw air from the S-OPS. In all cases flow available to the analyzer greatly exceeded that used by the analyzer (1.5 L min^{-1}) (Table 6.6-1). GSS leaks at a solenoid may reduce the measured concentrations of H_2S by mixing air from the inside of the trailer with the sampled airstream.

Table 6.6-1: Record of Leak checks for GSS s/n 4-0019 and GSS/S-OPS s/n A and C

Date	Site	GSS solenoid/ S-OPS	GSS mass Flow (L min^{-1})	GSS pressure (kPa)	GSS check result	S-OPS max flow (L min^{-1})	S-OPS mass flow (L min^{-1})	S-OPS pressure (kPa)	S-OPS check result
08/22/2008	IN5A	2	0.07	1.39	Pass	9.9	1.02	-0.86	Fail
		3	0.10	0.36	Pass	10	1.26	0.57	Fail
09/11/2008	IN5A	2	0.22	-37.87	Fail	N/A	N/A	N/A	N/A
		3	0.22	-36.90	Fail	N/A	N/A	N/A	N/A
09/18/2009	IN5A	2	0.18	-35.84	Fail	9.8	0.54	-36.78	Pass
		3	0.17	-37.55	Fail	10	0.61	-36.57	Pass
10/10/2009	IN5A	2	N/A	N/A	N/A	9.8	0.61	-36.7	Pass
		3	N/A	N/A	N/A	10.5	0.69	-36.48	Pass
10/28/2008	IN5A	2	0.22	-38.05	Fail	9.7	0.43	-37.87	Pass
		3	0.22	-38.37	Fail	10	0.49	-38.5	Pass
11/19/2008	IN5A	2	0.12	-37.3	Pass	9.8	0.33	-36.25	Pass
		3	0.07	-37.19	Pass	10.1	0.32	-37.91	Pass
12/10/2008	IN5A	2	0.23	-36.16	Fail	9.9	0.45	-37.58	Pass
		3	0.22	-38.12	Fail	10.3	0.54	-37.47	Pass
12/29/2008	IN5A	2	0.13	-36.19	Pass	9.7	0.46	-35.65	Pass
		3	0.12	-36.87	Pass	10	0.62	-38.03	Pass
01/21/2009	IN5A	2	0.20	-38.98	Fail	9.8	0.34	-37.56	Pass
		3	0.28	-37.2	Fail	10.5	0.38	-38.26	Pass
02/13/2009	IN5A	2	0.26	-37.74	Fail	9.9	0.99	-37.5	Pass
		3	0.20	-37.63	Fail	10.5	0.78	-37.24	Pass
02/25/2009	IN5A	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		3	0.26	-39.04	Fail	11	2.02	-37.06	Fail
03/11/2009	IN5A	2	0.28	-37.9	Fail	9.8	2.49	-39.16	Fail
		3	0.15	-39.28	Pass	11	1.34	-39.97	Fail
04/08/2009	IN5A	2	0.21	-38.05	Fail	6.95	0.83	-37.77	Fail
		3	0.00	-38.94	Pass	7.66	0.65	-38.18	Pass
05/05/2009	IN5A	2	0.21	-38.06	Fail	9.7	1.04	-37.67	Fail
		3	0.01	-36.25	Pass	10.3	0.71	-36.62	Pass
05/28/2009	IN5A	2	0.13	-38.14	Pass	9.9	0.95	-38.93	Pass
		3	0.06	-39.17	Pass	10.5	0.52	-37.71	Pass
06/15/2009	IN5A	2	0.33	-36.81	Fail	10	1.43	-36.24	Fail
		3	0.04	-35.74	Pass	10.5	0.67	-37.66	Pass
07/08/2009	IN5A	2	0.13	-37.4	Pass	9.7	1.28	-35.89	Fail
		3	0.03	-37.84	Pass	10.5	0.83	-37.21	Pass
07/23/2009	IN5A	2	0.31	-37.08	Fail	9.7	1.68	-38.26	Fail
		3	0.19	-36.75	Fail	10.5	1.18	-37.8	Fail
07/30/2009	IN5A	2	0.51	-36.43	Fail	9.5	1.77	-37.17	Fail
		3	0.40	-35.54	Fail	10.5	1.47	-37.8	Fail
08/06/2009	IN5A	2	-0.15	-36.76	Pass	N/A	N/A	N/A	N/A
		3	-0.15	-37.36	Pass	N/A	N/A	N/A	N/A
08/17/2009	IN5A	2	0.06	-37.69	Pass	9.8	1.18	-35.2	Fail
		3	0.04	-35.33	Pass	10.1	1.18	-36.3	Fail

The inlet flow balance checks are summarized in Tables 6.6-2A and 6.6-2B. While the inlet flow balance was measured at the beginning and end of each measurement period, results showed that the balance throughout the period was not assured if the balance test indicated an adequate balance. Balance across the inlets at any time during a period or at the beginning or end of a period was limited due to wetness of the inlet filters associated with fog, ice, snow, or rain. In addition dust on the inlet filters contributed to an undetermined rate of flow degradation

of individual inlets over a period. Spider webs would also restrict flow across the inlet filters. The allowable tolerance in the inlet balance was that the flow through any inlet was within 10% of the expected flow for the inlet.

Condensation or liquid water intrusion into the Teflon tubing of the S-OPS occurred often in the tubing around the area sources. Analysis of the problem revealed that condensation occurred as the air cooled in transit from the inlet to the trailer through tubing under a negative net radiation balance (particularly at night). In addition, water intrusion occurred during the leak testing if any water had accumulated along the junction between the filter/inlet and the S-OPS tubing. The impact of the liquid water in the S-OPS tubing on the measured concentration of H_2S was minimal due to the low solubility of H_2S.

Table 6.6-2A: Record of flow balancing- Side 1 (s/n A)

		Delta Inlet Flow (Beginning-End) (L min^{-1})										
Start Date	**End Date**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Check results**
9/18/2008	10/09/2008	0.01	0.06	0.21	0.07	0.10	0.00	0.07	-0.02	0.03	0.04	Pass
10/09/2008	10/28/2008	-0.02	-0.03	-0.02	0.02	0.03	0.10	-0.02	0.01	0.01	-0.03	Pass
10/28/2008	11/19/2008	0.05	0.03	-0.09	-0.07	-0.04	-0.07	-0.01	0.13	0.01	0.10	Pass
11/19/2008	12/10/2008	-0.06	-0.08	-0.02	-0.04	-0.05	-0.04	-0.06	-0.04	0.05	-0.11	Pass
12/10/2008	12/29/2008	0.03	0.00	-0.01	0.02	-0.01	0.00	0.01	-0.01	-0.01	-0.01	Pass
12/29/2008	01/21/2009	0.02	0.04	-0.02	-0.03	0.08	0.00	0.04	0.02	-0.05	0.03	Pass
01/21/2009	02/13/2009	-0.03	-0.03	-0.03	0.02	-0.11	0.04	-0.01	-0.03	0.05	0.01	Pass
02/13/2009	03/11/2009	0.01	0.06	0.01	0.02	0.05	0.05	0.01	0.06	0.02	0.10	Fail
03/11/2009	04/08/2009	-0.02	-0.02	0.05	-0.01	0.07	0.00	-0.04	-0.02	-0.03	0.00	Pass
04/08/2009	05/05/2009	0.01	-0.03	-0.04	0.00	-0.09	-0.04	-0.02	-0.03	-0.04	-0.04	Pass
05/05/2009	05/28/2009	0.00	0.05	0.01	-0.02	0.06	0.04	-0.04	-0.05	-0.04	0.00	Pass
05/28/2009	06/15/2009	-0.04	-0.03	-0.03	-0.04	-0.05	-0.12	-0.06	0.03	0.01	-0.03	Pass
06/15/2009	07/08/2009	-0.04	-0.01	0.01	0.02	-0.02	0.01	0.01	0.00	-0.02	-0.02	Pass
07/08/2009	07/30/2009	0.16	0.18	0.19	0.02	0.12	0.06	0.10	0.05	0.18	0.17	Pass
07/30/2009	08/17/2009	-0.19	-0.23	-0.21	0.04	-0.16	-0.05	-0.05	-0.10	-0.24	-0.08	Pass

Table 6.6-2B: Record of flow balancing- Side 2 (s/n C)

		Delta Inlet Flow (Beginning-End) (L min^{-1})										
Start Date	**End Date**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Check results**
9/18/2008	10/09/2008	-0.01	-0.02	-0.01	-0.07	-0.06	-0.07	-0.11	-0.01	-0.03	-0.01	Pass
10/09/2008	10/28/2008	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.02	-0.02	-0.01	Pass
10/28/2008	11/19/2008	0.10	0.00	0.00	0.07	-0.02	0.16	0.04	0.10	0.15	0.12	Pass
11/19/2008	12/10/2008	-0.13	-0.09	-0.11	-0.07	0.07	-0.10	-0.04	-0.23	-0.20	-0.10	Pass
12/10/2008	12/29/2008	-0.02	-0.01	-0.04	-0.01	0.00	-0.01	-0.03	-0.05	-0.03	0.00	Pass
12/29/2008	01/21/2009	0.05	0.09	0.05	0.05	-0.14	-0.06	0.12	0.14	0.08	-0.16	Pass
01/21/2009	02/13/2009	-0.03	0.00	-0.02	0.01	-0.02	0.03	0.00	-0.03	-0.02	-0.01	Pass
02/13/2009	02/25/2009	0.08	0.06	0.12	-0.08	0.13	0.07	-0.07	0.11	0.09	0.19	Pass
02/25/2009	03/11/2009	0.00	0.00	0.05	0.05	0.08	0.02	0.00	0.00	-0.03	0.04	Pass
03/11/2009	04/08/2009	-0.05	0.00	-0.04	0.03	-0.03	-0.01	0.03	-0.02	0.05	-0.04	Pass
04/08/2009	05/05/2009	0.01	-0.02	0.00	-0.02	-0.11	0.00	-0.06	0.02	-0.01	-0.02	Pass
05/05/2009	05/28/2009	-0.09	0.01	-0.02	0.04	-0.01	0.01	0.06	-0.04	-0.03	0.06	Pass
05/28/2009	06/15/2009	0.04	0.01	-0.02	0.00	-0.05	-0.01	-0.17	-0.01	-0.01	-0.05	Pass
06/15/2009	07/08/2009	-0.02	0.03	0.02	-0.06	0.00	0.03	0.01	0.04	-0.01	0.04	Fail
07/08/2009	07/30/2009	-0.02	-0.03	-0.02	0.09	0.01	-0.01	0.02	-0.04	0.01	-0.08	Pass
07/30/2009	08/17/2009	-0.01	0.01	-0.51	-0.24	-0.36	-0.31	0.10	0.10	-0.73	0.10	Fail

The nominal planned interval between S-OPS checks was 20 d (three weeks). S-OPS checks were conducted at this long term measurement location at one to three week intervals (Figure 6.6-1). The shorter periods between checks were a result of work being done on the site.

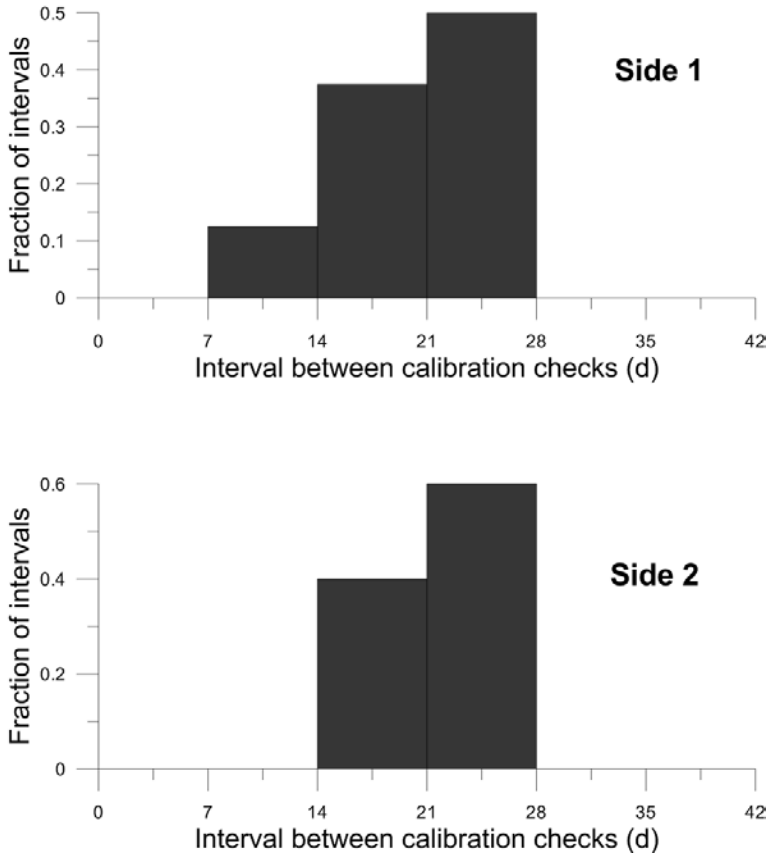


Figure 6.6-1: Intervals between checks

6.7 Miscellaneous meteorological and lagoon calibrations

6.7.1 Air temperature/humidity

A hygrothermometer (Model HMP45C, Vaisala Inc., Helsinki, Finland) measured both air temperature and relative humidity. Calibration of this sensor was conducted at least annually. Initial calibrations were conducted by the factory. The calibration checks are documented in Table 6.7-1.

Table 6.7-1: Calibration record of Vaisala HMP45C, s/n: 4410007

Relative humidity (RH)					
Calibration Date	**Expected RH (%)**	**Measured RH (%)**	**Difference from expected RH (%)**	**Average difference RH (%)**	**Action**
2/17/2010	21	102	-81		Replace/repair
	50	132	-82		Replace/repair
	95	182	-87		Replace/repair
				-84	Replace/repair
7/10/2008	11	11	0		Accept
	50	48	2		Accept
	84	78	6		Accept
				2	Accept
Temperature (T)					
Calibration Date	**Expected T (°C)**	**Measured T (°C)**	**Difference from expected T (°C)**		**Action**
2/17/2010	24.3	-81.7	106		Replace
7/10/2008	27.1	26.8	0.30		Accept

6.7.2 Barometric Pressure

An aneroid barometer (Model 278, Setra Inc, Boxborough, MA) with serial number 3033745 was used to measure barometric pressure. Calibration of this sensor was conducted at least annually. Initial calibrations were conducted by the factory. The calibration checks are documented in Table 6.7-2.

Table 6.7-2: Calibration record of Setra 278 s/n 3033745

Calibration Date	Expected value range (hPa)	Number of comparisons	Mean difference from reference (hPa)	Action
2/11-12/2010	998.4-992.5	6	1.6	Accept
9/16-17/2009	997.4-1000.1	6	0.8	Accept
2/27-3/2/2009	992.3-1010.0	6	2.0	Accept
7/23-27/008	995.6-996.8	6	1.1	Accept
1/22-23/2008	995.6-998.2	6	1.5	Accept

6.7.3 Solar Radiation

A pyranometer (Model 200SB, LiCOR Inc., Lincoln, NE) was used to measure solar radiation. Calibration of this sensor was conducted at least annually. Initial calibrations were conducted by the factory. The calibration checks are documented in Table 6.7-3.

Table 6.7-3: Calibration record of LiCOR 200SB Pyranometer, s/n PY554447

Calibration Date	Mean difference from reference ($W\ m^{-2}$)	Mean difference from reference (%)	Action
3/5-3/8 2010	4.84	0.91	Accept
8/30/2006			Factory Calibration

6.7.4 Lagoon water temperature

A thermistor (Model 107-L, Campbell Scientific Inc, Logan, Utah) was used to measure lagoon temperature. Calibration of this sensor was conducted at least annually. Initial calibrations were conducted by the factory. The calibration checks are documented in Table 6.7-4.

Table 6.7-4: Calibration record of Thermistor CSI 107-L (s/n V)

Calibration date	Expected value (°C)	Deviation from expected (°C)	Action
2/15/2010	1.1	1.2	Accept
2/15/2010	35.7	2.9	Accept
9/14/2009	0.1	-0.1	Accept
3/6/2009	0.0	0.1	Accept

6.7.5 CR1000 Data logger

The CR1000 data logger (Campbell Scientific Inc., Logan, Utah) was used to log all lagoon measurements (pH, oxidation-reduction potential, and temperature) and air temperature, relative humidity, barometric pressure, and wetness. Calibration checks of this unit were conducted at the beginning and end of the study. Initial calibrations were conducted by the factory. The calibration checks are documented in Table 6.7-6.

Table 6.7-6: Calibration record of Campbell Scientific CR1000 data logger, s/n 7676

Factory Calibration						
Calibration Date: 1/18/2007			**Single-Ended**		**Differential**	
Channel	**Input (mV)**	**Tolerance (mV)**	**Measured mV**	**Error (mV)**	**Measured (mV)**	**Error (mV)**
12	5000	± 3	5000.19	-0.19	5001.01	-1.01
12	-5000	± 3	-5002.51	-2.51	-5001.35	-1.35
12	2500	± 1.5			2500.42	-0.42
12	250	± 0.15			250.042	-0.042
12	25	± 0.015			25.005	-0.005
12	7.5	± 0.0045			7.50015	-0.0015
12	2.5	± 0.0015			2.49929	0.00071
12	-2.5	± 0.0015			-2.49967	0.00067
12	5000	± 6	4997.99	2.99	4999.32	0.32
12	5000	± 6	5001.97	-1.97	5003.03	-3.03
12	5000	± 6	N/A		N/A	
12	5000	± 6	N/A		N/A	

PAML Calibration				
Calibration Date: 2/5/2007	**Single Ended**		**Differential**	

SE Channel	Input (mV)	Tolerance SE|DE (mV)	Measured mV Mean Value	Error (mV)	Measured (mV)	Error (mV)
1	4950	± 6.96| 4.97	4951.7	-1.7		
2	4950	± 6.96| 4.97	4951.7	-1.7		
3	4950	± 6.96| 4.97	4951.7	-1.7		
4	4950	± 6.96| 4.97	4951.7	-1.7		
5	4950	± 6.96| 4.97	4951.7	-1.7		
6	4950	± 6.96| 4.97	4951.7	-1.7		
7	4950	± 6.96| 4.97	4951.7	-1.7		
8	4950	± 6.96| 4.97	4951.7	-1.7		
9	4950	± 6.96| 4.97	4951.7	-1.7		
10	4950	± 6.96| 4.97	4951.7	-1.7		
12	4950	± 6.96| 4.97	4951.7	-1.7		
13	4950	± 6.96| 4.97	4951.7	-1.7		
14	4950	± 6.96| 4.97	4951.7	-1.7		
15	4950	± 6.96| 4.97	4951.7	-1.7		
16	4950	± 6.96| 4.97	4951.7	-1.7		

Calibration Date: 2/24/2010			Single-Ended		Differential	
Channel	Input (mV)	Tolerance SE | DE (mV)	Measured (mV)	Error (mV)	Measured (mV)	Error (mV)
1	100	± 2.06 | 1.06	99.13	0.87		
2	100	± 2.06 | 1.06	99.13	0.87	99.53	0.47
3	100	± 2.06 | 1.06	99.13	0.87		
4	100	± 2.06 | 1.06	99.13	0.87		
5	100	± 2.06 | 1.06	99.13	0.87	99.53	0.47
6	100	± 2.06 | 1.06	99.13	0.87	99.53	0.47
7	100	± 2.06 | 1.06	99.45	0.87	99.53	0.47
8	100	± 2.06 | 1.06	99.13	0.87	99.53	0.47
9	100	± 2.06 | 1.06	99.43	0.87		
10	100	± 2.06 | 1.06	99.13	0.87		
11	100	± 2.06 | 1.06	99.13	0.87		
12	100	± 2.06 | 1.06	99.13	0.87		
13	100	± 2.06 | 1.06	99.13	0.87		
14	100	± 2.06 | 1.06	99.13	0.87		
15	100	± 2.06 | 1.06	99.13	0.87		
16	100	± 2.06 | 1.06	99.13	0.87		
1	0	± 2.06 | 1.06	0	0		
2	0	± 2.06 | 1.06	0	0	0	0
3	0	± 2.06 | 1.06	0	0		
4	0	± 2.06 | 1.06	0	0		
5	0	± 2.06 | 1.06	0	0	0	0

Calibration Date: 2/24/2010			Single-Ended		Differential	
Channel	**Input (mV)**	**Tolerance SE | DE (mV)**	**Measured (mV)**	**Error (mV)**	**Measured (mV)**	**Error (mV)**
6	0	± 2.06 | 1.06	0	0	0	0
7	0	± 2.06 | 1.06	0	0	0	0
8	0	± 2.06 | 1.06	0	0	0	0
9	0	± 2.06 | 1.06	0	0		
10	0	± 2.06 | 1.06	0	0		
11	0	± 2.06 | 1.06	0	0		
12	0	± 2.06 | 1.06	0	0		
13	0	± 2.06 | 1.06	0	0		
14	0	± 2.06 | 1.06	0	0		
15	0	± 2.06 | 1.06	0	0		
16	0	± 2.06 | 1.06	0	0		

6.7.6 CR800 Data logger

The CR800 data logger (Campbell Scientific Inc., Logan, Utah) was used to log all GSS measurements (air temperature and relative humidity, flow rate, and pressure). Calibration check of this unit was conducted only at end of the study. Initial calibrations were conducted by the factory. The calibration checks are documented in Table 6.7-7.

Table 6.7-7: Calibration record of Campbell Scientific CR800 data logger s/n 3699

Calibration date: 3/22/2010			Single-Ended	
SE Channel	**Input(mV)**	**Tolerance (mV)**	**Measured (mV)**	**Error (mV)**
1	100	±2.061	99.40	0.6
2	100	±2.061	99.40	0.6
3	100	±2.061	99.41	0.6
4	100	±2.061	99.41	0.6
5	100	±2.061	99.41	0.6
6	100	±2.061	99.41	0.6

Calibration date: 3/22/2010			Single-Ended	
SE Channel	**Input(mV)**	**Tolerance (mV)**	**Measured (mV)**	**Error (mV)**
1	0	±2.061	0	0
2	0	±2.061	0	0
3	0	±2.061	0	0
4	0	±2.061	0	0
5	0	±2.061	0	0
6	0	±2.061	0	0

6.8 Site Activity

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	8/21/2008		Setup	Set up S-OPS lines and antennas. Used GPS to find locations.
IN5A	8/22/2008		Setup	Too wet to perform wetness sensor calibrations or sludge depth measurement.
IN5A	8/22/2008		Setup	Sonic anemometers heights taken.
IN5A	8/22/2008		Setup	Sonic anemometer 3 pole on tower too big for sonic anemometer. Could not get tower sonic anemometers set up because thunderstorms; sonic anemometer 1 on met station running.
IN5A	8/22/2008		Setup	Could not balance S-OPS on south side. Could not replace the filters because of rain. Rain could be affected balance (H_2S still being measured even though the inlets are not balanced). Could not balance north side S-OPS due to rain (clogging filters). All other tests passed and removed corks for H_2S sampling.
IN5A	8/22/2008		Setup	Strong odor from lagoon on North and East sides due to Southwest winds. Reading H_2S values greater than 300ppb.
IN5A	8/22/2008		Setup	Wetness sensor: Too wet to calibrate
IN5A	8/22/2008		Setup	S-OPS Max Flow Test
IN5A	8/22/2008		Setup	S-OPS/GSS Leak Test: Pass
IN5A	8/22/2008		Setup	GSS No Flow Test
IN5A	8/22/2008		Setup	GSS Max Flow Test
IN5A	8/22/2008		Setup	GSS Leak Test: Pass
IN5A	8/22/2008	15:05-16:05	Setup	sonic anemometer intercomparison: Pass
IN5A	8/22/2008	15:45	Setup	Barometer audit: Accepted
IN5A	8/22/2008	16:20	Setup	sonic anemometer bias/zero check: Pass
IN5A	9/10/2008		Setup	Set up ground and tower retro-reflectors; mounted tower sonic anemometers. All retro-reflectors have 0.25-inch plastics.
IN5A	9/10/2008		Setup	Calibrated TDLAS 1032; ran out of time due to tube-connector leak. Will calibration other TDLAS tomorrow.
IN5A	9/10/2008		Setup	No internet connections to TDLAS laptops.
IN5A	9/10/2008		Setup	Set up CO_2 measuring instrument on North side of lagoon (3 cubes with 0.25-inch plastics).
IN5A	9/11/2008		Setup	Tried to calibrate TDLAS 1031 for 30 minutes, but could not get values within +/-10% bias.
IN5A	9/11/2008		Setup	Changed S-OPS filters and re-taped threads with Teflon tape. GSS leak (0.64 LPM during test); ran out of time and could not perform remaining S-OPS/GSS acceptance.
IN5A	9/11/2008		Setup	Scanner in NW corner grinding even after sending new commands; will bring back to office to troubleshoot.
IN5A	9/11/2008		Setup	GSS Leak Test: Pass
IN5A	9/11/2008		Setup	GSS Max Flow Test
IN5A	9/11/2008	16:34	Setup	Calibrated TDLAS 1029
IN5A	9/16/2008		Setup	Error message on TDLAS 1 laptop - had to power-cycle machine. Lost all paths on TDLAS 1--re-aimed.

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	9/16/2008		Setup	Installed TDLAS 2 and scanner. Tried to aim paths. Could not aim paths 5 and 10 on TDLAS 2 because of rain.
IN5A	9/16/2008		Setup	On modem set subact mask=255.255.255.0. Set up single path for bLS/RPM validation study. Path is 102 meters running along the East side of the lagoon.
IN5A	9/17/2008	14:00	Remote	Daily Status Check from PAML Notes: Re-aimed three paths on TDLAS 2. Changed TCP/IP settings on H_2S analyzer because H_2S analyzer was not in time sync with LAN. Found TCP/IP setting had changed to default settings, so they were changed back to proper settings. Set up bLS/RMP validation study yesterday. Path is 102 m long along east side of lagoon. Keep getting red box errors and pan/tilt errors on TDLAS 1. Cannot find path 5 on TDLAS 1. Must be wet. Flagging occurring on all sonic anemometers at regular intervals; must be interference from farm. Centerline Duty Cycle on TDLAS 2 (1031) is around 250. No lagoon probes yet.
IN5A	9/18/2008		Calibration	Wetness Sensor: Calibration accepted
IN5A	9/18/2008		Calibration	GSS Leak Test: Pass
IN5A	9/18/2008		Calibration	GSS Max Flow Test
IN5A	9/18/2008		Calibration	GSS No Flow Test
IN5A	9/18/2008		Calibration	S-OPS/GSS Leak Test: Pass
IN5A	9/18/2008		Calibration	S-OPS Balance: South A
IN5A	9/18/2008		Calibration	S-OPS Balance: North C
IN5A	9/18/2008		Calibration	S-OPS Max Flow Test
IN5A	9/18/2008	14:24	Calibration	TEC 450i Calibration Verification Check
IN5A	9/18/2008	14:50	Calibration	TEC 450i Reference Precision Check
IN5A	9/18/2008	15:25-16:30	Calibration	sonic anemometer intercomparison: Pass
IN5A	9/18/2008	16:38	Calibration	Barometer audit: Accepted
IN5A	9/18/2008	18:00	Calibration	sonic anemometer bias/zero check: Pass
IN5A	9/24/2008		Calibration	Performed H_2S multipoint calibration using diluter (0.5 ppm, 0.7 ppm, 0.25 ppm) and directly from the tank (4.02 ppm--FF20675) to test diluter performance. Could not get enough flow for 1 ppm or 2 ppm.
IN5A	9/24/2008		Calibration	Internet not working; reset router and is now working properly.
IN5A	9/24/2008		Calibration	TDLAS 1 was not aligned upon arrival. The settings were not setup for optimization. It is now enabled and set up for enabling optimization.
IN5A	9/24/2008		Calibration	TDLAS 1031 giving appropriate values for CDC (~148-149); will leave TDLAS on scanner on NW corner and keep single-path with TDLAS 1032.
IN5A	9/24/2008		Calibration	Laptop with single path had error message with *GasView MP* upon arrival; plan to keep instrument running to obtain sufficient data from study assessment (program failure at 9/19/2008 at 11:44:21 GMT).
IN5A	9/24/2008		Calibration	Distances had not yet been entered into *GasView MP* setup files. Distances entered into TDLAS 1 and 2 setup files. Single path distance not entered to maintain consistency with previous data; distance recorded but 1.0 m entered into GasView program (102 m).
IN5A	9/24/2008		Calibration	H_2S concentration continued to decrease on 450i when measuring straight from tank; tank pressure low (~400-500 psi); re-running multipoint to see if trend continues with other concentrations; ran 0.7 ppm for over 20 minutes and received approximately the same value as

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
				with original. Started running low on H_2S gas, so only reran at 0.7 ppm.
IN5A	9/24/2008		Calibration	Restarted single-path laptop computer (*GasView MP* program shut down with error while FOS on site). No CO_2 log file named LI840_IN5A_09242008.txt on desktop. New *GasView MP* log file TDL3_IN5A_bLSRPMstudy_09242008.gvl.
IN5A	9/24/2008		Calibration	Mapped power routing throughout trailer and completed site layout.
IN5A	9/24/2008		Calibration	Wetness sensor reading ~1-2.5 KOhm when dry: starting to corrode and need to repaint during next trip.
IN5A	9/24/2008		Calibration	Need to get new medical information for IN5A.
IN5A	9/29/2008	14:00	Remote	Daily Status Check from PAML Notes: H_2S needs to be power-cycled to enforce the internet connection required for time synchronization. Beginning on day 630, all three sonic anemometers experienced a lot of data loss, likely due to communication interference. Wetness sensor never goes above zero.
IN5A	9/30/2008	16:30	Remote	Daily Status Check from PAML Notes: On extra laptop from bLS validation study, error message from Boreal Laser *GasView MP* program: "Boreal Laser has encountered a problem and needs to close. We are sorry for the inconvenience." Same message also occurred yesterday. Restarted program and problem occurred again. Flag 1 appears a few times in H_2S data. Wetness sensor never reads wet.
IN5A	10/1/2008	12:15	Remote	Daily Status Check from PAML Notes: sonic anemometer 3 frequently has one or so flagged points. Wetness sensor not working properly.
IN5A	10/2/2008	11:50	Remote	Daily Status Check from PAML Notes: GSS/ H_2S /Innova graphs not up to date since month change. Wetness sensor not working properly.
IN5A	10/3/2008	14:05	Remote	Daily Status Check from PAML Notes: On TDLAS 1, only 3 (otherwise all 5) paths are good. After discussing with Matt, it was concluded for the next two paths there were no optimization strings. Wetness sensor not working properly.
IN5A	10/6/2008	12:10	Remote	Daily Status Check from PAML Notes: Overflow error on sonic anemometer program. Restarted program and it is now working. Wetness sensor is not working. FOS will check it during next visit to site.
IN5A	10/7/2008	13:00	Remote	Daily Status Check from PAML Notes: Unable to connect to CR800 at first; power-cycled and it is now working. Data file now up to date.
IN5A	10/8/2008		Calibration	Upon arrival, the laptop for the bLS/RPM study was not working. Power-cycled to make it work again.
IN5A	10/8/2008		Calibration	Both TDLAS's were optimizing a lot and getting poor light values because of rain.
IN5A	10/8/2008		Calibration	TDLAS 1029 and Scanner 6 (s/n: 1202) are now in the NW corner as TDLAS 2. Changed power supplies in both #1 and #2 power supplies to 24 V. Seems to be working well on Scanner 6.
IN5A	10/8/2009	19:42	Calibration	Calibrated TDLAS 1029
IN5A	10/9/2008		Calibration	Spider webs on the inside of inlet filter holders; filters not dirty but cleaned filter holders of webs.
IN5A	10/9/2008		Calibration	Wetness sensor showing wet resistances when dry (~100 KOhm); removed sensor.
IN5A	10/9/2008		Calibration	Removed pH/ORP probes' wires from CR 1000 at 16:38 GMT.
IN5A	10/9/2008	15:15-16:15	Calibration	sonic anemometer intercomparison: Pass
IN5A	10/9/2008	16:32	Calibration	Barometer audit: Accepted
IN5A	10/9/2008	16:33	Calibration	sonic anemometer bias/zero check: Pass

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	10/9/2008	17:50	Calibration	pH sensor: Calibration, Acceptance, and QC check completed
IN5A	10/9/2008	18:01	Calibration	ORP sensor: Acceptance and calibration completed
IN5A	10/10/2008		Calibration	Started doing H_2S 4.02 ppm direct check at 15:20 and ended at 15:32 (data were loading in the running file).
IN5A	10/10/2008		Calibration	Could not calibrate TDLAS 1031. It was not responding well; taking it back to PAML.
IN5A	10/10/2008	17:02	Calibration	Calibrated TDLAS 1032
IN5A	10/20/2008	14:41	Remote	Daily Status Check from PAML Notes: *iPort* program error: "encountered a problem and needed to close." No communication with H_2S analyzer since 8:50 GMT on 10/20/2008. Had to restart sonic anemometer program to get H_2S analyzer to connect; created fill file for missing data. Data are now loading in real-time. Cannot connect to TDLAS laptops. Communication problems causing some flagging in all three sonic anemometers. Wetness sensor not working properly.
IN5A	10/21/2008	16:14	Remote	Daily Status Check from PAML Notes: Some flagging in all sonic anemometers due to communication problems. Flag 1 (missing data) in H_2S data. Cannot connect to either TDLAS laptop. Will look at wetness sensor tomorrow.
IN5A	10/22/2008		Repair	Restarted TDLAS laptops. After restart, could not get *GasView MP* program to load previous setup files; program said files were corrupted. Loaded older setup file for *GasView MP* program and re-aimed paths.
IN5A	10/22/2008		Repair	Checked TCP/IP settings on 450i, and they were correct (time synch was off by over 8 minutes). Power-cycled 450i and time synch is only behind by one minute.
IN5A	10/22/2008		Repair	Tried sanding wetness sensor to get working properly, but it did not help. A new one will be ordered.
IN5A	10/23/2008	12:47	Remote	Daily Status Check from PAML Notes: There is some flagging on all sonic anemometers due to communication issues. H_2S analyzer flag 1 (missing data); connection lost at 15:45 GMT on 10/22/2008. Missing data for TDLAS QC because TDLAS laptops froze up. No wetness sensor.
IN5A	10/24/2008	12:33	Remote	Daily Status Check from PAML Notes: H_2S data since 15:15 GMT 10/22/2008 is missing (flag 1). Filled missing data, and started data loading in real-time. TDLAS 1 is optimizing a lot due to rain. No wetness sensor.
IN5A	10/27/2008		Calibration	Time sync on H_2S analyzer was 2 min 15 sec behind LAN. Checked TCP/IP settings and H_2S, and they were fine. Started both TDLAS computers and LAN, so updates could be installed.
IN5A	10/27/2008		Calibration	pH sensor: Calibration, Acceptance, and QC check completed
IN5A	10/27/2008		Calibration	ORP sensor: Acceptance and calibration completed
IN5A	10/27/2008	14:57	Calibration	Barometer audit: Accepted
IN5A	10/27/2008	15:50-16:40	Calibration	sonic anemometer intercomparison: Pass
IN5A	10/27/2008	16:34	Calibration	Calibrated TDLAS 1029
IN5A	10/27/2008	17:09	Calibration	Calibrated TDLAS 1032
IN5A	10/27/2008	18:10	Calibration	sonic anemometer bias/zero check: Pass
IN5A	10/28/2008		Calibration	Performed multipoint calibration on TEC 450i to check diluter accuracy. Highest concentration is straight from the tank.
IN5A	10/28/2008		Calibration	Measured the retro-reflector heights. See site note for details.
IN5A	10/28/2008		Calibration	Maintenance list completed.
IN5A	10/28/2008	16:15	Calibration	Finished installing lagoon probe float.

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	10/29/2008	13:43	Remote	Daily Status Check from PAML Notes: Noticed date on H_2S analyzer is off by several months (May 2009 vs. October 2008). Time is correct, so sync program is working. Found that date changed on 10/22/2008 at 15:51 GMT. Restarted 450i to try to update time sync, but it is still sending the wrong date. Only GSS files up to date because of H_2S date being wrong. No wetness sensor.
IN5A	10/30/2008		Calibration	Restarted 450i to reset the time sync and correct the date. This did not work; date says 5/2/2009
IN5A	10/30/2009		Calibration	Performed a multipoint calibration on the TEC450i with the *Environics* (s/n: 3925) from the office to check the accuracy of the *Environics* diluter.
IN5A	10/30/2010		Calibration	Installed and calibrated a new wetness sensor at the meteorology station.
IN5A	10/31/2008	12:35	Remote	Daily Status Check from PAML Notes: Date on TEC 450i still off. It is reading 5/3/2009. Some flagging on all sonic anemometers due to communication issues. Checked H_2S parameters in real-time because there is on QC data.
IN5A	11/3/2008	12:50	Remote	Daily Status Check from PAML Notes: Date on TEC 450i reading 5/6/2008 instead of current date. Numerous warning with *iPort* screen. See report for details. H_2S parameters look ok during remote login conducted at later time. Communication problems with sonic anemometers.
IN5A	11/4/2008	13:40	Remote	Daily Status Check from PAML Notes: Date on TEC 450i reading 5/7/2009 instead of current date. Parameters still look normal. QC program will be modified to incorporate incorrect date. pH has dropped significantly since yesterday (8.16 to 7.62).
IN5A	11/5/2008	13:20	Remote	Daily Status Check from PAML Notes: TEC 450i date still reading incorrect date (5/8/2009). H_2S QC check incomplete.
IN5A	11/6/2008	12:40	Remote	Daily Status Check from PAML Notes: Wrong date still being shown on LAN. pH decreasing in lagoon.
IN5A	11/7/2008	14:00	Remote	Daily Status Check from PAML Notes: Date on LAN still incorrect. pH in lagoon is gradually decreasing.
IN5A	11/10/2008	16:17	Remote	Daily Status Check from PAML Notes: Path 10 on TDLAS needed to be re-aimed. Lower light levels the past few days due to rain/mist. Paths still aligned. Date on TEC 450i is still incorrect (5/13/2009). Flagging on sonic anemometers due to communication issues. Checked TEC 450i data in real-time, and it appears to be good.
IN5A	11/11/2008	13:40	Remote	Daily Status Check from PAML Notes: Date on TEC 450i is still incorrect (5/14/2009). TEC 450i is also over four minutes behind the LAN. QC graphs are now up to date. Program has been changed.
IN5A	11/12/2008	15:11	Remote	Daily Status Check from PAML Notes: Date on TEC 450i is still incorrect (5/15/2009). Some flagging on all sonic anemometers due to communications issues.
IN5A	11/13/2008	13:41	Remote	Daily Status Check from PAML Notes: Date on TEC 450i is still incorrect (5/16/2009). Some flagging on all sonic anemometers due to communications issues.
IN5A	11/13/2008	13:53	Remote	Daily Status Check from PAML Notes: Date on TEC 450i is still incorrect (5/17/2009). Some flagging on all sonic anemometers due to communications issues. TDLAS's optimizing a lot due to rain at site.
IN5A	11/17/2008	13:45	Remote	Daily Status Check from PAML Notes: TEC 450i date still incorrect. TDLAS 1 laptop has frozen up. Must have happened during site check yesterday because time sync check was fine and scanner was moving originally. FOS will restart computer during site visit for calibrations. GSS pressure and mass flow for both paths are moving closer to each other but not the same (cold weather?) Will monitor in the future. ORP is constant. Will be removing and calibrating probes this week; will check status of probe operation during calibrations.

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	11/18/2008	14:00	Remote	Daily Status Check from PAML Notes: Both TDLAS laptops are frozen. See notes for details. FOS will restart all computers tomorrow during site visit. Restarted sonic anemometer programs. TEC 450i still reading wrong date. Flagging on sonic anemometer 1 at 687.2; sonic anemometer 2 at 687.4 (w also spiked to 1.5-2.0 m/s briefly); sonic anemometer 3 at 685.9. ORP sensor is constant. Wetness sensor seems to be wet a lot, but could be due to frost/dew in the morning; will check tomorrow during calibration check.
IN5A	11/19/2008		Calibration	The lagoon level is very low, and the lagoon probe float is not moving at all in the wind, so it appears the lagoon probes are stuck in the mud at the bottom of the lagoon.
IN5A	11/19/2008		Calibration	Restarted TEC 450i at 17:18 GMT/17:25 GMT on LAN. Times and dates are now in sync.
IN5A	11/19/2008		Calibration	Wetness sensor is clean and dry; reading "NAN" on CR 1000. Snow on ground and ice in spot; may have had snow or ice on wetness sensor yielding wet readings.
IN5A	11/19/2008		Calibration	Performed TEC 450i multipoint with new H_2S tank. Single point did not pass. New curve: y=0.795537281-0.007711017; R-squared is 0.999793637.
IN5A	11/19/2008		Calibration	Sonic anemometers will run overnight; higher winds today.
IN5A	11/19/2008		Calibration	Too windy to perform sludge depth measurements.
IN5A	11/20/2008		Calibration	Too windy to perform sludge depth measurements.
IN5A	11/20/2008		Calibration	Sonic anemometers passed overnight in calmer winds.
IN5A	11/20/2008		Calibration	Will remove lagoon probe float for winter. QC program shows lagoon temp has dropped to 2.3 °C in the past four days. Forecast for the next few days is very cold/freezing. Probes may be stuck in the mud, causing higher temperature readings. Puddles are icy; do not want to risk damaging probes during next two week period.
IN5A	11/20/2008		Calibration	Lagoon probes covered in dirt (took pictures). Both were slightly scratched, and pH did not pass. Removing for the winter and bringing back to PAML.
IN5A	11/20/2008		Calibration	Restarted LAN.
IN5A	11/20/2008		Calibration	S-OPS tubing facing downward on most inlets; used heat gun on two inlets on north side and three inlets on south side.
IN5A	11/20/2008		Calibration	Maintenance list completed.
IN5A	11/20/2008		Calibration	ORP sensor: Acceptance and calibration completed
IN5A	11/20/2008		Calibration	pH sensor: Calibration, Acceptance, and QC check completed. Acceptance fails.
IN5A	11/20/2008	10:59-11:59	Calibration	sonic anemometer intercomparison: Pass
IN5A	11/20/2008	15:26	Calibration	sonic anemometer bias/zero check: Pass
IN5A	11/20/2008	16:03	Calibration	Barometer audit: Accepted
IN5A	11/20/2008	16:04	Calibration	Wetness sensor calibration: Accepted.
IN5A	11/20/2008	16:10	Calibration	Unwired lagoon sensors.
IN5A	11/20/2008	17:36	Calibration	Calibrated TDLAS 1029 Notes: light levels approximately 1500 during calibration. Over 12000 without 1/8 plastic; adding plastic brings light levels to about 1500.
IN5A	11/20/2008	18:01	Calibration	Calibrated TDLAS 1032 Notes: accidentally got in beam path; excluded this value during calculations (highlighted in control chart).
IN5A	11/21/2008	13:33	Remote	Daily Status Check from PAML Notes: sonic anemometer QC program not working, but the sonic anemometers are working fine. H_2S data flags (#1) were just due to when LAN was restarted. Lagoon probes

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
				were taken out yesterday.
IN5A	11/24/2008	13:00	Remote	Daily Status Check from PAML Notes: TDLAS light levels were low earlier in the day, but all were back to normal by 14:00 GMT. *iPort* error: see notes for details. Flag 1 in H_2S data; see notes for details. No lagoon probes.
IN5A	11/25/2008	14:00	Remote	Daily Status Check from PAML Notes: sonic anemometer 2 had five periods with flagging around 694.56. Mass flow and pressure dropped significantly around 694.36 (11/24 at 3:30 A.M. EST). This was about the same time it started to rain that night, so perhaps a bunch of filters got wet and may now be frozen.
IN5A	11/26/2008	14:15	Remote	Daily Status Check from PAML Notes: Flagging occurs for all sonic anemometers but not at significant amounts. GSS pressure/mass flow peaked at approx. 23:00 GMT following temp., max and dry wetness sensor. Dropped again to min. at approx. 5:00 GMT following temp., min and wet wetness sensor. Affecting near/short paths much more then far long paths though they both have the same trends.
IN5A	11/27/2008	16:30	Remote	Daily Status Check from PAML Notes: GSS mass flow is dropping.
IN5A	12/2/2008	13:45	Remote	Daily Status Check from PAML Notes: sonic anemometers seem to have stopped incrementing data at 12/2/2008 at 13:29 GMT. Checked a few minutes later, and data were incrementing again. On TDLAS 2, paths 2, 3, and 6 were not aimed. Re-aimed and they seem to be working. Will check later. GSS mass flowing reducing. H_2S internal temperature is rising a little bit.
IN5A	12/3/2008	14:20	Remote	Daily Status Check from PAML Notes: Stopped sonic anemometer program at 14:32 GMT. Restarted *iPort* and filled data since yesterday. Restarted real-time data collection for H_2S. Restarted sonic anemometer program at 14:38 GMT. GSS mass flow and GSS pressure are both still highly variable. No lagoon probes.
IN5A	12/4/2008	13:20	Remote	Daily Status Check from PAML Notes: Low light levels on TDLAS paths, but all paths seem ok. Will check again later. Some sonic anemometer flagging seen with sonic anemometers 2 and 3 (less in sonic anemometer 1).
IN5A	12/9/2008		Calibration	Environics diluter does not seem to be working properly. Had port 1 as air, port 2 as H_2S (30.5 ppm) and port 3 as SO_2 (42.9 ppm). Would only run with port 1; switched SO_2 and air (ports 1 and 3 respectively) and only flowed from SO_2 (port 1); tried with H_2S and air as well (ports 2 and 1 respectively) and only flowed from port 1 (air). Could not perform multipoint with Environics. Used 146i with 30.5 ppm tank (LL34303) to perform multipoint at 1, 2, 3, and 4 ppm. y=0.869024194x-0.000811211. R-squared=0.999994376.
IN5A	12/9/2008		Calibration	TDLAS's not aligned upon arrival; heavy rain most likely causing obstructions.
IN5A	12/9/2008		Calibration	Lagoon is frozen; cannot perform sludge depth measurements.
IN5A	12/9/2008		Calibration	Cannot test wetness sensor because of rain.
IN5A	12/9/2008		Calibration	TDLAS's did not pass calibration although both gave perfect zeros. (1032_-14.25%; 1029_-12.14% bias)
IN5A	12/9/2008		Calibration	12/5/2008 19:15:33: AC restored message sent to registered clients connected to Load Segment 1 12/5/2008 19:15:33: AC restored message sent to registered clients connected to Load Segment 2
IN5A	12/9/2008		Calibration	Lagoon site layout completed
IN5A	12/9/2008	16:57	Calibration	Calibrated TDLAS 1032 Note: Bias -14.25%
IN5A	12/9/2008	17:22	Calibration	Calibrated TDLAS 1029 Note: Bias -12.14%
IN5A	12/10/2008		Calibration	Started GSS calibration at 16:23. Will restart tomorrow.

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	12/10/2008		Calibration	12/9/2008 22:05:44: UPS switched to battery power. 12/9/2008 22:05:49: AC restored message sent to registered clients connected to Load Segment 1 12/9/2008 22:05:49: AC restored message sent to registered clients connected to Load Segment 2
IN5A	12/10/2008	16:25-17:25	Calibration	sonic anemometer intercomparison: Pass
IN5A	12/10/2008	17:42	Calibration	Barometer audit: Accepted
IN5A	12/10/2008	17:43	Calibration	sonic anemometer bias/zero check: Pass
IN5A	12/10/2008	17:47	Calibration	Wetness sensor calibration: Accepted.
IN5A	12/11/2008		Calibration	Performed multipoint calibrations on both TDLAS's (1032 and 1029). Performed the multipoint calibrations at a higher flow rate (1500 ccm compared to the normal 500 ccm) because we found the TDLAS's performed at the higher flow rate, especially at the low NH_3 concentrations.
IN5A	12/11/2008		Calibration	Maintenance list completed.
IN5A	12/12/2008	15:30	Remote	Daily Status Check from PAML Notes: QC files not set up yet, remote check only. No Innova.
IN5A	12/22/2008	15:36	Remote	Daily Status Check from PAML Notes: TDLAS 2 has lost paths 7, 8, 9, and 4. TDLAS 1 has lost paths 5, 6, and 7. All H_2S parameters are zero since 12/21/08 at 3:15 GMT (*iPort* was disconnected). Reconnected *iPort* to the 450i; created a fill file for the missing data, then started loading the H_2S data in real time again. Re-aimed all misaligned TDLAS files and saved new setup files. Some missing data in all sonic anemometers due to communication issues and poor weather conditions. No lagoon probes.
IN5A	12/23/2008	18:24	Remote	Daily Status Check from PAML Notes: Some flagging in all sonic anemometer data due to communications issues at site. GSS pressure and flow are still changing a lot. There were some flag #1 for the H_2S analyzer because *iPort* lost connection yesterday. Everything now working.
IN5A	12/24/2008	13:45	Remote	Daily Status Check from PAML Notes: TDLAS paths are off due to freezing rain and fog. Fill H_2S data starting at 12/21/08 at 15:27 through 12/22/208 16:20 (had to revert to filling last 4400 records). All three sonic anemometers have flagged data; likely iced over. Large variability in GSS mass flow.
IN5A	12/29/2008		Calibration	Upon arrival, found TDLAS 1 had lost all paths, and TDLAS 2 had lost two paths. TDLAS 1 (1032) had lost all paths because of condensation on the inside of the TDLAS window. Dried unit inside, but the condensation return when placed outdoors again. Internal temperature of TDLAS is 22.4 °C which should be fine. Will leave it out overnight to see what happens.
IN5A	12/29/2008		Calibration	Installed Innova, but did not perform calibration because a multipoint calibration was performed on the instrument on 12/24/2008 at PAML. Started Innova at 16:35 GMT.
IN5A	12/29/2008		Calibration	After setting up the sonic anemometers for intercomparison, sonic anemometer 1 kept sending back zero values for the first few hours, but eventually it started working properly.
IN5A	12/29/2008	15:35	Calibration	Barometer audit: Accepted
IN5A	12/29/2008	16:08	Calibration	Wetness sensor calibration: Accepted
IN5A	12/29/2008	17:21	Calibration	Calibrated TDLAS 1029 Note: The new cal curves from the last multipoint calibration have not been put in the new control chart yet.
IN5A	12/29/2008	17:45	Calibration	Calibrated TDLAS 1032 Note: The new cal curves from the last multipoint calibration have not been put in the new control chart yet.
IN5A	12/29/2008	18:50-19:50	Calibration	sonic anemometer intercomparison: Pass

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	12/29/2008	20:08	Calibration	Sonic anemometer bias/zero check; all pass. Note: sonic anemometer 2 and 3 bias was done on 12/29/2008. Sonic anemometer 1 bias was done on 12/30/2008 at 14:43:22 GMT.
IN5A	12/30/2008		Calibration	TDLAS 1 (1032) still has condensation inside the window. Will bring back to PAML.
IN5A	12/30/2008		Calibration	Farm workers loading manure out of the pit next to the trailer and spreading it on the field directly to the East of the lagoon. Talked to workers, and they said they would be loading the pit today and tomorrow (because it is forecasted to get warm later today and the field would become too muddy to drive in).
IN5A	12/30/2008		Calibration	Maintenance list completed.
IN5A	12/31/2008		Repair	Installed TDLAS 1031 and aimed all paths.
IN5A	1/5/2009	13:50	Remote	Daily Status Check from PAML Notes: Flagging on all sonic anemometers due to communications issues. GSS pressure and mass flow still quite variable. QC program for Innova not running yet. TDLAS 1 was changed to 1031 on 12/31/2008. Checked with remote login and all paths are aligned.
IN5A	1/9/2009	14:10	Remote	Daily Status Check from PAML Notes: Realigned TDLAS 1 path 10. Path was lost on 1/6 at 16:30, about one hour before sonic anemometers went off line. May be covered in ice. Many other paths were lost around this time, but all others recovered in a day or less.
IN5A	1/12/2009		Calibration	Performed methane calibration on Innova. After calibration, will take Innova back to PAML to be placed in the East trailer. Could not perform NH_3 calibration at site because there is no NH_3 tank. Will calibrate NH_3 at PAML.
IN5A	1/12/2009		Calibration	Lagoon site layout completed
IN5A	1/12/2009	13:50	Remote	Daily Status Check from PAML Notes: All sonic anemometers recovered near beginning of day 741. Innova QC not working. GSS mass flow variable, no lagoon probes.
IN5A	1/13/2009	14:55	Remote	Daily Status Check from PAML Notes: *iPort* program stopped at 12:16 GMT on 1/13/2009. Created fill file for missing data and then started loading data in real time again. Had to stop and restart sonic anemometer program in order to restart *iPort*. Paths 8, 9, and 10 on TDLAS 2 were not aligned. Could not re-aim, probably due to ice or frost.
IN5A	1/14/2009	13:35	Remote	Daily Status Check from PAML Notes: TDLAS paths are covered in ice or frost and are not aligned. Some flagging on all sonic anemometers due to communication issues. GSS pressure and mass flow still very variable. QC graphs are all zero until 15:15 on 1/13/2009, after that the graphs look fine.
IN5A	1/15/2009	13:36	Remote	Daily Status Check from PAML Notes: Some flagging on all sonic anemometers due to communication issues. GSS pressure and flow quite variable.
IN5A	1/16/2009	13:37	Remote	Daily Status Check from PAML Notes: *iPort* program stopped running at 15:15 on 1/15/2009. Created fill file for missing data and then started loading data in real time again. Had to stop and restart sonic anemometer program in order to restart *iPort*. GSS pressure and flow quite variable. Some flagging on all sonic anemometers due to communication issues.
IN5A	1/20/2009	13:50	Remote	Daily Status Check from PAML Notes: GSS pressure and flow quite variable. Some flagging on all sonic anemometers due to communication issues. H_2S flag 1 from day 746.80 to 747.59. TDLAS QC are about one day behind. Both TDLAS laptops have frozen up. We fix during calibration check tomorrow.
IN5A	1/21/2009		Calibration	Replaced ground rod/football clamp on met station.
IN5A	1/21/2009		Calibration	Due to freezing temperatures, will not perform wetness sensor verification. Water could freeze on sensor causing skewed values. Currently reading "NAN" accurately (dry conditions).

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	1/21/2009		Calibration	Snow cover all around lagoon.
IN5A	1/21/2009		Calibration	No error messages on LAN. Panasonic froze up; restarted both Panasonic and LAN.
IN5A	1/21/2009		Calibration	Lagoon probes not installed in lagoon due to freezing temperatures. No lagoon calibrations.
IN5A	1/21/2009		Calibration	Awaiting new NH_3 cylinder; currently no TDLAS calibrations.
IN5A	1/21/2009		Calibration	Sonic anemometer 3 did not pass during intercomparison. Checked placement and alignment with sonic anemometers 1 and 2; could be interfering with wind turbulence from sonic anemometers 1 and 2. Will continue to run through Friday) 1/23/2009) morning to check at different wind conditions.
IN5A	1/21/2009	19:42	Calibration	Barometer audit: Accepted
IN5A	1/23/2009		Calibration	Sonic anemometer data/GSS/ H_2S data not valid until H_2S file created today. Ran sonic anemometers over past few days for intercomparison.
IN5A	1/23/2009		Calibration	Changed memory card in CR 1000. Light was orange upon removal, but was not orange when putting in new card.
IN5A	1/23/2009		Calibration	Maintenance list completed.
IN5A	1/23/2009	14:20-15:20	Calibration	Sonic anemometer intercomparison; all pass.
IN5A	1/23/2009	15:53	Calibration	sonic anemometer bias/zero check: Pass
IN5A	1/23/2009	17:35	Calibration	Calibrated TDLAS 1029
IN5A	1/23/2009	18:20	Calibration	Calibrated TDLAS 1031 Note: Accidentally got in beam's path; will disregard in calculations.
IN5A	1/26/2009	17:30	Remote	Daily Status Check from PAML Notes: GSS/ H_2S /Innova and TDLAS files were not up to date initially. After resending the data and rerunning, files are now up to date. No lagoon probes.
IN5A	1/28/2009	16:15	Remote	Daily Status Check from PAML Notes: Appears like TDLAS 1 is recovering from effects of heavy snow last night. GSS mass flow fluctuating. No lagoon probes.
IN5A	1/29/2009	16:40	Remote	Daily Status Check from PAML Notes: GSS mass flow on both lines has dropped from about 7 to below 5 LPM.
IN5A	1/29/2009		Repair	Changed NW TDLAS to fixed path. Took the scanner to PAML for later use at NC3A.
IN5A	1/30/2009	17:00	Remote	Daily Status Check from PAML Notes: Error message upon login: "The system has recovered from a serious error." Nothing active upon login; system appeared to be rebooting. Message box: "System Configuration Utility. You have used the system configuration utility to make changes to the way Windows starts..." When system configuration utility came up, tried to change to Normal Startup; when clicking "apply" got message "An Access Denied error was returned while attempting to change a service. You may need to log on using an administrator account to make the specified changes." Allowed computer to restart. Last chunk of 300s sonic anemometer data was around 05:00 GMT (created fill file for this time). Last H_2S data on 1/30/09 at 4:56. Single path on north side of lagoon replaced TDLAS 2 yesterday afternoon (needed for NC trip). Until about 18:02 today, this data was spaced across paths 1-10. Starting at 18:10 GMT, changed pan-tilt options to 1 path and created new .GMP file. TDLAS QC too close to start of new segment to tell anything. GSS mass flow still varying quite a bit. No lagoon probes. Some flag 1 in H_2S data. Data has been filled in.
IN5A	2/2/2009	15:40	Remote	Daily Status Check from PAML Notes: TDLAS 2 is on a single path. On TDLAS 1, all ten paths exist and are giving good light values while program is running. Not sure why QC is giving only 9 paths, missing path 2. Checked setup file, and found valid values for all paths. GSS mass flow still dropping overnight but returning to normal during daytime hours. Lagoon probes not present at site due to frozen lagoon.

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	2/3/2009	13:45	Remote	Daily Status Check from PAML Notes: QC still missing path 2 in TDLAS 1 but exists in setup file and path is being scanned. Deleted old backup files to make room. GSS mass flow still dropping overnight but recovering during daytime hours. CR 1000 data is updating, but the QC file today is not up to date. No lagoon measurements.
IN5A	2/5/2009	23:00	Remote	Daily Status Check from PAML Notes: TDLAS 2 is on a single path (no scanner). GSS pressure and mass flow are still quite variable.
IN5A	2/6/2009	14:15	Remote	Daily Status Check from PAML Notes: The centerline duty cycle on TDLAS 1031 (TDLAS 1) jumped to 255 on 2/5/2009. Alarm 401 on TDLAS 1. GSS mass flow and pressure quite variable.
PAML	2/6/2009	19:39	Calibration	Calibrated TDLAS 1032. Note: Doing a quick 100 ppm span check at PAML to make sure the TDLAS is working properly. TDLAS had condensation inside it in the past. Taking TDLAS 1032 to IN5A next week to replace TDLAS 1031, which has a high Centerline Duty Cycle.
IN5A	2/9/2009		Calibration	TDLAS 1031 loses communication ("xxxx"); connected at the start up, but disconnected after five minutes. Cal curve looked funny and distorted on oscilloscope. Power cycled; afterwards, would not stop centering. TDLAS was giving "CAL ERR" on screen.
IN5A	2/9/2009		Calibration	Did not calibrate TDLAS 1032 on site because it was already calibrated/passed on 2/6/2009 at PAML.
IN5A	2/9/2009		Calibration	Restarted all computers.
IN5A	2/9/2009		Calibration	UPS History: 1/29/2009: 23:26:18: UPS switched to battery power. 23:26:22: AC Restored Message sent to registered clients connected to Load Segment 1. 23:26:22: AC Restored Message sent to registered clients connected to Load Segment 2. 2/7/2009: 13:01:13: UPS switched to battery power. 13:01:13: Utility power has failed. 13:01:13: UPS bypass unavailable. 13:01:20: AC power has been restored. 13:01:23: AC Fail Message sent to registered clients connected to Load Segment 1. 13:01:23: AC Fail Message sent to registered clients connected to Load Segment 2. 13:01:24: AC Restored Message sent to registered clients connected to Load Segment 1. 13:01:24: AC Restored Message sent to registered clients connected to Load Segment 2.
IN5A	2/9/2009		Calibration	Lagoon site layout completed
IN5A	2/9/2009	15:32	Calibration	Barometer audit: Accepted
IN5A	2/9/2009	15:34	Calibration	Grid wetness sensor calibration: Pass Note: Damp conditions made it hard for dry test to pass.
IN5A	2/9/2009	15:55-16:55	Calibration	Sonic anemometer intercomparison: all pass. Note: At 16:15:09 lost communication so value is zero for all sonic anemometers.
IN5A	2/9/2009	16:32	Calibration	Calibrated TDLAS 1029
IN5A	2/9/2009	17:18	Calibration	sonic anemometer bias/zero check: Pass
IN5A	2/10/2009		Calibration	Performed TDLAS, pH and ORP, and S-OPS/GSS calibrations.
IN5A	2/10/2010		Calibration	Brought sonic anemometer 1938 back to PAML for repairs.
IN5A	2/10/2011		Calibration	Brought back to PAML an empty zero gas cylinder.
IN5A	2/10/2012		Calibration	Printer was not operational.

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	2/10/2009	14:30	Remote	Daily Status Check from PAML Notes: Re-aimed path 2 on TDLAS 1. Found it by moving down 35 steps. TDLAS QC files not up to date; everything looked fine in remote check. TDLAS 2 is on a single path. TDLAS 1 has changed from 1031 to 1032. GSS pressure and mass flow still quite variable. Flag 1 in H_2S data; created a fill file for missing data yesterday.
IN5A	2/11/2009	16:00	Remote	Daily Status Check from PAML Notes: Some flagging on sonic anemometers due to communication issues. GSS pressure and mass flow quite variable.
IN5A	2/12/2009	15:10	Remote	Daily Status Check from PAML Notes: Re-aimed paths 2, 6, and 8 on TDLAS 1 and saved the new setup files. Very strong winds and heavy rain caused paths to be lost. Some flagging on sonic anemometers due to communication issues. GSS pressure and mass flow quite variable.
IN5A	2/12/2009	18:30	Remote	Remote login to start a new CR 1000 file since the current one is too long for the CR 1000 QC to handle. New file named CR1000_IN5A_20090212.dat. Overlapped a few hours of data by copying from previous file.
IN5A	2/13/2009		Calibration	Stopped H_2S data collection at 2/13/2009 14:45 GMT. Started H_2S data collection at 2/13/2009 17:13 GMT; beginning of new data file.
IN5A	2/13/2009		Calibration	UPS History: 2/11/2009 16:05:24: UPS switched to battery power. 16:05:24: Utility power has failed. 16:05:24: Utility bypass unavailable. 16:05:34: AC Fail message sent to registered clients connected to Load Segment 1. 16:05:34: AC Fail message sent to registered clients connected to Load Segment 2. 16:05:39: AC power has been restored. 16:05:39: AC Restored message sent to registered clients connected to Load Segment 1. 16:05:39: AC Restored message sent to registered clients connected to Load Segment 2. 17:25:08: UPS switched to battery power. 17:25:08: UPS bypass unavailable. 17:25:15: AC power has been restored. 17:25:18: AC Fail message sent to registered clients connected to Load Segment 1. 17:25:18: AC Fail message sent to registered clients connected to Load Segment 2. 17:25:19: AC Restored message sent to registered clients connected to Load Segment 1. 17:25:19: AC Restored message sent to registered clients connected to Load Segment 2.
IN5A	2/13/2009		Calibration	Changed inlet filters in the south S-OPS line (S-OPS s/n: A). The north S-OPS filters are quite dirty also, but FOS could not change the inlet filters since there were not enough filters. North S-OPS filters (S-OPS s/n: A) will need to be changed at the next calibration check.
IN5A	2/13/2009		Calibration	Maintenance list completed.
IN5A	2/13/2009	15:15-15:48	Calibration	TEC 450i single point calibration.
IN5A	2/13/2009	15:15-17:15	Calibration	S-OPS/GSS calibrations Notes: Changed inlet filters in the south S-OPS line (S-OPS s/n: A). The north S-OPS filters are quite dirty also, but FOS could not change the inlet filters since there were not enough filters. North S-OPS filters (S-OPS s/n: A) will need to be changed at the next calibration check. North S-OPS barely passed inlet balancing.
IN5A	2/16/2009	14:40	Remote	Daily Status Check from PAML Notes: Re-aimed paths 6 and 7 on TDLAS 1. GSS flow was zero from 19:15 on 2/13/2009 to 7:15 on 2/15/2009. GSS battery voltage and panel temperature were zero during this time. Since 7:15 on 2/15/2009, values have returned to normal, but the mass flow is higher than it was in the past. H_2S had flag #192 during time GSS voltage was zero.
IN5A	2/17/2009	14:30	Remote	Daily Status Check from PAML Notes: Unable to connect remotely. GSS mass flow is higher than it has been previously.

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	2/18/2009	20:40	Remote	Daily Status Check from PAML Notes: TDLAS 1, path 2 has low light levels; TDLAS 2 paths have low light levels. Probably caused by drizzly, foggy conditions. Will check tomorrow and will re-aim if necessary. No lagoon probes.
IN5A	2/19/2009	14:45	Remote	Daily Status Check from PAML Notes: Almost all paths on TDLs had low light levels. See notes for comments/diagrams. All three sonic anemometers nearly completely flagged starting around 03:00 GMT last night. Snow in area, along with falling temperatures. GSS mass flow has pink line constant but the blue line is highly variable; remains much higher than previously found.
IN5A	2/20/2009	15:30	Remote	Daily Status Check from PAML Notes: All paths on TDLAS 1 have low light levels, and paths 7-10 on TDLAS 2 have low light levels. See notes for new paths alignments. Unable to locate higher light levels; may be blocked due to snow.
IN5A	2/23/2009	15:53	Remote	Daily Status Check from PAML Notes: Tried to re-aim paths 2, 4, 5, and 7 on TDLAS 1. Could not get light values above 200 on path 7; it may be frosted over. Tried to re-aim path 7 again at 18:20 GMT but could not get valid light levels. GSS pressure and mass flow on north side of S-OPS still quite variable.
IN5A	2/24/2009	15:20	Remote	Daily Status Check from PAML Notes: TDLAS 1 paths are aligned, but they are optimizing a lot, probably due to dew or frost on retro-reflectors. GSS pressure and mass flow on north side of S-OPS still quite variable.
IN5A	2/25/2009		Takedown	Removed TDLAS, sonic anemometers, and CR 1000 instruments for 6 month calibrations.
IN5A	2/25/2009		Takedown	Stopped CR 1000 measurements at 14:45 GMT.
IN5A	2/25/2009		Takedown	Did not perform any on-site calibrations because 20 day calibrations were performed less than 20 days ago and six month calibrations are this week and next week.
IN5A	2/25/2009		Takedown	Plan to change inlet filters on north side S-OPS (S-OPS C, 53, false). Performed leak test first (2.90 LPM, -38.50 kPa). GSS leak test indicated bad pump; changed pump diaphragm (2.69 LPM, -39.21 kPa).
IN5A	2/25/2009		Takedown	UPS History: 2/13/2009 18:59:35: AC power has been restored. 18:59:35: AC Restored message sent to registered clients connected to Load Segment 1. 18:59:35: AC Restored message sent to registered clients connected to Load Segment 2.
IN5A	2/25/2009		Takedown	Measured lagoon height using center green pipe on north side and east retro-reflector on north side of lagoon. Eye level does not magnify, so a close measurement spot was necessary (tried measurement spot at north retro-reflector on east side but could not see stadia rod). Measured lagoon height near green pipe from east retro-reflector on north side. Level check form located with Open site notes.
IN5A	3/11/2009		Calibration	Upon arrival, found no power at northwest TDLAS and on the west side of the lagoon. Called Prof. Rich Grant and tried to resolve the problem but was not successful. Called electrician and fixed the problem.
IN5A	3/11/2009		Calibration	Performed multipoint calibration on TEC 450i.
IN5A	3/11/2009		Calibration	Changed filter papers on both S-OPS. South S-OPS could not pass due to wet conditions.
IN5A	3/12/2009	16:48	Remote	Daily Status Check from PAML Notes: Paths 6-10 on TDLAS 1 are not aligned. Could be caused by freezing rain on retro-reflectors.
IN5A	3/13/2009	13:00	Remote	Daily Status Check from PAML Notes: Continuous flag 64 in H_2S data. GSS MFC is not working (large offset causes blue path to be over scale). TDLAS 1 paths 6-10 have low light levels.
IN5A	3/16/2009	12:30	Remote	Daily Status Check from PAML Notes: Re-aimed paths 1 and 4-10 on TDLAS 1. Flag 64 in H_2S data. GSS mass flow reading NAN due to large offset. No lagoon float.

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	3/17/2009	14:30	Remote	Daily Status Check from PAML Notes: Flag 64 on blue line in H_2S data (due to MFC offset). Flag 2 was in H_2S data for a time last night (temperature out of range; either internal, chamber or both). Back to normal now. GSS panel temperature reached about 40 °C yesterday; heat is still on in trailer. No lagoon probes.
IN5A	3/18/2009	12:40	Remote	Daily Status Check from PAML Notes: Flag 64 in H_2S data. GSS MFC offset issue. No lagoon float.
IN5A	3/19/2009	12:45	Remote	Daily Status Check from PAML Notes: Flag 64 in H_2S data. GSS MFC offset issue. No lagoon float.
IN5A	3/20/2009	13:00	Remote	Daily Status Check from PAML Notes: TDLAS 1 path 1 has low light levels; re-aimed path. Flag 64 in H_2S data. GSS MFC issue. PS1 (pink) is steady.
IN5A	3/23/2009	12:30	Remote	Daily Status Check from PAML Notes: *Microsoft Visual C++* Runtime Library C:\Program Files\Genie-Soft\CBMPro7.exe - sonic anemometers still running. Deleted previous backups to make room for new backups. Flags in H_2S data: side zero--64/66 flag; side 1--2 flag (high flow?). GSS mass flow says zero, but the flow is high, so the actual reading is NAN).
IN5A	3/24/2009	13:00	Remote	Daily Status Check from PAML Notes: Checked path locations on TDLAS 2, and they are in the correct spots. They were off initially. Will check QC tomorrow to monitor pan/tilt locations. No flags in H_2S data since yesterday's QC check. No lagoon probes.
IN5A	3/25/2009	13:00	Remote	Daily Status Check from PAML Notes: QC program has TDLAS 2 retro-reflector 1 location is different spot than where it actually is. Will save a new setup to try to fix. Sonic anemometer QC files are not up to date. Stopped updating at 814.246583; will check again on remote login. Flags in H_2S data: Side 0 had one flag at 64. No lagoon measurements.
IN5A	3/26/2009	12:45	Remote	Daily Status Check from PAML Notes: *iPort* error; had to stop and restart sonic anemometer program as well. Last H_2S modification was on 3/25/2009 at 15:37 GMT (last data point at 15:36 GMT). Created fill file, FillIN5A450I0326091301.dat, for missing data. Started new real time data file at 13:05 GMT. Restarted sonic anemometers at 13:07 GMT. H_2S side 0 has a few flag 4 points. At approximately 816.656 all the H_2S parameters go to zero; program probably failed and will back up data upon login. Original location of path 1 does not look correct, but current location is where it should be. No lagoon measurements.
IN5A	3/27/2009	12:30	Remote	Daily Status Check from PAML Notes: Flag 64 on path 0 in H_2S data. H_2S file name structure wrong with original H_2S data. Looked okay previously; at the end of the period, will put pieces in one file. No lagoon measurements.
IN5A	4/2/2009	16:15	Remote	Daily Status Check from PAML Notes: Upon remote login, found ten Powerware popup messages with the most recent being on 4/2/2009 around 3:00 AM local time. "Netwatch is experiencing a loss of communication with the shutdown server 192.168.0.7." Remote desktop disconnected as well. There is also a V*isual C++* problem. Re-aimed TDLAS 1 path 1; it has had low light levels since day 820. Sonic anemometer 1 has some flagging on day 819. H_2S graphs went to zero on day 821.489. GSS MFC offset issue. No lagoon probes.
IN5A	4/3/2009	16:15	Remote	Daily Status Check from PAML Notes: Took many attempts throughout day to access site remotely. Error message: "Netwatch is experiencing a loss of communication with the shutdown server 192.168.0.7." Re-aimed TDLAS 1 path 1. Three 5-minute periods for sonic anemometer 3 have greater than 100 flagged points. Paths 1 and 10 on TDLAS 1 have low light levels. No lagoon probes.
IN5A	4/6/2009	15:00	Remote	Daily Status Check from PAML Notes: Cannot connect to TDLAS laptops. Last TDLAS QC data was from 3/31/2009. Sonic anemometer 1 has some flagging on day 827 (probably due to rain/frozen precipitation). Average w on sonic anemometer 1 went up to about 0.4 m/s on day 826 (storm front went through last night). Flow on North S-OPS is too high for sensor to read it, so it reads zero for quite a bit.

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	4/7/2009		Calibration	Upon arrival, found both TDLAS laptops had frozen up. Restarted computers and installed updates on both laptops. Additionally, the internet modems and routers were power-cycled. Can now remotely connect to the TDLAS laptops from the LAN computer.
IN5A	4/7/2009		Calibration	Lagoon site layout completed
IN5A	4/7/2009	15:31-15:44	Calibration	Calibrated TDLAS 1032
IN5A	4/7/2009	15:58-16:15	Calibration	Calibrated TDLAS 1029
IN5A	4/8/2009		Calibration	Upon arrival, found there were quite a few Netwatch communication errors, and the LAN lost its connection to both TDLAS laptops again. Found that the cause was a bad cable from the modem to the router.
IN5A	4/8/2009		Calibration	Installed a new flow sensor in the GSS. Performed GSS flow multipoint with the Gilian.
IN5A	4/8/2009	16:25	Calibration	Barometer audit: Accepted
IN5A	4/8/2009	16:27	Calibration	Wetness sensor calibration: Pass.
IN5A	4/9/2009	13:30	Remote	Daily Status Check from PAML Notes: Not enough space to perform backup. Deleted previous backups to make room for new backups. Changed pan/tilt options specs for minimum acceptable light value from 1000 to 2000 to see if it will improve fraction of time with all ten paths aligned; saved new setups (backup and running). No lagoon measurements.
IN5A	4/10/2009	17:40	Remote	Daily Status Check from PAML Notes: Changed acceptable minimum light levels values to 1000. No lagoon measurements.
IN5A	4/13/2009	15:15	Remote	Daily Status Check from PAML Notes: Cannot remotely connect to site. Average w for sonic anemometer 1 was 0.2 m/s and -0.2 m/s for sonic anemometer 3. No lagoon measurements.
IN5A	4/14/2009	12:50	Remote	Daily Status Check from PAML Notes: Rainy/foggy weather at site causing TDLAS 2 to lose paths. No QC updates since 4/13/2009. No lagoon probes.
IN5A	4/16/2009	12:20	Remote	Daily Status Check from PAML Notes: sonic anemometers 1 and 3 had flagging a couple of days ago (rainy). Sonic anemometer 3 u, v, w, and T values very high during that time. No lagoon probes.
IN5A	4/16/2009		Repair	Picked up methane/propane tank to take back to PAML.
IN5A	4/16/2009		Repair	Installed new Firmware on the 146i diluter.
IN5A	4/16/2009		Repair	Changed GSS tubing heater thermostat from 85F to 70F. Changed setting on trailer heater thermostat from "Low Heat" to "Low Cool" because of expected warm temperatures.
IN5A	4/17/2009	12:50	Remote	Daily Status Check from PAML Notes: Some flag 1 in H_2S data yesterday while FOS was on site. GSS mass flow is slow climbing. There was a spike in the GSS/S-OPS RH at NAEMS day 837.677. No lagoon probes.
IN5A	4/20/2009	14:10	Remote	Daily Status Check from PAML Notes: Average w for sonic anemometer 1 is 0.2 m/s. Sonic anemometer 3 has some flagged data on NAEMS day 841. During the flagged period, the u, v, and w values go very high. TDLAS's have been optimizing a lot due to rain at the site. No lagoon probes.
IN5A	4/21/2009	12:30	Remote	Daily Status Check from PAML Notes: TDLAS 1 paths 1 and 10 are off because of rain. TDLAS 2 is optimizing a lot due to rain. Still getting some flagging on sonic anemometer 3; probably due to rain. During flagged times the u, v, and w values spike.
IN5A	4/27/2009	16:50	Remote	Daily Status Check from PAML Notes: Not enough space to perform backup. Deleted previous backups to make room for new backups. No Innova on site. Lagoon probes not present.
IN5A	4/28/2009	12:45	Remote	Daily Status Check from PAML Notes: Cannot connect to TDLAS laptops; they are frozen up. Will be on site tomorrow to perform 20-day calibrations; will restart all computers. TDLAS QC has not updated

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
				since yesterday. GSS mass flow is increasing. No lagoon measurements.
IN5A	4/29/2009	12:20	Remote	Daily Status Check from PAML Notes: Cannot connect to TDLAS laptops; they are frozen. Sonic anemometer 2 shows a lot of flagging. No lagoon probes.
IN5A	4/30/2009		Calibration	Upon arrival, found *iPort* error on LAN. *iPort* had not updated since 4/29/2009 17:12 GMT. Filled data starting at 17:11 GMT on 4/29/2009.
IN5A	4/30/2009		Calibration	Restarted LAN.
IN5A	4/30/2009		Calibration	Strong odor (H_2S) upon arrival.
IN5A	4/30/2009		Calibration	UPS history: 4/9/2009 22:16:48: UPS switched to battery power. 22:16:53: AC Restored message sent to registered clients connected to Load Segment 1. 22:16:53: AC Restored message sent to registered clients connected to Load Segment 2.
IN5A	4/30/2009		Calibration	Set up two Innova Gas View Monitors for intercomparison in the field. Could not sync the two Innova clocks. Open-source Innova (710-216) read 15:47; Barn-source Innova (710-005) read 07:39.
IN5A	4/30/2009		Calibration	Performed multipoint on TEC 450i using H_2S tank #LL34303 (expired tank). Will either perform inter-comparison with new tank or entirely new multipoint with new tank during next visit.
IN5A	4/30/2009	16:02-17:30	Calibration	TEC 450i multipoint calibration Notes: Actual recorded concentration for calibration at 1 ppm (during multipoint) will be used for today's 20-day calibration; see control chart for actual MP values.
IN5A	5/1/2009	14:00	Remote	Daily Status Check from PAML Notes: sonic anemometer 2 is incrementing slowly. Innova data stops incrementing at 4/30 at 23:59. TDLAS data was missing from 4/27 to 4/30, and the last data sent to PAML was on 4/25. Resolved issue; file break error in TDLAS data. Created a new file. No lagoon probes.
IN5A	5/4/2009	13:00	Remote	Daily Status Check from PAML Notes: No lagoon measurements.
IN5A	5/5/2009		Calibration	Removed TDLAS 1029 from SE corner to bring to OK3A.
IN5A	5/5/2009		Calibration	Maintenance list completed.
IN5A	5/5/2009		Calibration	Lagoon site layout completed
IN5A	5/5/2009	15:30-18:30	Calibration	Performed S-OPS/GSS calibrations Note: Inlet balance values are written on separate paper (attached to form).
IN5A	5/5/2009	16:25-17:25	Calibration	Performed sonic anemometer intercomparison; sonic anemometer 2 fails. Notes: sonic anemometer 2 had some zero values that sonic anemometers 1 and 3 did not have. Will replace current sonic anemometer 2 (1925) with sonic anemometer 1928.
IN5A	5/5/2009	17:35-18:35	Calibration	Performed sonic anemometer intercomparison; all pass. Notes: Intercomparison performed with new sonic anemometer 2 (1928).
IN5A	5/5/2009	18:55	Calibration	Sonic anemometer bias/zero calibration; all pass.
IN5A	5/5/2009	12:40	Remote	Daily Status Check from PAML Notes: Starting on day 849, finding significant loss on sonic anemometer 2, most likely caused by communication interference. Ran QC on Innova for the first time for this site/period. GSS mass flow slowly but steadily increasing with time (about 0.5 LPM over the last 22 days). No lagoon probes.
IN5A	5/6/2009	12:25	Remote	Daily Status Check from PAML Notes: TDLAS 1 was removed yesterday to take to OK3A. Sonic anemometer 2 is losing 25%-50% of data because of flagging. Flag 1 in H_2S data during calibration verification yesterday. Brief flag 2 in Innova data. No lagoon probes.
IN5A	5/7/2009	13:20	Remote	Daily Status Checks from PAML Notes: sonic anemometers 1 and 2 have differing u. v. w. and T graphs. TDLAS 1 was relocated to OK3A.

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
				No lagoon float.
IN5A	5/8/2009	12:30	Remote	Daily Status Check from PAML Notes: TDLAS 2 has lost paths 3 and 4; checked later and paths recovered. Few excessive spike counts in sonic anemometers 2 and 3.
IN5A	5/18/2009	13:50	Remote	Daily Status Check from PAML Notes: *iPort* error; stopped sonic anemometer and Innova programs. H_2S data missing since 5/10/2009 at 14:01. Filled missing H_2S data files and restarted sonic anemometer and Innova programs. Re-aimed TDLAS 2 paths 2 and 3. TDLAS 1 not present. No lagoon probes. Noticed air temperature malfunction around the start of day 867 (reading between -20 and -40 °C).
IN5A	5/19/2009	15:40	Remote	Daily Status Check from PAML Notes: No lagoon measurements. Temperature sensor reading -40 °C . TDLAS 1 is not present at site. Re-aimed TDLAS 2 path 3 due to low light levels. Reduced minimum acceptable light level to 1000 from 2000.
IN5A	5/20/2009	17:45	Remote	Daily Status Check from PAML Notes: No lagoon measurements. Temperature sensor reading -39 °C . TDLAS 1 is not present at site. Re-aimed TDLAS 2 path 3 due to low light levels.
IN5A	5/21/2009	12:50	Remote	Daily Status Check from PAML Notes: TDLAS laptops are frozen, so there is not connection with TDLAS/scanners. Last data from TDLAS's were sent on 5/20/2009 at 6:15 UTC. Air temperature sensor not working.
IN5A	5/22/2009		Calibration	Upon arrival, found that the TDLAS 1 laptop on arrival. It also had a brief error message that disappeared before it could be written down. Shut down and restarted TDLAS 2 laptop. Installed several updates on both laptops and LAN.
IN5A	5/22/2009		Calibration	Restarted *GasView MP* on TDLAS 2 and tried to download latest setup file, but got error message: " Incompatible or corrupt setup file." Copied correct setup numbers from backup files, and now the program is running ok.
IN5A	5/22/2009		Calibration	Upon arrival, found that the exhaust part on Lumasense Innova was taped over, and no air was exhausting. Also, no tube was available for exhaust of PAML's Innova, so calibration was done using a larger tube taped to the exhaust port. Backup data file: Innova_backupIN5A_20090522_1640.txt
IN5A	5/22/2009		Calibration	Grass is getting very tall around the lagoon. It is currently growing in front of the TDLAS's and completely blocking TDLAS 2 path 3 (NW side). Tried to beat back the grass as much as possible but a mower/weed eater is needed.
IN5A	5/22/2009		Calibration	Found water in the south side retro-reflectors; resealed.
IN5A	5/22/2009		Calibration	Maintenance list completed.
IN5A	5/22/2009	17:20-17:45	Calibration	Innova single point calibration. Notes: Innova started giving Chopper failure error, so the instrument was restarted. Innova time sync: Innova--5/22/2009 8:38; LAN--5/22/2009 16:39.
IN5A	5/26/2009		Calibration	Used string trimmer to trim tall grass weeds from paths 1 and 3 on the west side.
IN5A	5/26/2009		Calibration	Installed updates and restarted computers.
IN5A	5/26/2009		Calibration	NH_3 regulator was loose and was leaking. Checked and saw the junction from the cylinder to gauge (in regulator) was loose. Will take back to PAML to fix.
IN5A	5/26/2009		Calibration	Lumasense Innova hooked up to LAN since last visit on 5/22/2009. Data from PAML Innova collected in the file Innova_backupIN5A_20090526_1506.txt. Lumasense Innova is now running, starting with the file 20090526_1935.txt. Using tape in the inlet of Lumasense as the inlet is not 0.25". Not using any exhaust tubing (missing exhaust tubing for lumasense Innova).
IN5A	5/26/2009	15:55-16:54	Calibration	Sonic anemometer intercomparison; all pass.
IN5A	5/26/2009	16:04-16:36	Calibration	TEC 450i single point calibration.

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	5/26/2009	17:18	Calibration	Sonic anemometer bias/zero calibration; all pass.
IN5A	5/26/2009	18:25-18:43	Calibration	Calibrated TDLAS 1032
IN5A	5/26/2009	19:00	Calibration	Wetness sensor calibration: Pass.
IN5A	5/26/2009	19:00	Calibration	Barometer audit: Accepted
IN5A	5/27/2009	18:45	Remote	Daily Status Check from PAML Notes: No lagoon measurements. Flag 1 in H_2S data. FOS will be on site to install new T/RH probe. Temperature sensor reading -39 °C . Wetness probe will be painted tomorrow.
IN5A	5/28/2009		Calibration	UPS History: 5/21/2009 03:41:04: UPS switched to battery power. 03:04:08: AC Restored Message sent to registered clients connected to Load Segment 1. 03:04:08: AC Restored Message sent to registered clients connected to Load Segment 2.
IN5A	5/28/2009		Calibration	Temperature/Thermistor s/n: (5). pH s/n: 006. ORP s/n: 080.
IN5A	5/28/2009		Calibration	Tightened retro-reflectors to ground north and west sides of lagoon. Re-aimed paths 1, 2, 6, and 7.
IN5A	5/28/2009		Calibration	Replaced T/RH sensor in weather station at about 2:00 PM local time. Old s/n: B4340031; new s/n: B4410007.
IN5A	5/28/2009	14:30	Calibration	S-OPS/GSS calibration performed
IN5A	5/28/2009	16:15	Calibration	Lagoon float installed.
IN5A	5/29/2009	13:52	Remote	Daily Status Check from PAML Notes: Not enough space to perform backup. Deleted backups to make space.
IN5A	6/1/2009	12:30	Remote	Daily Status Check from PAML Notes: Re-aimed TDLAS 2 path 3.
IN5A	6/2/2009	13:00	Remote	Daily Status Check from PAML Notes: *IPort* failed; last collected data was at 12:20 GMT on 6/2/2009. Stopped sonic anemometers to restart *iPort* and filled missing data; restarted sonic anemometers. Very dense fog causing paths to be lost.
IN5A	6/3/2009	12:13	Remote	Daily Status Check from PAML Notes: sonic anemometer program stopped at 14:30 GMT 6/2/2009. Tried restarting program, but could not get program running again. Checked again at 19:30 GMT and found that sonic anemometers started incrementing at 14:30 GMT. Fog in area causing low light levels on TDLAS paths. Could not find TDLAS 2 path 3.
IN5A	6/4/2009	12:30	Remote	Daily Status Check from PAML Notes: TDLAS 1 is not present at the site. TDLAS 2 path 3 has low light levels. Sonic anemometer 1 has mean w values above zero.
IN5A	6/5/2009	16:00	Remote	Daily Status Check from PAML Notes: sonic anemometer 1 has mean w values above zero. Sonic anemometer 3 has flagging.
IN5A	6/8/2009	12:30	Remote	Daily Status Check from PAML Notes: sonic anemometer 3 is giving all zeros as data and also has flags 2, 6, and 10 in its data. Runtime error on Genie Soft program. Not enough space to perform backup. Deleted backups to make space.
IN5A	6/9/2009		Calibration	UPS History: 6/3/2009 07:57:42: UPS switched to battery power. 07:57:47: AC Restored message sent to registered clients connected to Load Segment 1. 07:57:47: AC Restored message sent to registered clients connected to Load Segment 2.
IN5A	6/9/2009		Calibration	Grass was not too high for retro-reflectors. Grass and wheat are still pretty low, and the grass around the lagoon has been mowed by the farm.
IN5A	6/9/2009	18:15	Calibration	Stopped recording wetness sensor data. Removed wetness sensor for ice test.

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	6/9/2009	14:50-15:50	Calibration	Sonic anemometer intercomparison; all pass.
IN5A	6/9/2009	15:33-15:50	Calibration	Calibrated TDLAS 1032
IN5A	6/9/2009	16:45	Calibration	Sonic anemometer bias/zero calibration; all pass.
IN5A	6/10/2009	18:15	Remote	Daily Status Check from PAML Notes: TDLAS 2 path 3 was not aligned; re-aimed path.
IN5A	6/11/2009	14:15	Remote	Daily Status Check from PAML Notes: TDLAS 2 path 3 was not aligned; re-aimed path. Sonic anemometer 1 u and w graphs look different than the other sonic anemometers.
PAML	6/11/2009	19:25	Calibration	Calibrated wetness sensor: Fail. Note: Calibration was performed before sanding.
PAML	6/11/2009	19:31	Calibration	Calibrated wetness sensor: Pass. Note: Calibration was performed after sanding but before painting.
IN5A	6/12/2009	12:54	Remote	Daily Status Check from PAML Notes: TDLAS 2 path 3 is not aimed correctly. Tried to re-aim path but was not able to obtain a light level reading higher than 700. TDLAS 1 is not present at site. TDLAS 2 has not had all ten paths aligned today; this is probably caused by high moisture levels in the retro-reflector boxes.
PAML	6/12/2009	15:03	Calibration	Calibrated wetness sensor: Pass. Note: Calibration was performed after painting.
IN5A	6/15/2009		Calibration	Measured flow rate of each nozzle on both sides of the S-OPS with Gilibrator flow meter.
IN5A	6/15/2009	18:00	Calibration	S-OPS/GSS calibrations performed Notes: Inlet balance failed initially on the North S-OPS; changed the nozzle on inlet 7, and the system passed. Inlet balance forms are attached to the calibration sheet.
IN5A	6/16/2009		Calibration	Took out the lagoon probes and replaced the wetness sensor.
IN5A	6/16/2009		Calibration	Upon arrival found *iPort* program was frozen. Restarted *iPort* as well as the sonic anemometers. All data were saved.
IN5A	6/16/2009		Calibration	Barometer audit: Accepted
IN5A	6/16/2009	15:48-16:28	Calibration	TEC 450i single point calibration.
IN5A	6/16/2009	16:35	Calibration	Wetness sensor calibration: Pass.
IN5A	6/16/2009	16:57-17:12	Calibration	Calibrated TDLAS 1032
IN5A	6/16/2009	17:25-17:30	Calibration	Calibrated TDLAS 1031
IN5A	6/17/2009		Calibration	Maintenance list completed.
IN5A	6/17/2009	15:45	Calibration	pH sensor: Quality Assurance completed.
IN5A	6/17/2009	15:55	Calibration	Calibrated ORP sensor 080
IN5A	6/18/2009	12:07	Remote	Daily Status Check from PAML Notes: TDLAS 2 stopped running at 17:50 UTC 6/17/2009. Many paths on TDLAS 1 were off, probably caused by heavy rain at site. TDLAS QC program not updating for new TDLAS (TDLAS 1). Upon remote login, found *Microsoft Visual C++* Runtime error. Added "DoEvent" statement to sonic anemometer program. Sonic anemometer 1 w is above zero. Sonic anemometer 3 is not reporting any data currently. When installing lagoon temperature probe, temperature initially read 45 °C , but it has since dropped to normal levels.
IN5A	6/19/2009	12:05	Remote	Daily Status Check from PAML Notes: sonic anemometer 3 does not appear to be reading data correctly. H_2S data stops at 14:45 UTC 6/18/2009. All missing data were filled.

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	6/22/2009	12:09	Remote	Daily Status Check from PAML Notes: *Microsoft Visual Basic* run-time error '6' overflow error: "Timeout error while reading response from instrument at address at 173. TDLAS 1 paths are not aligned; probably caused by heavy rainfall in area--will monitor. Sonic anemometer program stopped running and was restarted at 12:30 UTC.
Column1	Column2	Column3	Column4	Column5
IN5A	6/23/2009		Other	Lagoon site layout completed
IN5A	6/23/2009		Other	Restarted TDLAS 2 (1032).
IN5A	6/23/2009	12:44	Remote	Daily Status Check from PAML Notes: TDLAS 2 was turned off at site on 6/18/2009.
IN5A	6/23/2009	16:50-20:22	Other	S-OPS testing done on north S-OPS line. Performed leak test to 1.49 LPM and -37.0 kPa.
IN5A	6/24/2009		Other	Performed T/RH/D S-OPS testing. Weed wacked around N and W ends of lagoon. Cleared around S-OPS on N and cleared TDLAS paths on W. Aimed paths 2 and 3.
IN5A	6/26/2009	12:11	Remote	Daily Status Check from PAML Notes: sonic anemometer 3 u, v, w, and T graphs are still unbalanced. The remote desktop connection keeps getting disconnected. Can only connect to TDLAS 1031 currently.
IN5A	6/29/2009	16:17	Remote	Daily Status Check from PAML Notes: sonic anemometer 3 u, v, w, and T graphs are still unbalanced. Upon remote login, found Runtime error for Genie-soft.
IN5A	7/1/2009	14:36	Other	S-OPS testing done on north S-OPS line. Performed leak test to 1.49 LPM and -37.0 kPa.
IN5A	7/2/2009		Other	Tested all North side inlets for flow rate using Gilibrator. Installed LI-840 CO_2/H_2O analyzer.
IN5A	7/2/2009		Other	Aimed TDLAS path 3. This path has a tendency to drift up and to the right. Set the path at Pan: 15696; Tilt: -245
IN5A	7/2/2009		Other	Shut down H_2S analyzer at 16:18 UTC, restarted at 16:52 UTC.
IN5A	7/2/2009	16:00	Other	Started CO_2 measurements
IN5A	7/7/2009	12:18	Remote	Daily Status Check from PAML Notes: Both TDLAS's (1031 and 1032) cannot be aimed on path 2 with alarm 70. FOS will be on site tomorrow.
IN5A	7/8/2009	16:05	Remote	Daily Status Check from PAML Notes: All TDLs have been fixed and are now working.
IN5A	7/8/2009		Calibration	Wetness and solar radiation sensors need to be cleaned before next calibration check.
IN5A	7/8/2009		Calibration	Prof. Rich Grant performed audit on Ben Evans.
IN5A	7/8/2009		Calibration	UPS history: 6/20/2009 00:53:43: AC Restored Message sent to registered clients connected to Load Segment 2. 7/4/2009 07:12:13: UPS switched to battery power. 07:12:13: Utility power has failed. 07:12:13: UPS bypass unavailable. 07:12:17: AC power has been restored. 07:12:17: AC Restored Message sent to registered clients connected to Load Segment 1. 07:12:17: AC Restored Message sent to registered clients connected to Load Segment 2.
IN5A	7/8/2009	16:00	Calibration	S-OPS/GSS calibrations
IN5A	7/8/2009	17:42	Calibration	Barometer audit: accepted.
IN5A	7/8/2009	17:42	Calibration	Wetness sensor calibration: accepted.
IN5A	7/9/2009		Calibration	Could not perform pH/ORP acceptance/stability because the 5V power supply was not on site.

Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	7/9/2009		Calibration	Will clean wetness sensor and solar radiation sensor tomorrow (7/10/2009).
IN5A	7/9/2009		Calibration	pH sensor: QA and inspection/maintenance performed
IN5A	7/9/2009	16:55	Calibration	ORP sensor: calibration performed
IN5A	7/9/2009	18:06-18:41	Calibration	TEC 450i single point calibration
IN5A	7/10/2009		Calibration	Cannot get AC to work; it's blowing out cool air.
IN5A	7/10/2009		Calibration	Too windy to perform sludge depth measurements.
IN5A	7/10/2009		Calibration	Performed TDLAS inter-comparsion. See open site notes for diagrams.
IN5A	7/10/2009		Calibration	Maintenance and inspection list completed
IN5A	7/10/2009	14:50-15:50	Calibration	Sonic anemometer intercomparison; all pass.
IN5A	7/10/2009	16:28	Calibration	Bias/Zero sonic anemometer calibration; all pass.
IN5A	7/10/2009	18:03-18:19	Calibration	Calibrated TDLAS 1031
IN5A	7/10/2009	18:28-18:44	Calibration	Calibrated TDLAS 1032
IN5A	7/10/2009	19:30-20:00	Calibration	Cleaned wetness sensor and pyranometer.
IN5A	7/13/2009	12:06	Remote	Daily Status Check from PAML Notes: TDLAS 1 (1031) was unresponsive upon login. Last data was recorded on 7/11/2009. Restarted *GasView MP* during later remote login and loaded setup file. TDLAS 2 paths 3 and 4 were off; realigned, and all paths are aligned.
IN5A	7/14/2009	12:11	Remote	Daily Status Check from PAML
IN5A	7/15/2009	11:45	Remote	Daily Status Check from PAML Notes: TDLAS 1 (1031) stopped running at 12:31 UTC 7/14/2009. Update at 18:58: FOS were on site today and restarted both TDLAS laptops, and the TDLAS's are now running fine.
IN5A	7/15/2009		Other	TDLAS 1 laptop was locked up upon arrival. Restarted the computer, and it is now working properly. Currently running GMP file that was empty; used backup file.
IN5A	7/15/2009		Other	TEC 450i has been losing time. Time check showed that the LAN read 15:40:11 while the instrument read 15:37:00 (191 seconds behind). Power-cycled 450i, and it is now synched with the LAN.
IN5A	7/15/2009		Other	Performed CO_2 bag test with GSS/S-OPS. See open site notes for details.
IN5A	7/15/2009		Other	Set up new S-OPS lines for DMI-GHG study.
IN5A	7/16/2009		Setup	Set up new S-OPS lines on east and west side of the lagoon.
IN5A	7/16/2009		Setup	Set up new sonic anemometer on north side of lagoon.
IN5A	7/16/2009		Setup	Installed methane analyzer.
IN5A	7/16/2009		Setup	Worked on plumbing to H_2S analyzer.
IN5A	7/16/2009		Setup	Trimmed grass around retro-reflectors for TDLAS paths.
IN5A	7/16/2009		Setup	Installed hydrogen cylinder.
IN5A	7/16/2009		Setup	While working on all the tubes to the CO_2 analyzer, the tubes were disconnected for about ten minutes.
IN5A	7/16/2009		Setup	S-OPS sensor installation report completed.
IN5A	7/17/2009	12:00	Remote	Daily Status Check from PAML Notes: sonic anemometers were not logging data. Shut down and restarted sonic anemometers at 12:38 GMT. Sonic anemometers are now logging data.

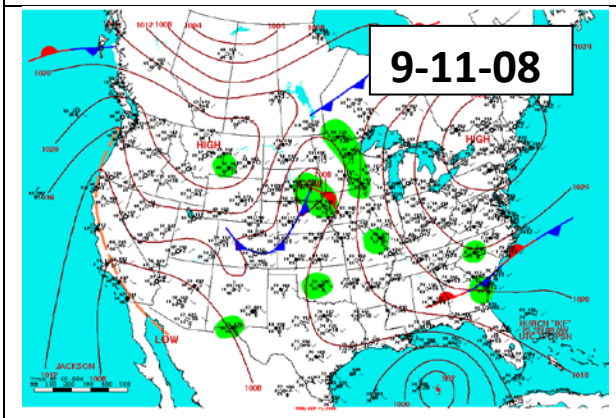
Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	7/20/2009	16:02	Remote	Daily Status Check from PAML Notes: Cannot aim TDLAS 1032 path 3.
IN5A	7/20/2009		Setup	Installed east and west S-OPS lines and extension lines.
IN5A	7/20/2009		Setup	Upon arrival found that the H_2S analyzer was not running.
IN5A	7/20/2009		Setup	Methane analyzer is now running.
IN5A	7/21/2009	13:20	Remote	Daily Status Check from PAML Notes: Re-aimed TDLAS 1 path 7. The H_2S sample flow, voltages, and lamp intensity have all gone to zero.
IN5A	7/22/2009		Other	Performed CH_4 and H_2S bag test.
IN5A	7/22/2009		Other	Took SE scanner back to PAML to replace failed East scanner. Due to a lack of time, could not aim fixed path--will do tomorrow.
IN5A	7/22/2009		Other	Fire burning to the east of the lagoon.
IN5A	7/23/2009	14:25	Remote	Daily Status Check from PAML Notes: Fluctuation in ORP sensor readings.
IN5A	7/23/2009		Calibration	Fire burning to the east of the lagoon.
IN5A	7/23/2009		Calibration	Hooked up S2 and S3 from GSS to east and west paths to perform leak test. Could not get S-OPS leak test flow to pass on west side (~4.2 LPM). Did not have time to deal with east side. Put Teflon tape on inlet tubing (filter holder/tubing "hook" junction) where connections are loose--still leaking however. Tested each filter holder, but could not find leaks. Ran out of time and had to complete leak of the north/south paths for NAEMS project. Did not perform inlet balance on N/S side--will perform at cal check next week.
IN5A	7/23/2009	15:15-16:15	Calibration	S-OPS/GSS calibration (S/N: A, C) Notes: Did not perform inlet balance on N/S side--will perform at cal check next week.
IN5A	7/23/2009	16:15-18:19	Calibration	S-OPS/GSS calibrations (S/N: G, H) Notes: Could not get S-OPS leak test flow to pass on west side (~4.2 LPM). Put Teflon tape on inlet tubing (filter holder/tubing "hook" junction) where connections are loose--still leaking however. Tested each filter holder, but could not find leaks. Ran out of time and had to complete leak of the north/south paths for NAEMS project.
IN5A	7/23/2009	18:16+	Calibration	S-OPS/GSS calibration (S/N: A, C) Notes: Did not perform inlet balance on N/S side--will perform at cal check next week.
IN5A	7/24/2009	12:15	Remote	Daily Status Check from PAML Notes: On remote login screen, "Backup Monitor. Not enough space to perform backup." Clicked OK and backup was aborted. Unable to re-aim TDLAS 2 path 3. Fog/haze in area on 7/24/2009; fire/smoke in area on 7/23/2009. All three H_2S temperature graphs are reading zero for temperature. H_2S chamber pressure and sample flow also all zeros. PMT voltage, lamp voltage, and lamp intensity are all zero as well.
IN5A	7/27/2009		Calibration	Printer not working.
IN5A	7/27/2009		Calibration	Air used for TEC 55C (methane analyzer) dropped a lot.
IN5A	7/27/2009		Calibration	SO_2 gas regulator was found to be open (the cylinder knob is very tight, could not close).
IN5A	7/27/2009		Calibration	After sonic anemometer intercomparison, found sonic anemometer 3 was not collecting data. Wires were loose inside sonic anemometer--fixed. After bias check, found sonic anemometer 2 giving zeros--will check tomorrow.
IN5A	7/27/2009	16:45-17:19	Calibration	H_2S single point calibration
IN5A	7/29/2009	13:30	Remote	Daily Status Check from PAML Notes: Backup error message upon login; clicked ok. Aimed paths 1, 4, 5, 6, 7, 10 on TDLAS 1. Unable to aim path 3, possibly due to moisture. Showers and fog are in the area today.

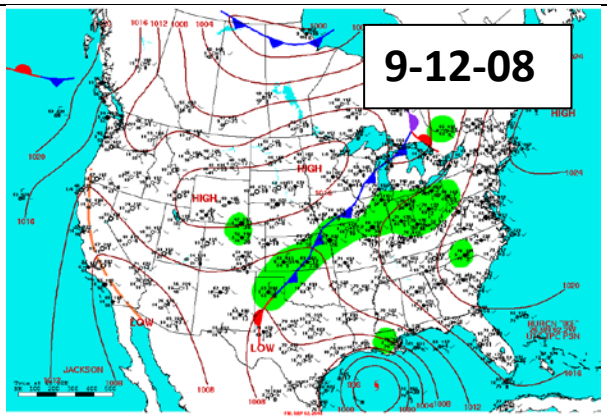
Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	7/30/2009		Calibration	Took sonic anemometer 2 back to PAML for repair.
IN5A	7/30/2009		Calibration	Zero cylinder tank empty, will take back to PAML.
IN5A	7/30/2009		Calibration	Printer not working.
IN5A	7/30/2009	14:52-15:13	Calibration	Calibrated TDLAS 1031
IN5A	7/30/2009	15:34-15:39	Calibration	Calibrated TDLAS 1032
IN5A	7/30/2009	17:00	Calibration	pH sensor: QA and inspection/maintenance performed
IN5A	7/30/2009	17:10	Calibration	Barometer audit: accepted.
IN5A	7/31/2009	13:30	Remote	Daily Status Check from PAML Notes: Re-aimed TDLAS 2 paths 3, 4, 7, and 9. TDLAS 1 is not present.
IN5A	8/3/2009	13:20	Remote	Daily Status Check from PAML Notes: *iPort* stopped at 8/1/2009 18:57 UTC. Filled missing H_2S data. Restarted real-time data collection. Restarted LI 840; it has been down since 7/20. Re-aimed TDLAS 2 paths 1, 3, 4, 7, 8, and 9. TDLAS 1 is not present. No wetness sensor data since day 937. GSS panel temperature out of control. Likely caused by AC problem. Sonic anemometer 2 had up to 300 sonic anemometer flags on day 344.
IN5A	8/6/2009	18:58	Calibration	Calibrated wetness sensor W6 (new)
IN5A	8/6/2009	19:12	Calibration	Calibrated wetness sensor W8
IN5A	8/7/2009	12:35	Remote	Daily Status Check from PAML Notes: TDLAS 1 not present.
IN5A	8/10/2009	13:30	Remote	Daily Status Check from PAML Notes: GSS panel temperature reached 43 °C yesterday. H_2S chamber temperature went from 43 °C to 53 °C .
IN5A	8/11/2009	12:30	Remote	Daily Status Check from PAML Notes: GSS panel temperature reached 43.5 °C yesterday. H_2S chamber temperature spiked to 53 °C . Flag 2 in H_2S data. Sonic anemometer 3 had a handful of five-minute intervals with sonic anemometer flagging. TDLAS 1 not present.
IN5A	8/12/2009	12:06	Remote	Daily Status Check from PAML Notes: Fog in area.
IN5A	8/13/2009	12:09	Remote	Daily Status Check from PAML Notes: Fog in area.
	8/14/2009	12:11	Remote	Daily Status Check from PAML Notes: Fog in area with high dew points, causing low TDLAS light levels. H_2S data were missing; last fill was at 7:07 UTC 8/14/2009. Filled missing data.
IN5A	8/17/2009		Calibration	Forgot to open new file for calibration of H_2S. Used the running file IN5A450I0814091249.dat for calibration. Started at 15:45 UTC and ended at 16:13 UTC.
IN5A	8/17/2009		Calibration	S-OPS North side failed. Changed filter papers on inlets 3 and 9, but the line still failed. Changed all filter papers and the S-OPS passed.
IN5A	8/17/2009		Calibration	Did not take down the sonic anemometers because of rain.
IN5A	8/17/2009		Calibration	Shut down TEC 450i analyzer. Will bring back to PAML.
IN5A	8/17/2009	15:00-17:20	Calibration	S-OPS/GSS calibrations Notes: S-OPS/GSS leak test fails. It has been failing since the last visit. Changed all filter papers for the North S-OPS line.
IN5A	8/17/2009	15:55-16:25	Calibration	TEC 450i single point calibration Notes: Forgot to open a new calibration file, used the running file.
IN5A	8/18/2009		Calibration	Rain/mist all day prevented calibrated of sonic anemometers.
IN5A	8/18/2009		Calibration	Taking back both TDLAS's to PAML.
IN5A	8/18/2009		Calibration	Upon arrival found one TDLAS laptop was frozen.

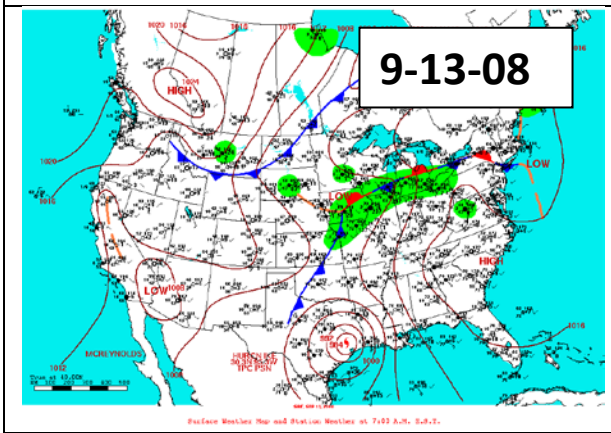
Site	Date (mm/dd/yyyy)	Time (UTC)	Activity (setup, takedown, calibration, repair, or remote)	Event (description, notes, or comments)
IN5A	8/18/2009		Calibration	UPS history: 8/11/2009 2:45-3:45: UPS temperature alarm. 8/17/2009 10:09:15: UPS switched to battery power. 10:09:18: AC Restored Message sent to registered clients connected to Load Segment 1. 10:09:18: AC Restored Message sent to registered clients connected to Load Segment 2.
IN5A	8/18/2009		Calibration	ORP sensor: calibration performed
IN5A	8/18/2009	14:58-15:12	Calibration	Calibrated TDLAS 1032
IN5A	8/18/2009	15:00-17:00	Calibration	S-OPS/GSS calibrations Notes: S-OPS/GSS leak test fails. It has been failing since the last visit. Changed all filter papers for the North S-OPS line.
IN5A	8/18/2009	15:22-15:35	Calibration	Calibrated TDLAS 1031
IN5A	8/18/2009	16:00	Calibration	pH sensor: QA and inspection/maintenance performed
IN5A	8/19/2009	12:20	Remote	Daily Status Check from PAML
IN5A	8/20/2009	12:20	Remote	Daily Status Check from PAML
IN5A	8/21/2009	12:20	Remote	Daily Status Check from PAML

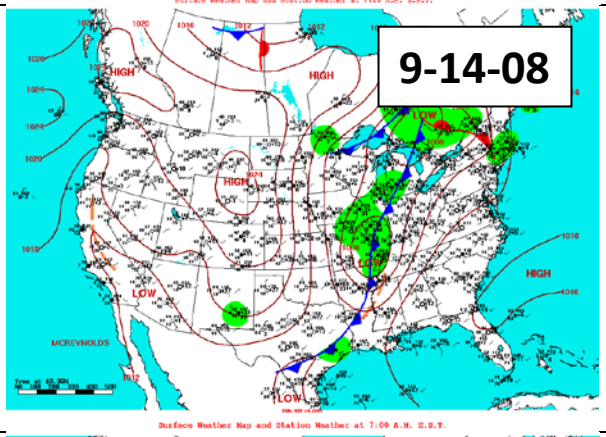
6.9 Site Weather

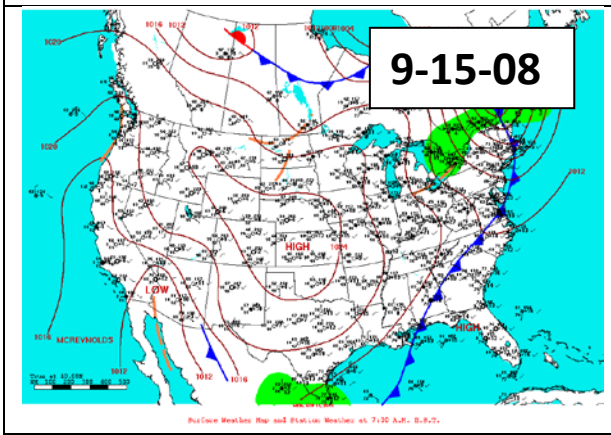
Period 6

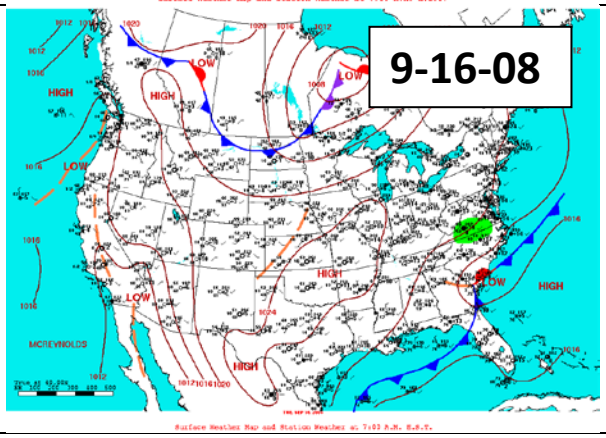


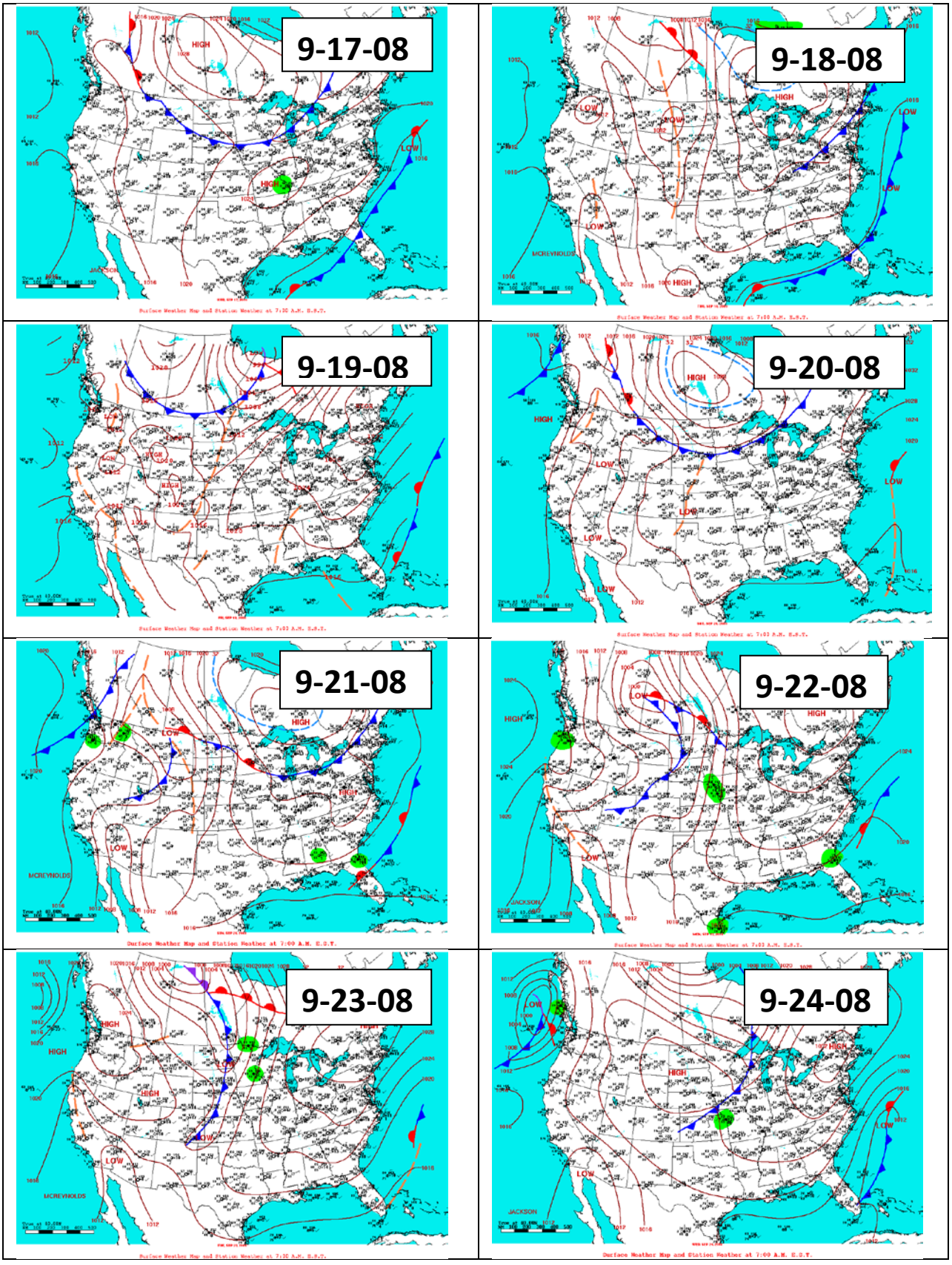








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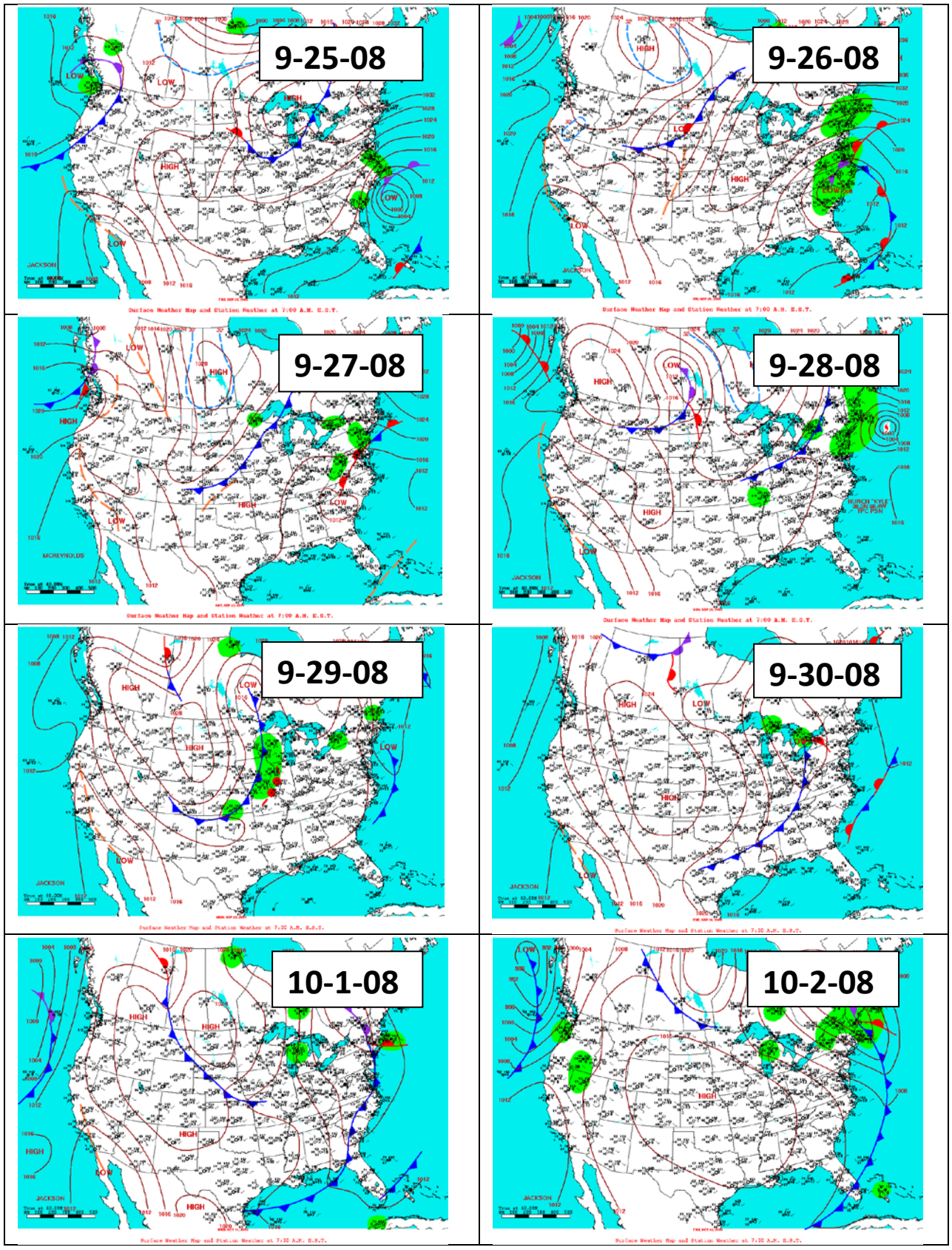
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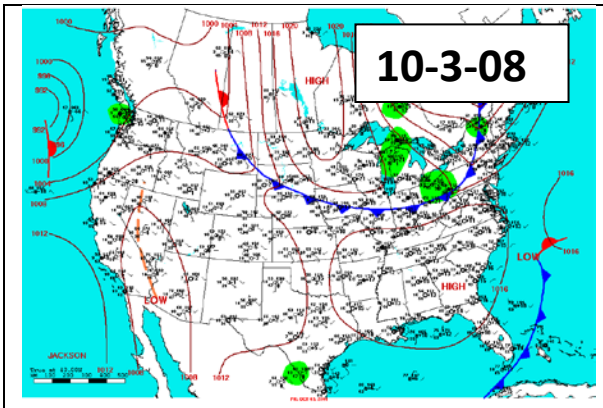
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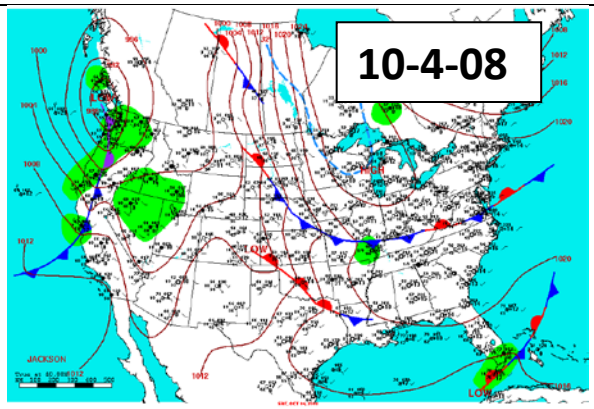
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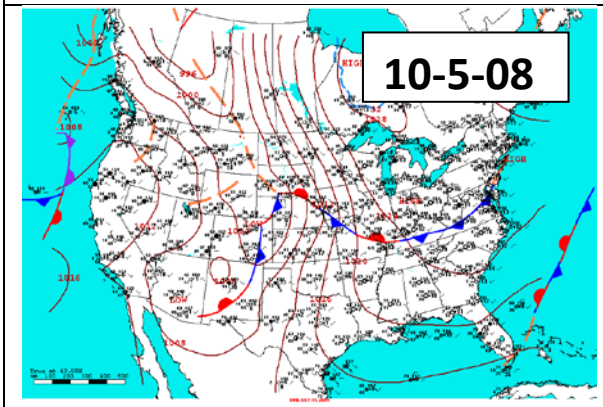
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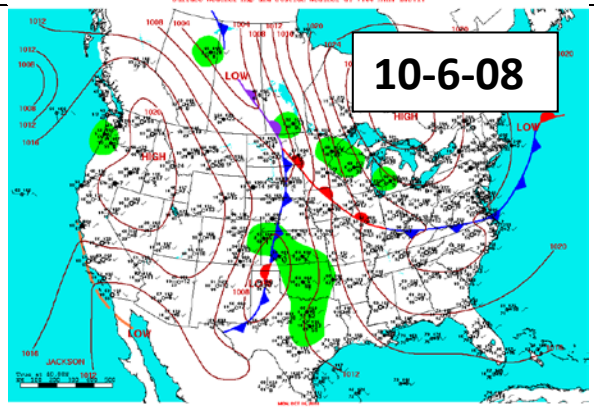
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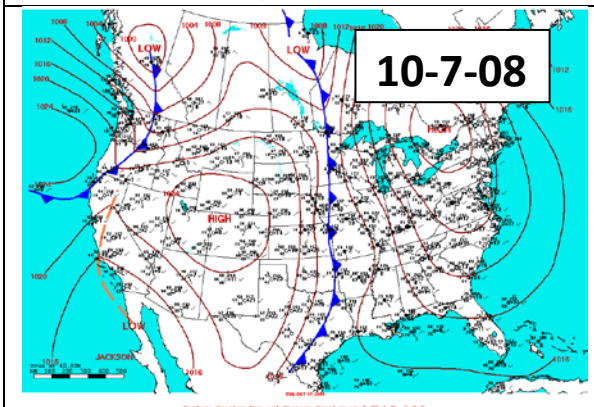
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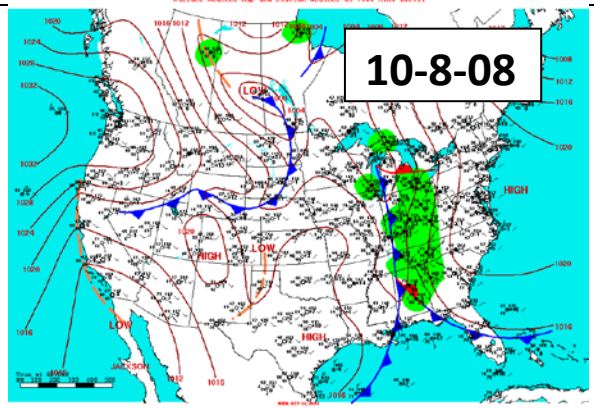
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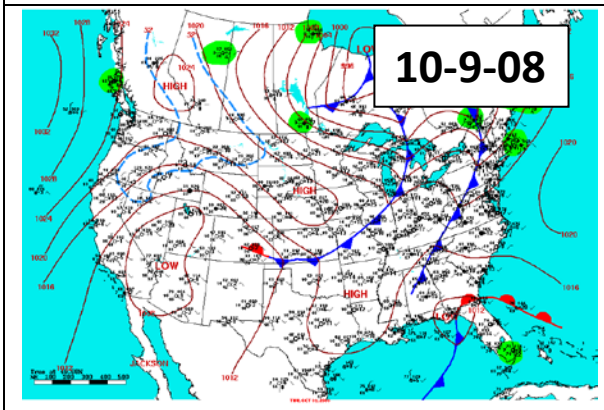
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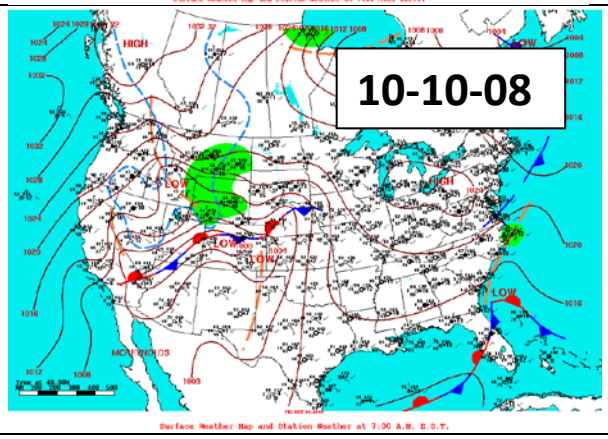
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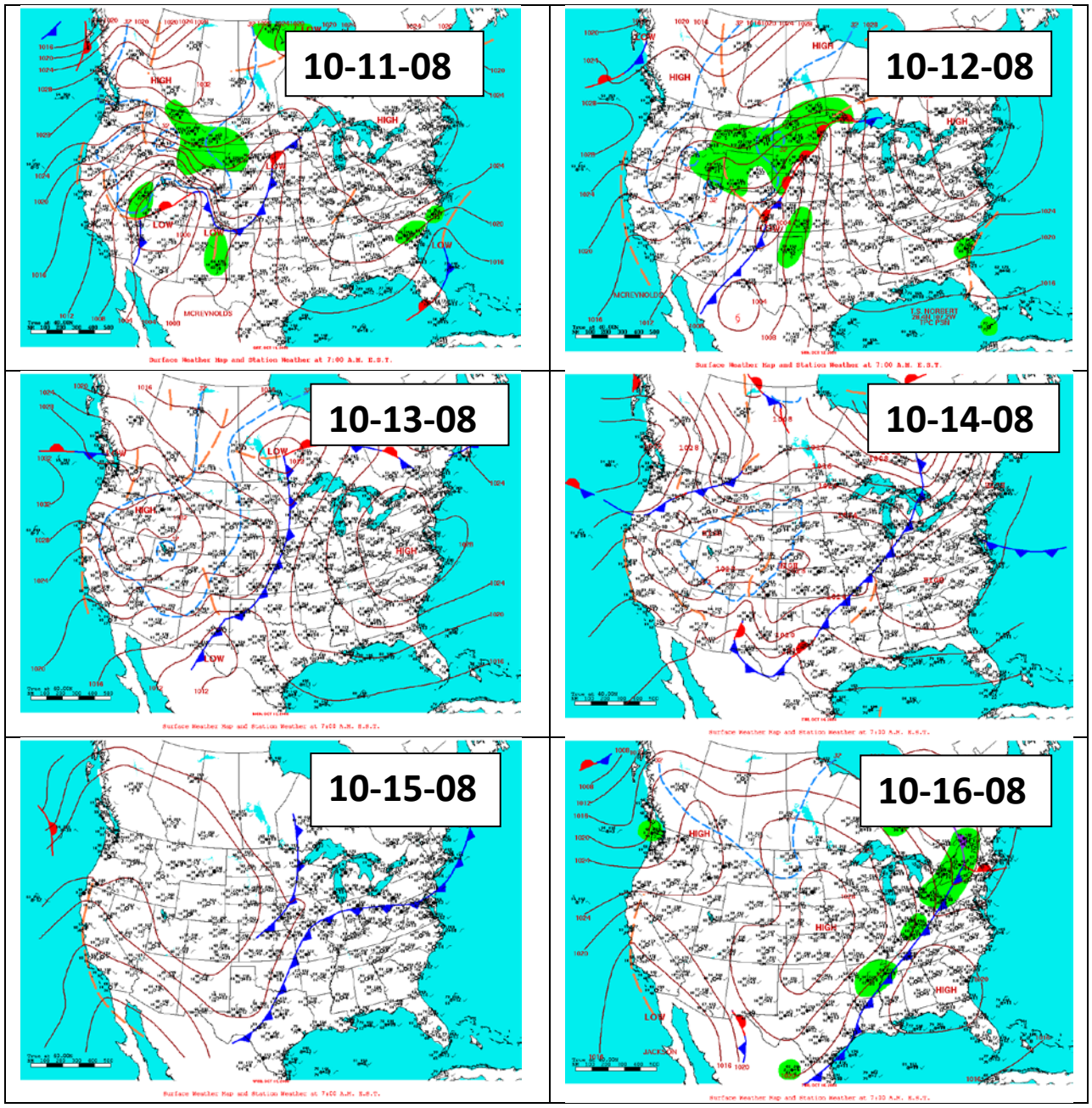
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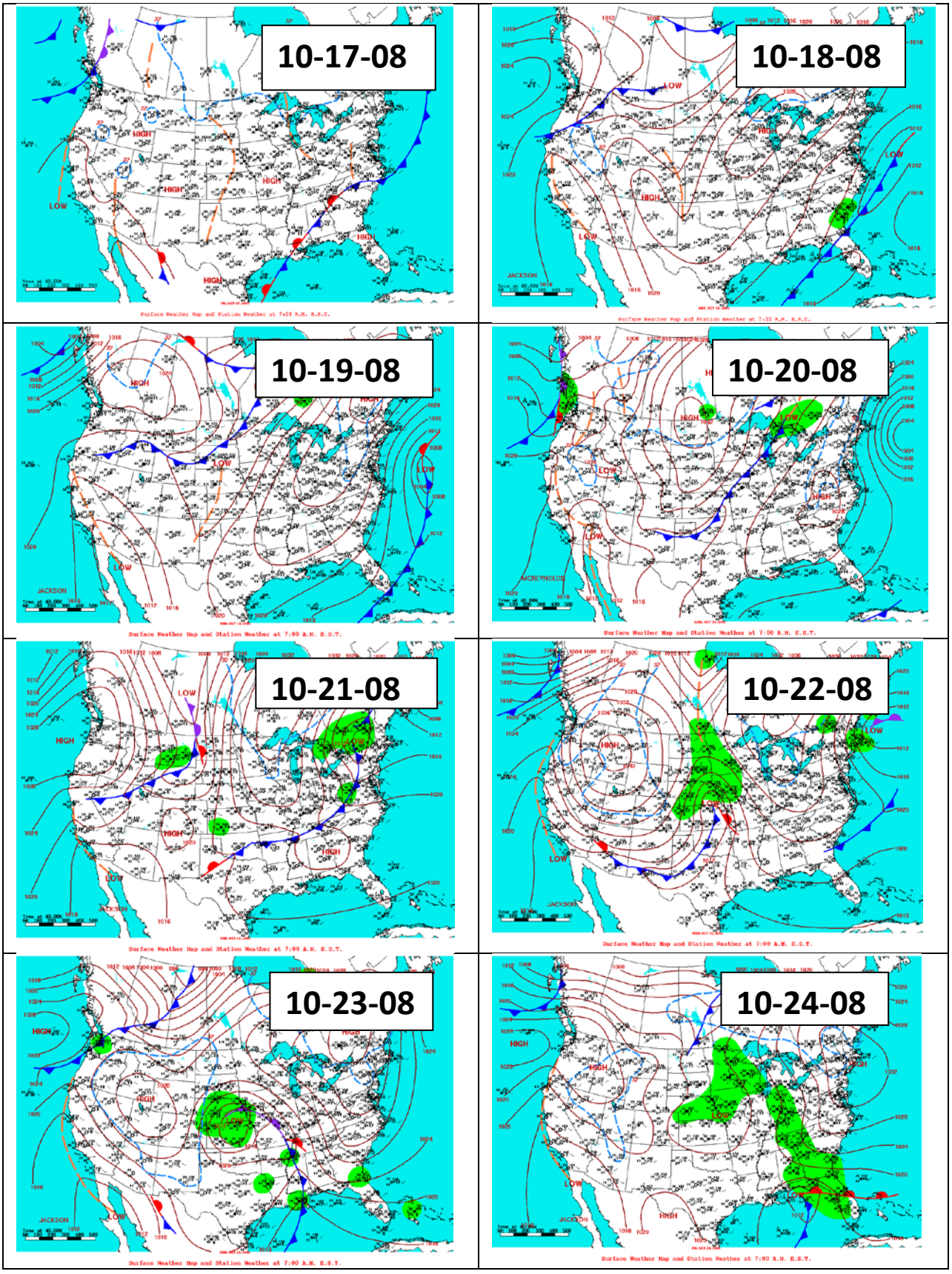
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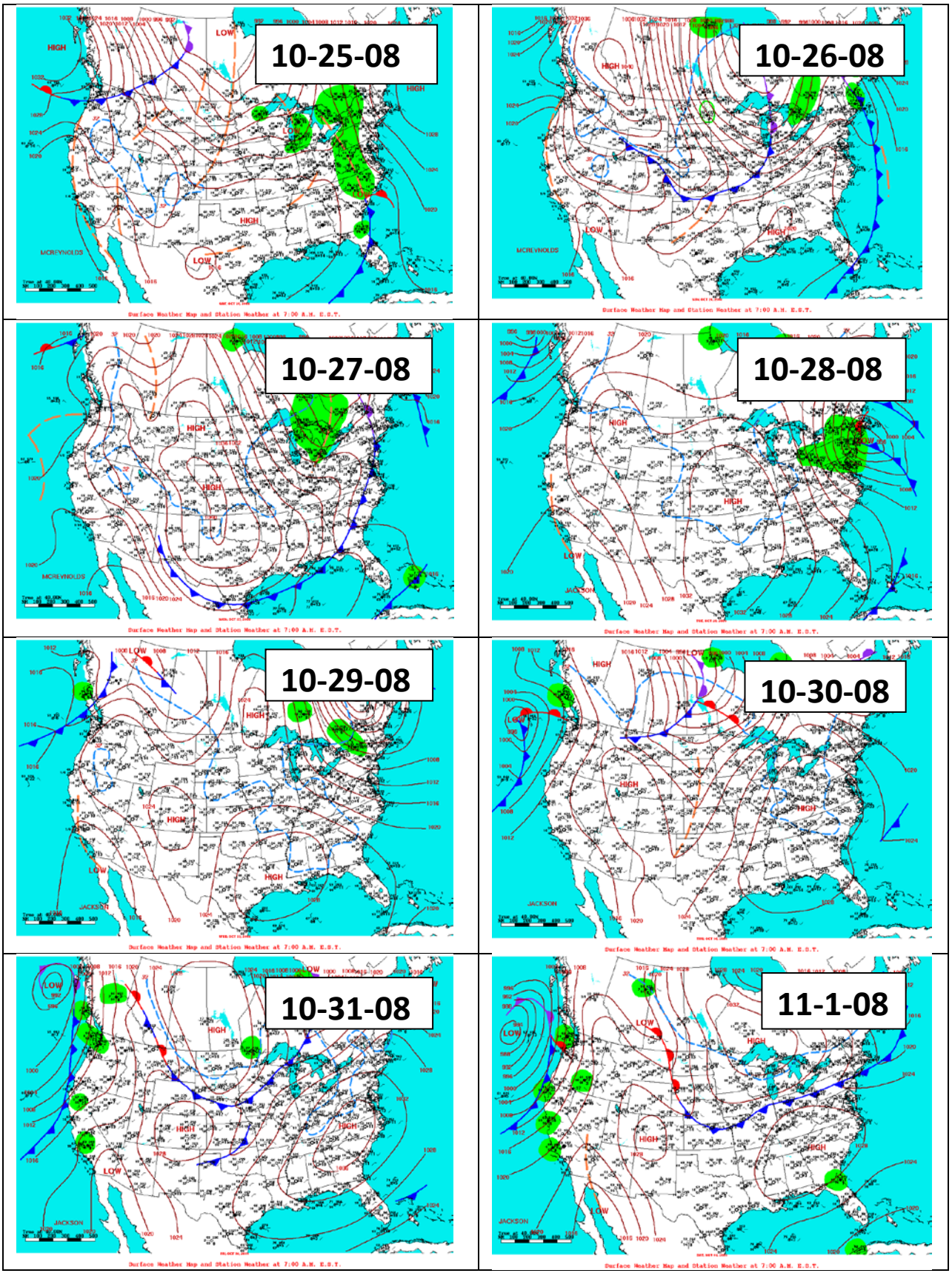
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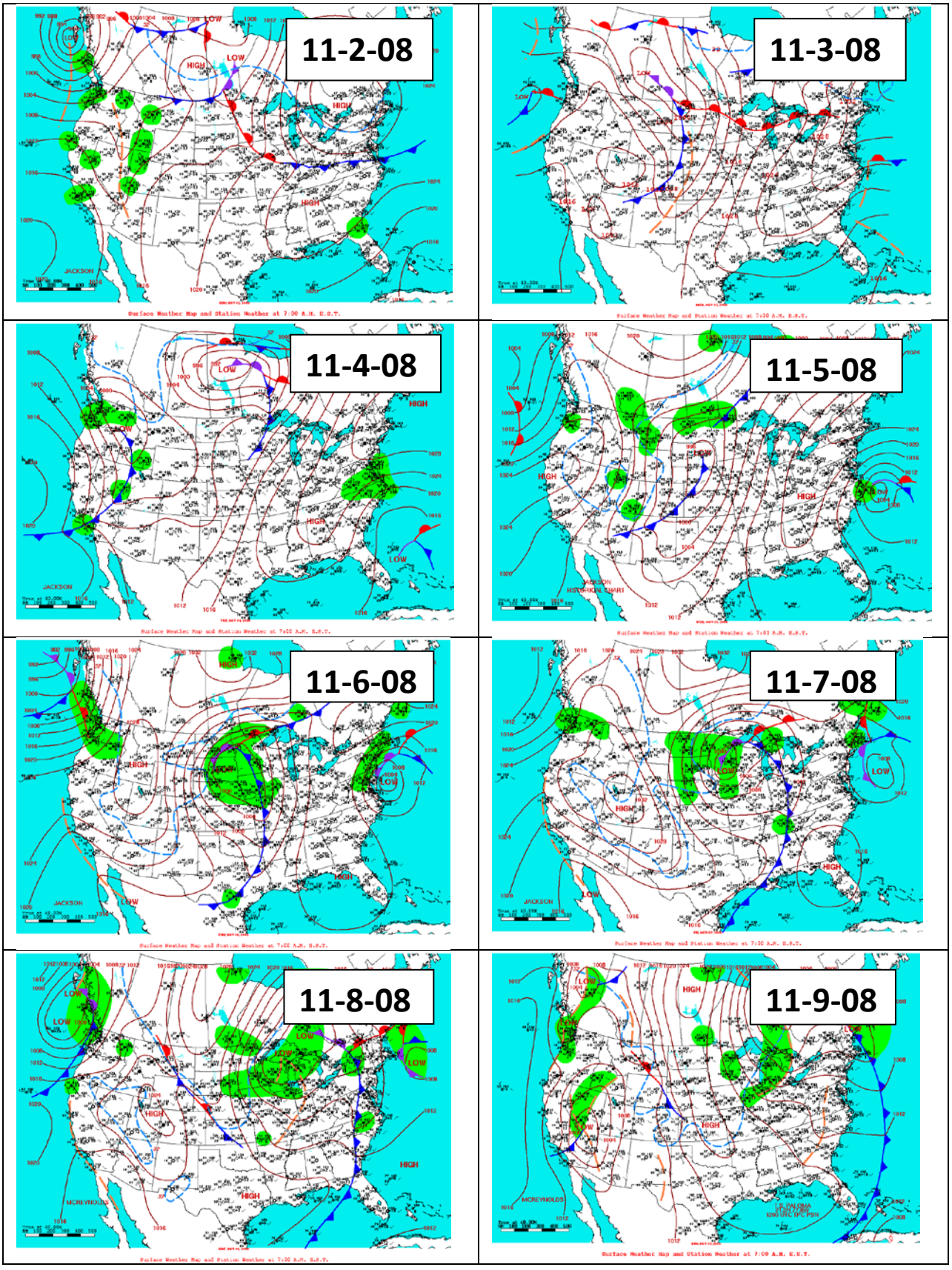
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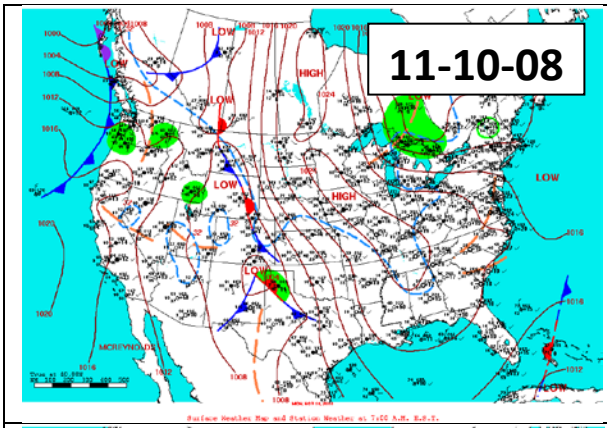
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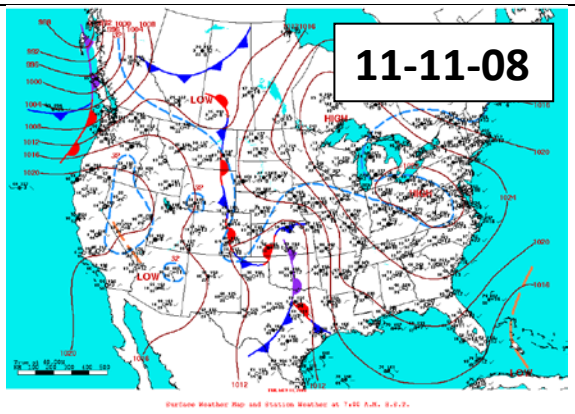
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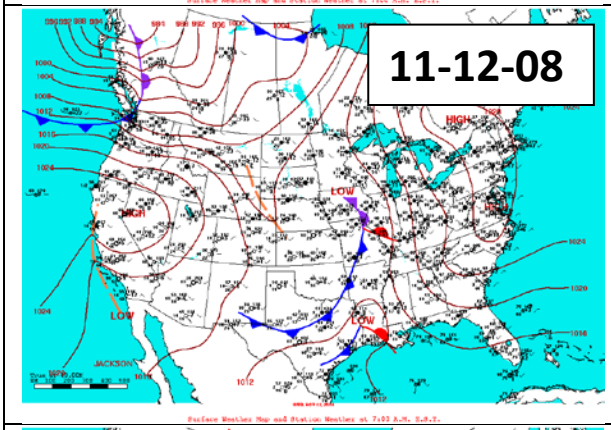
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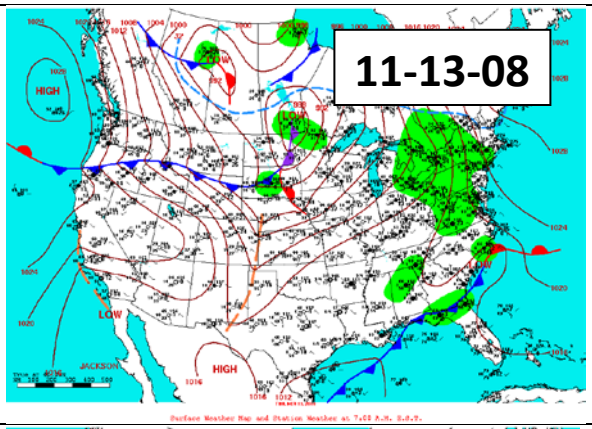
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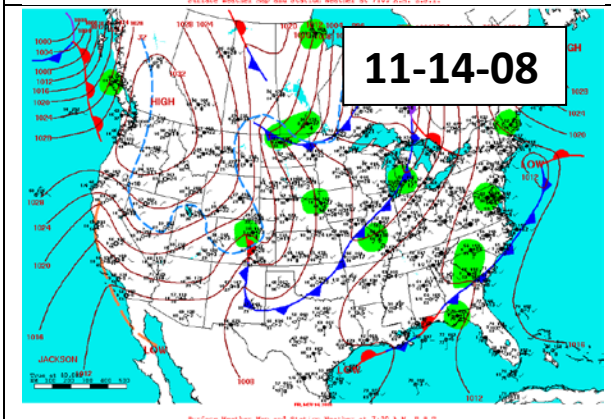
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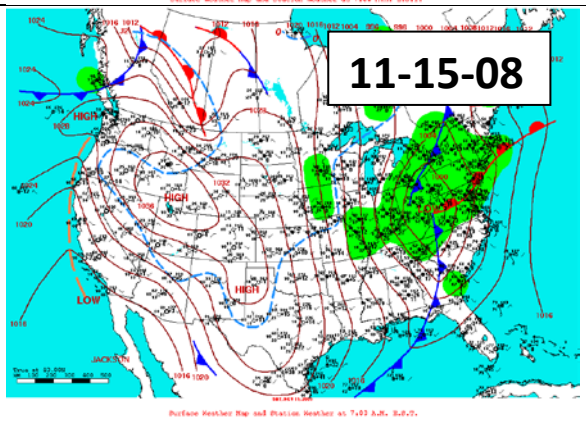
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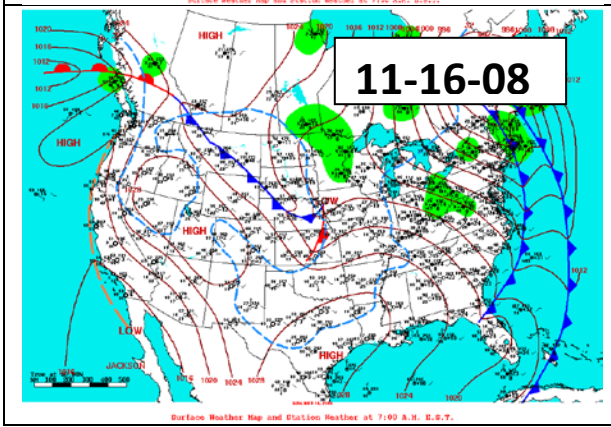
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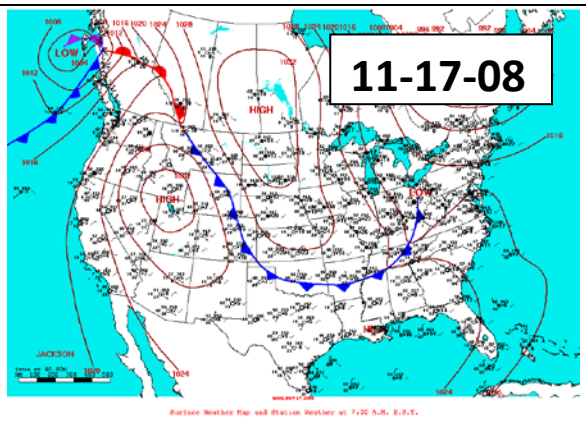
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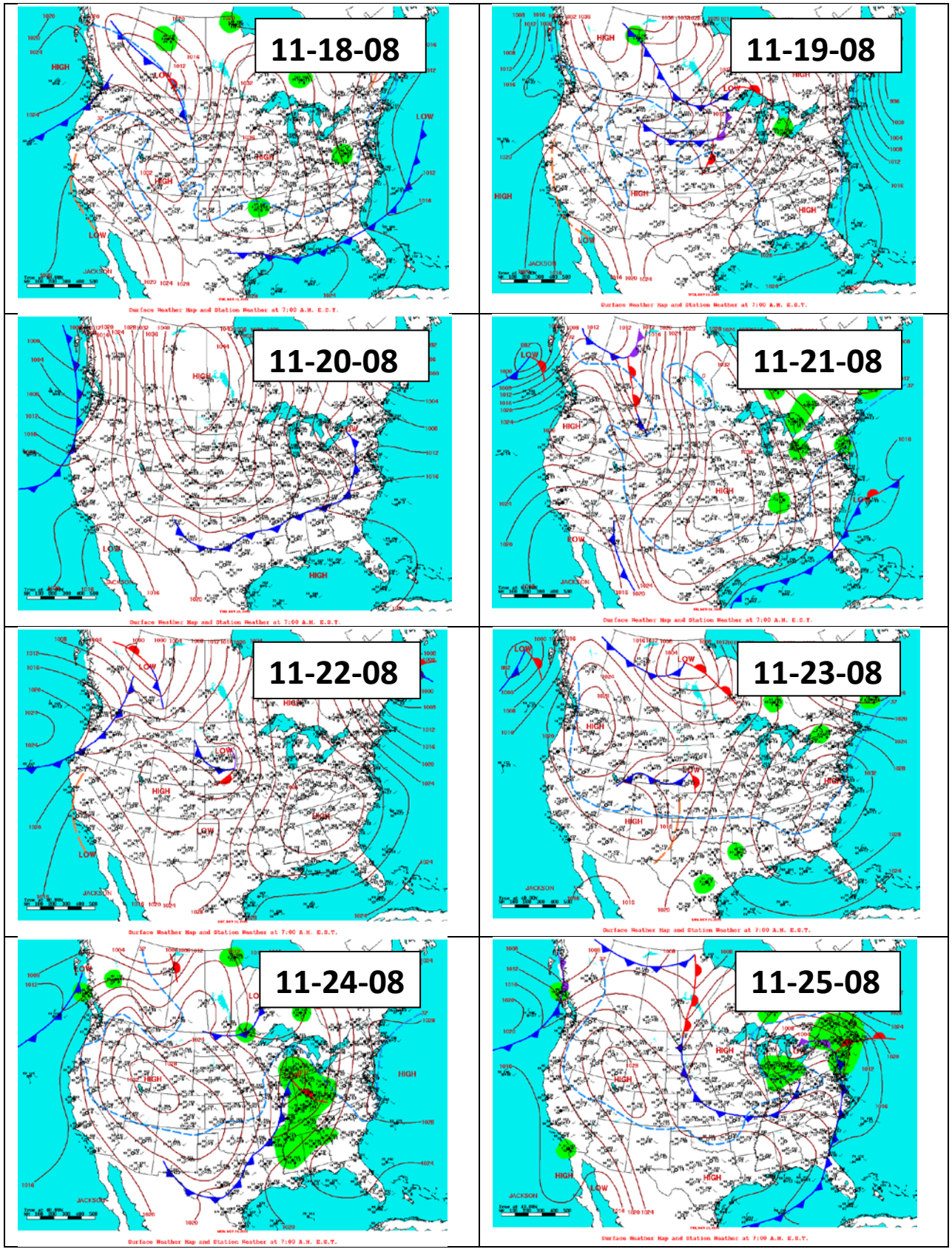
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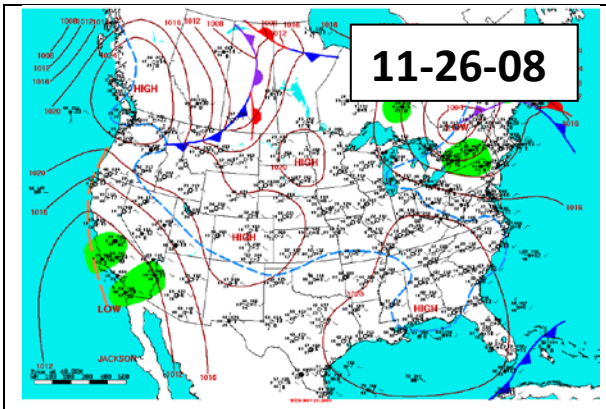
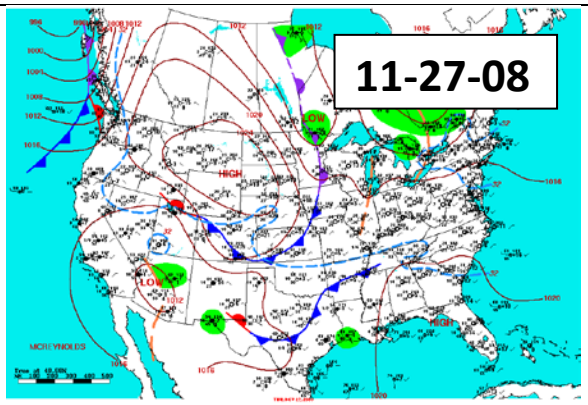
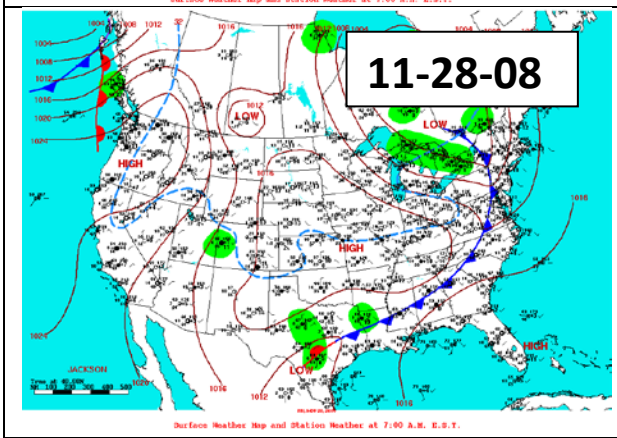
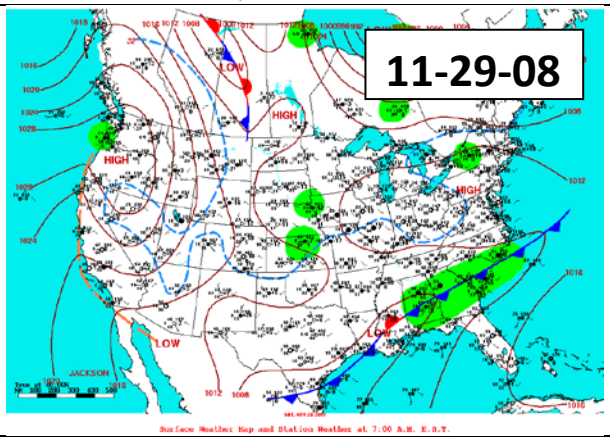
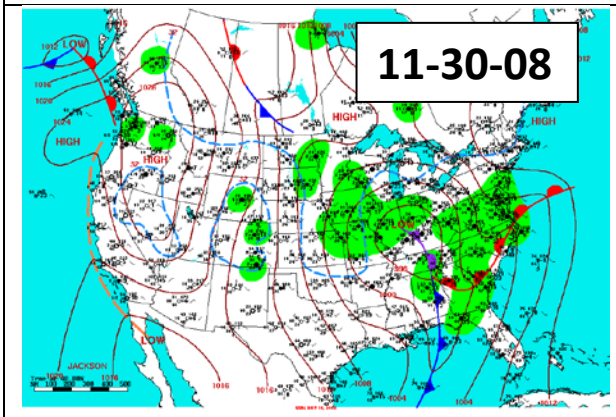


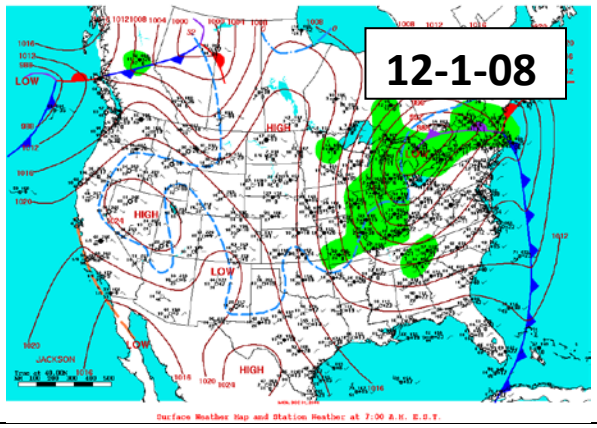


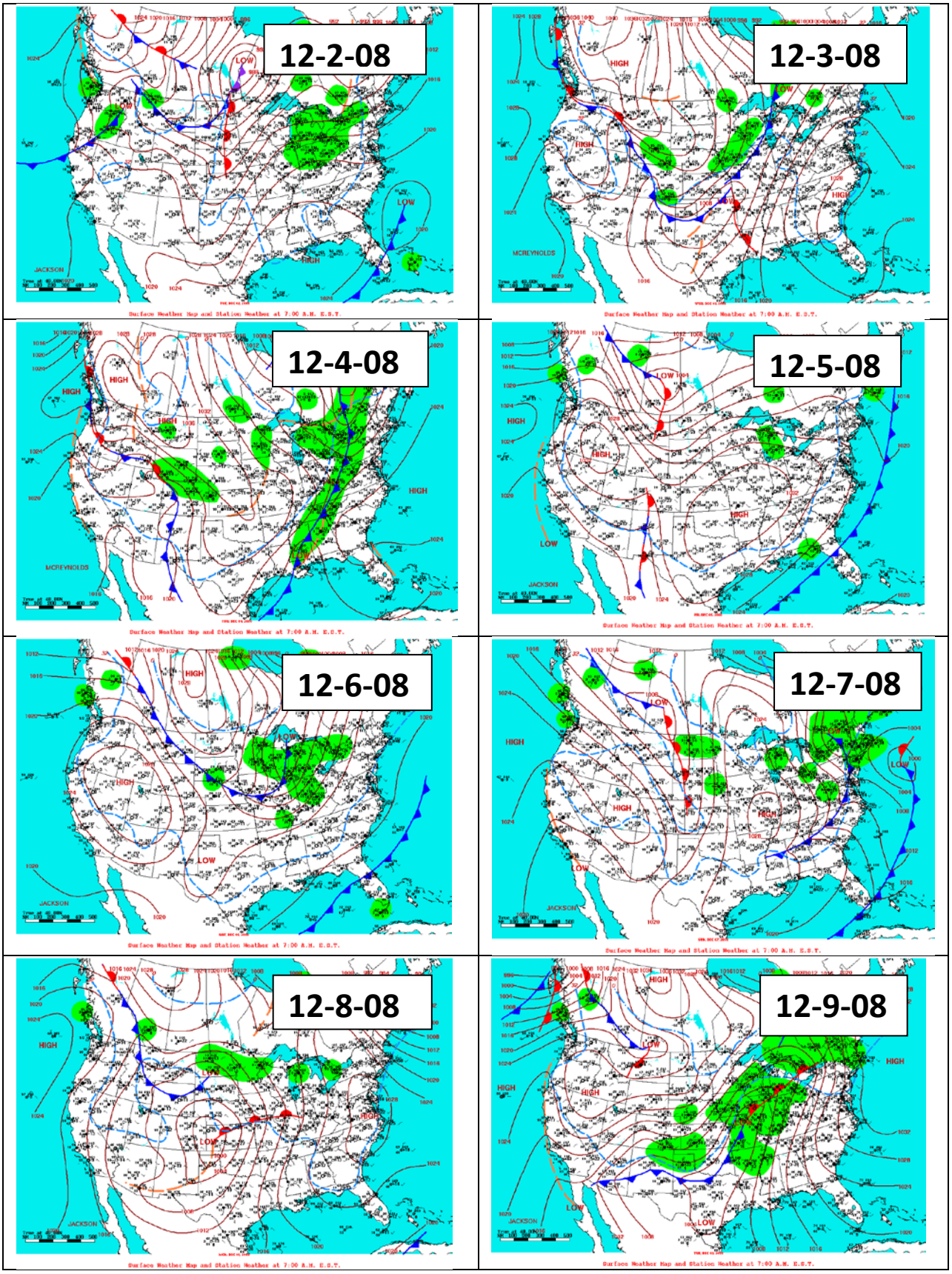






Period 7

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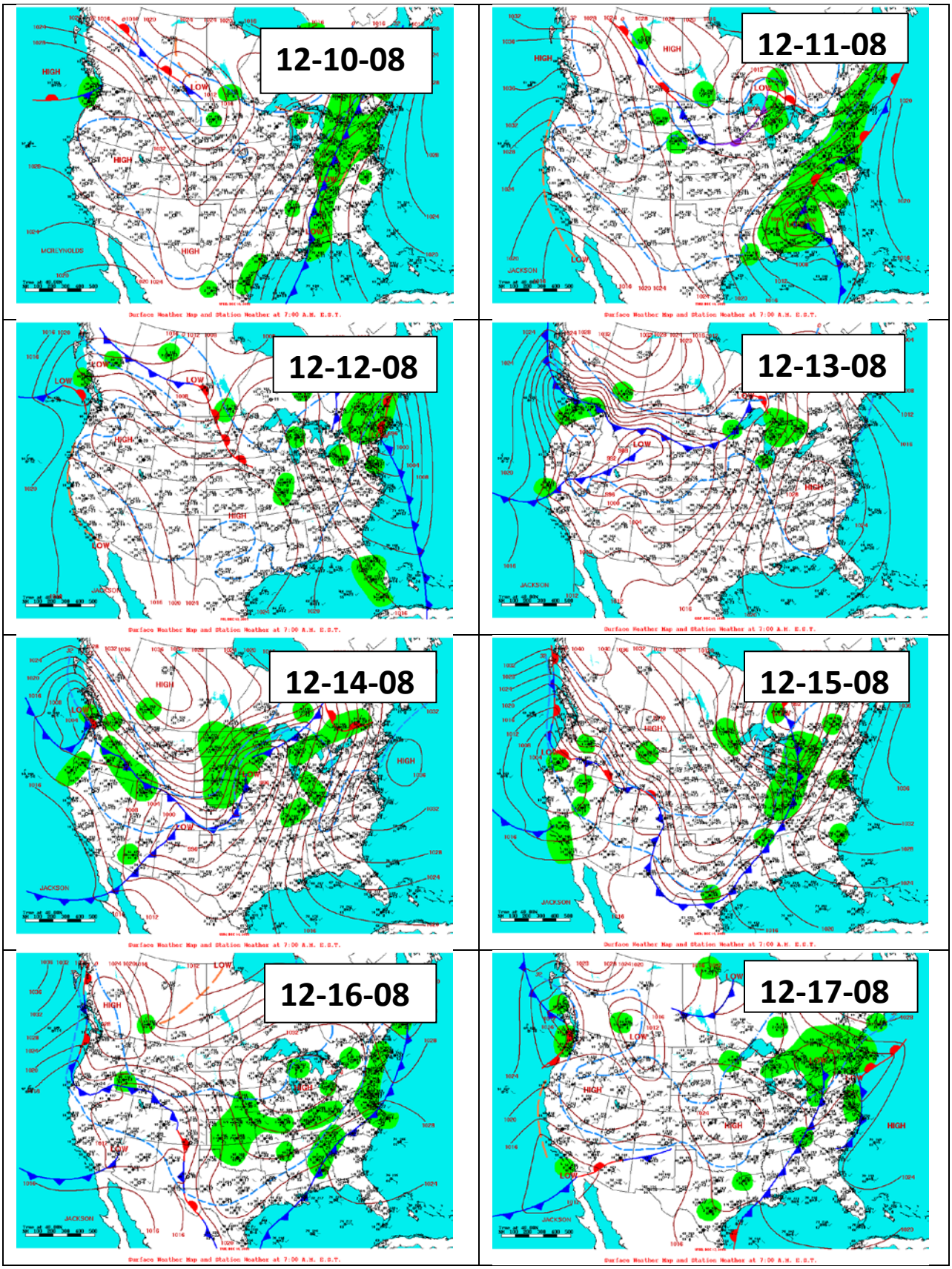
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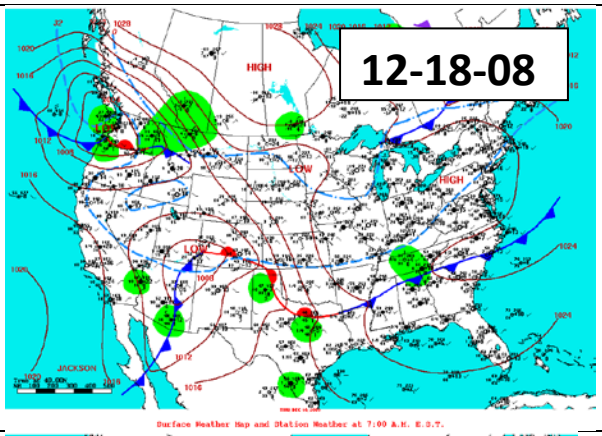
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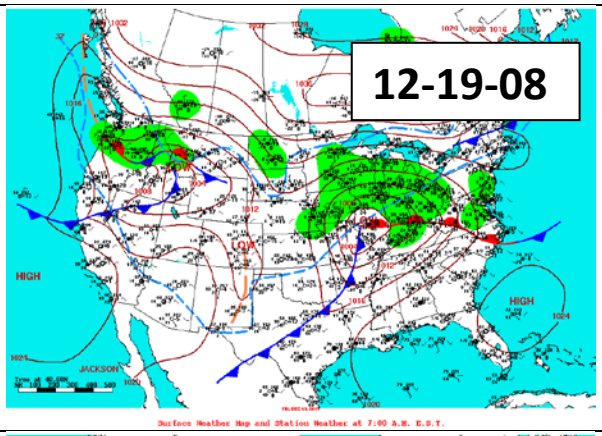
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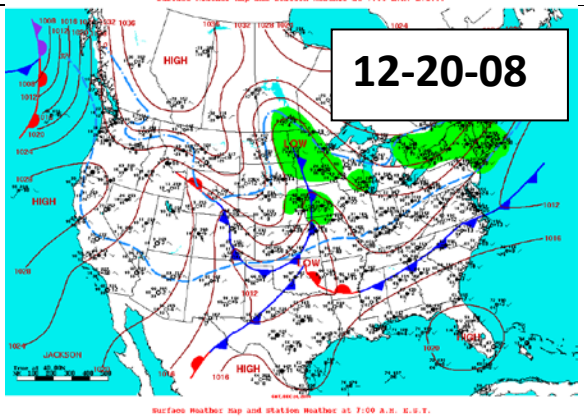
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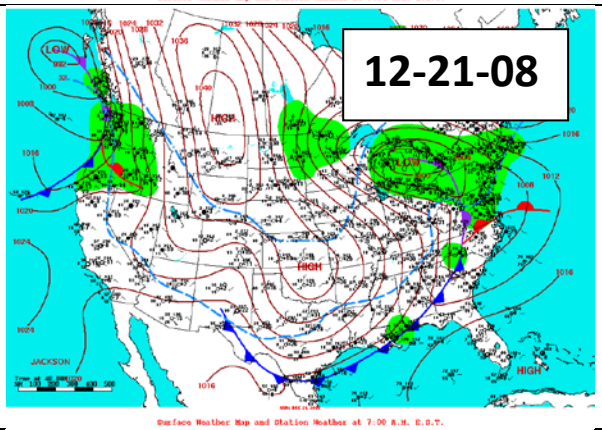
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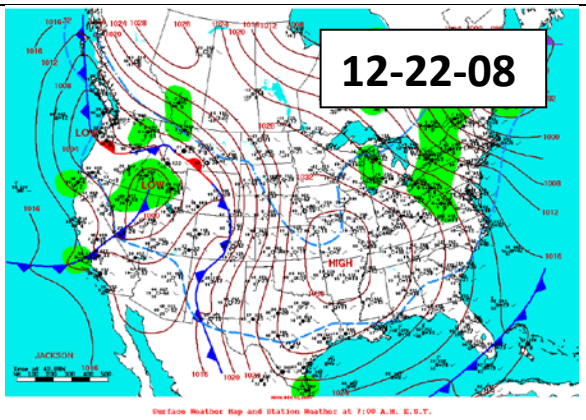
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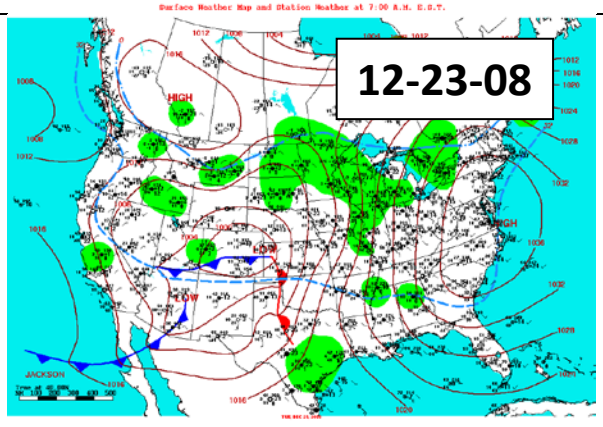
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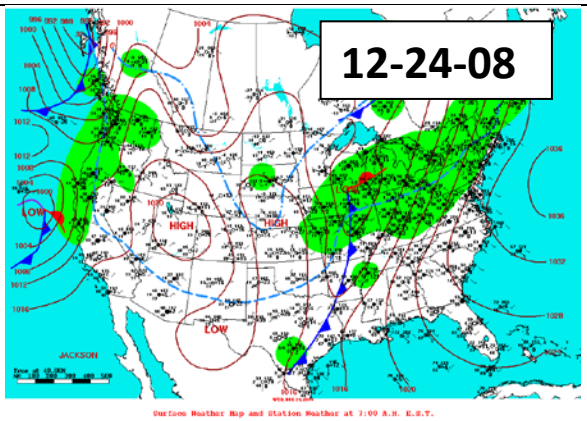
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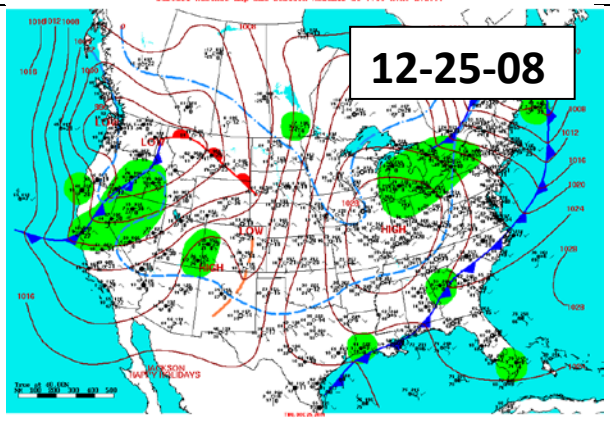
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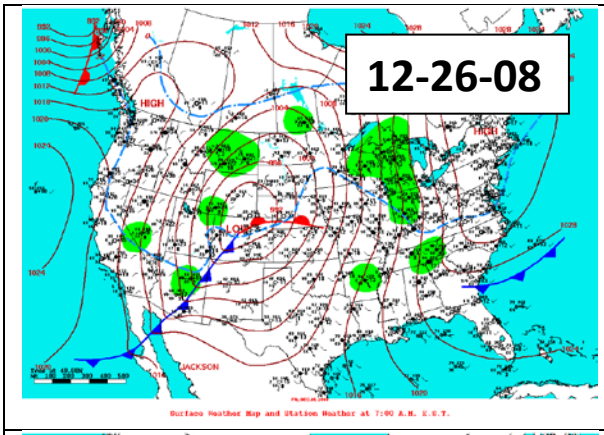
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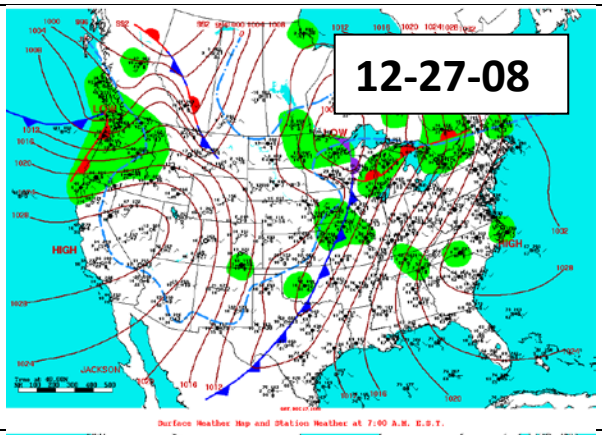
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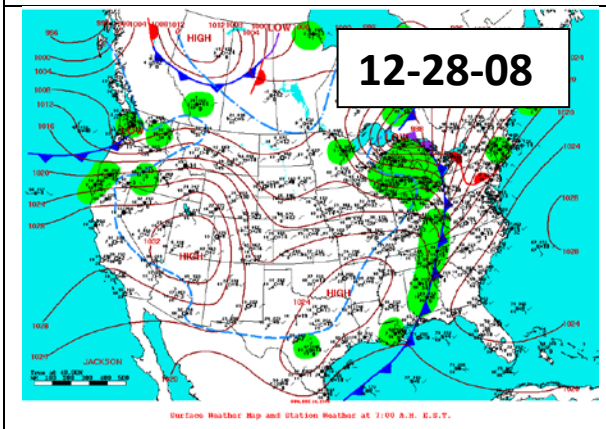
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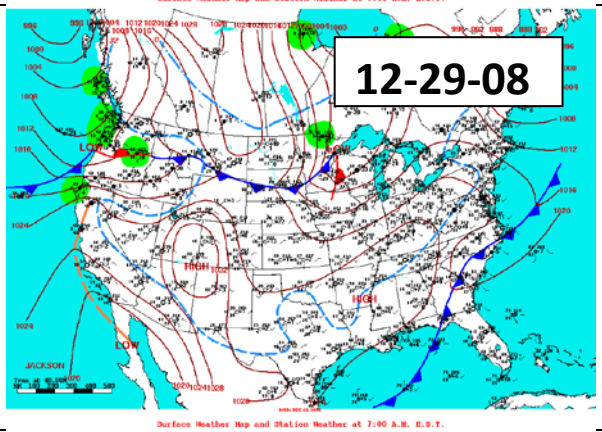
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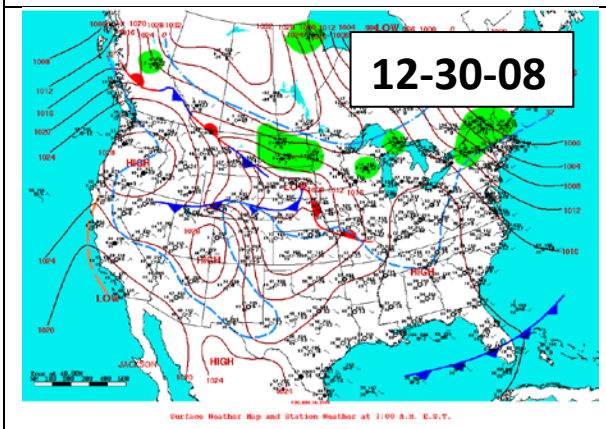
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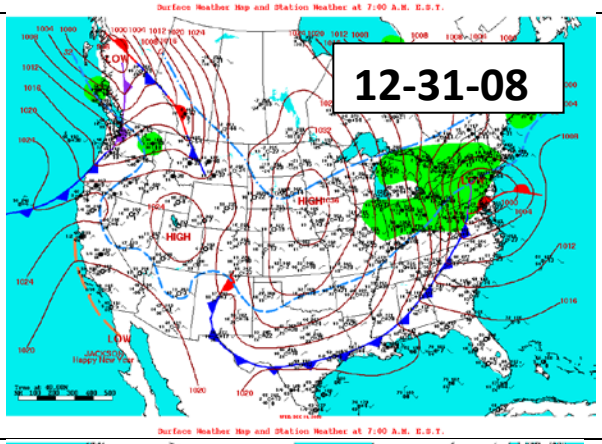
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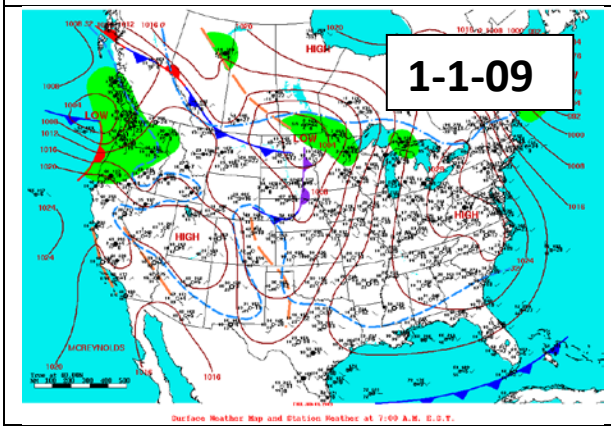
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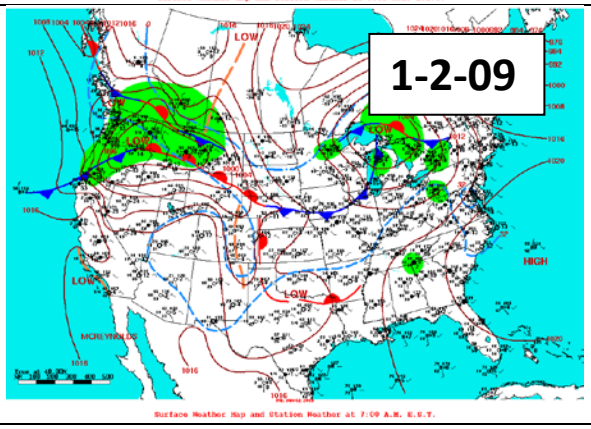
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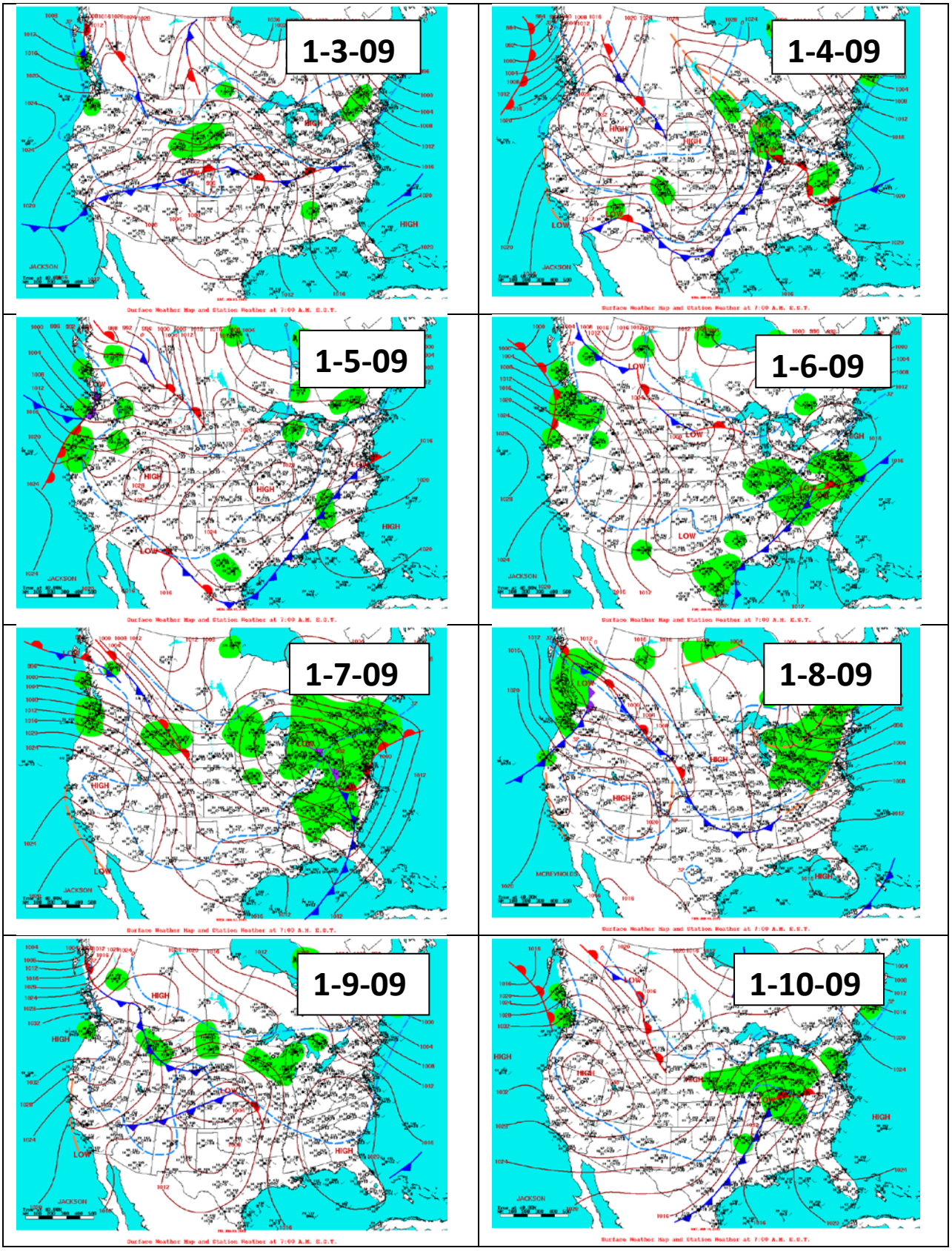
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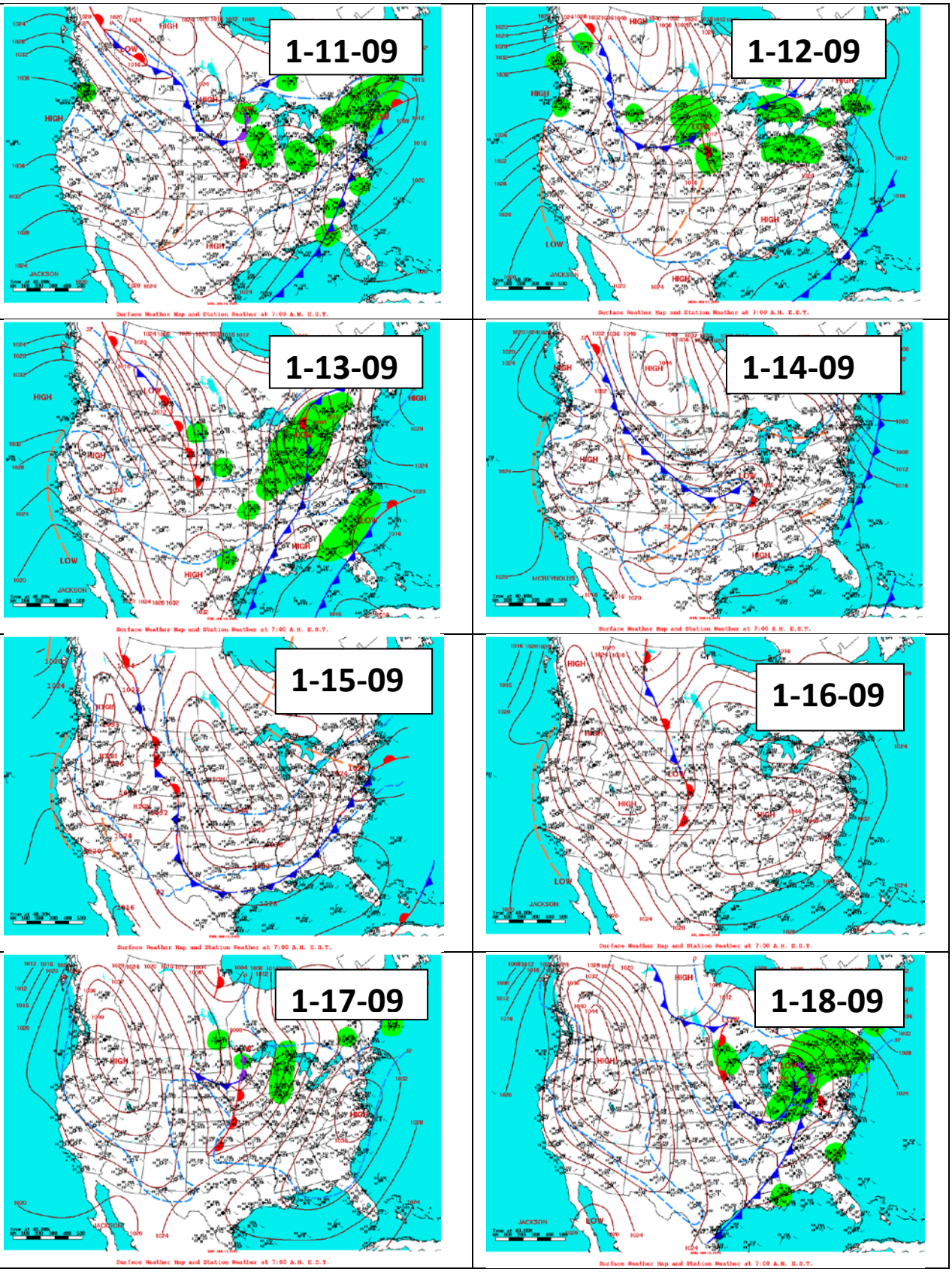
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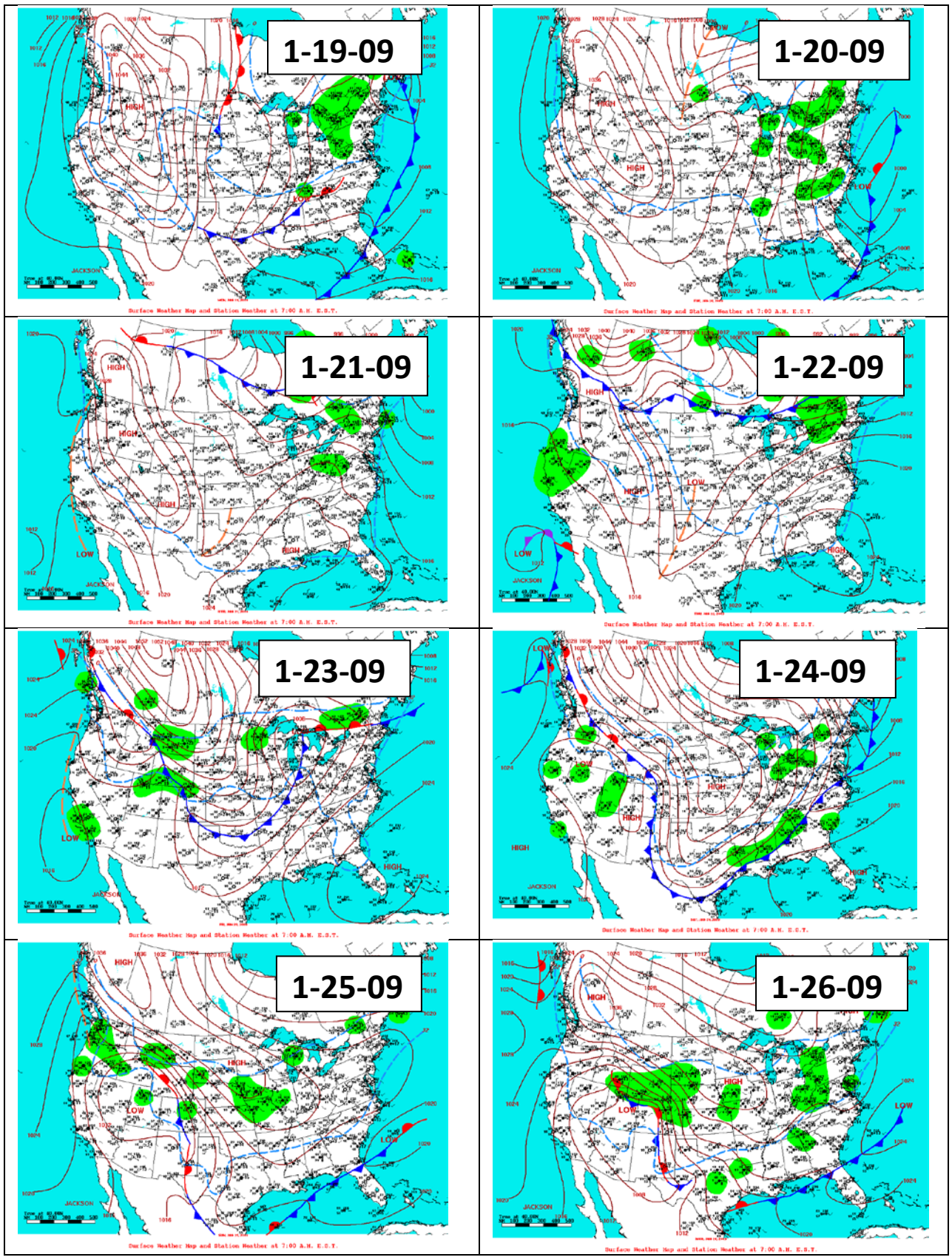
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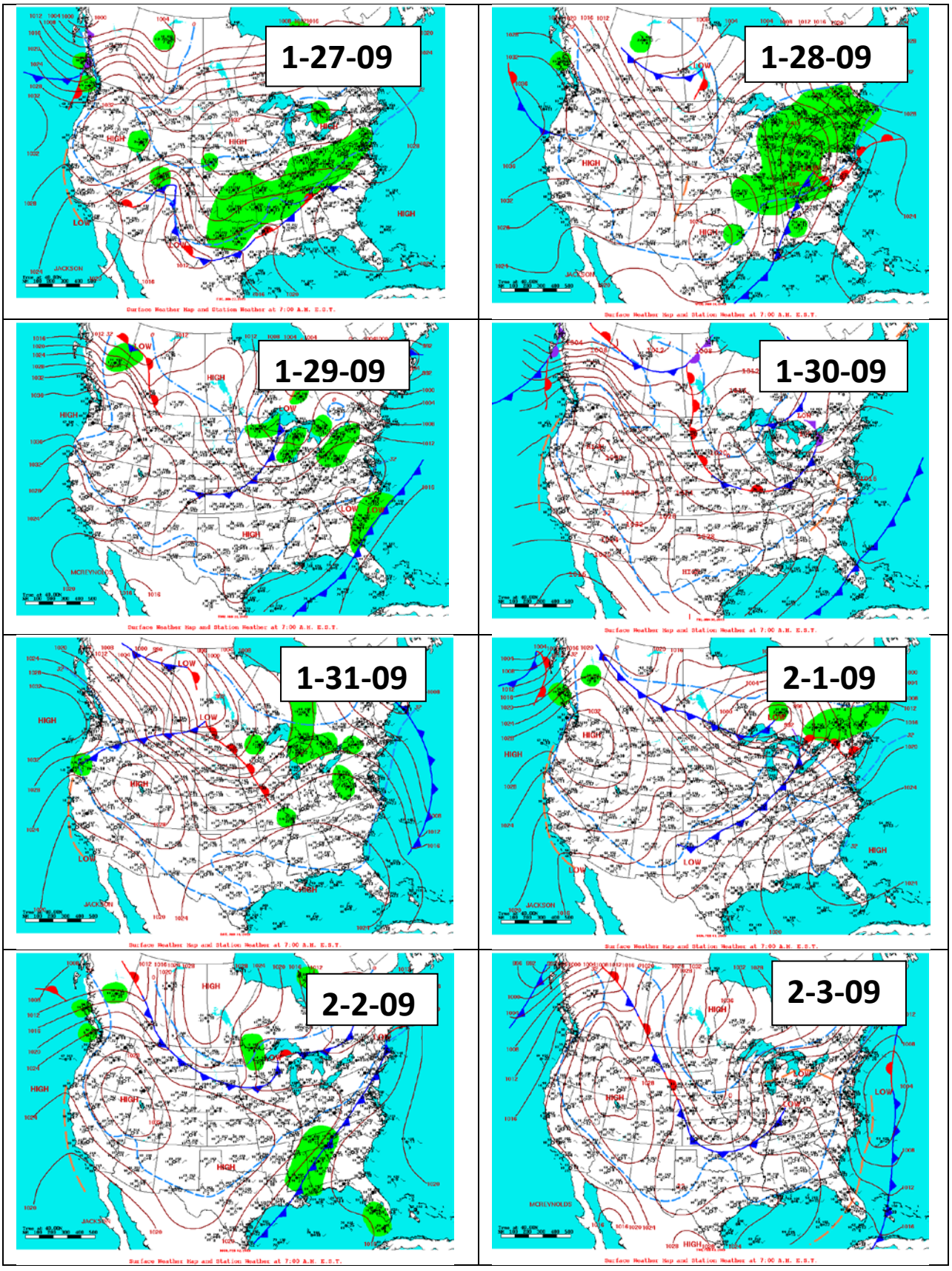
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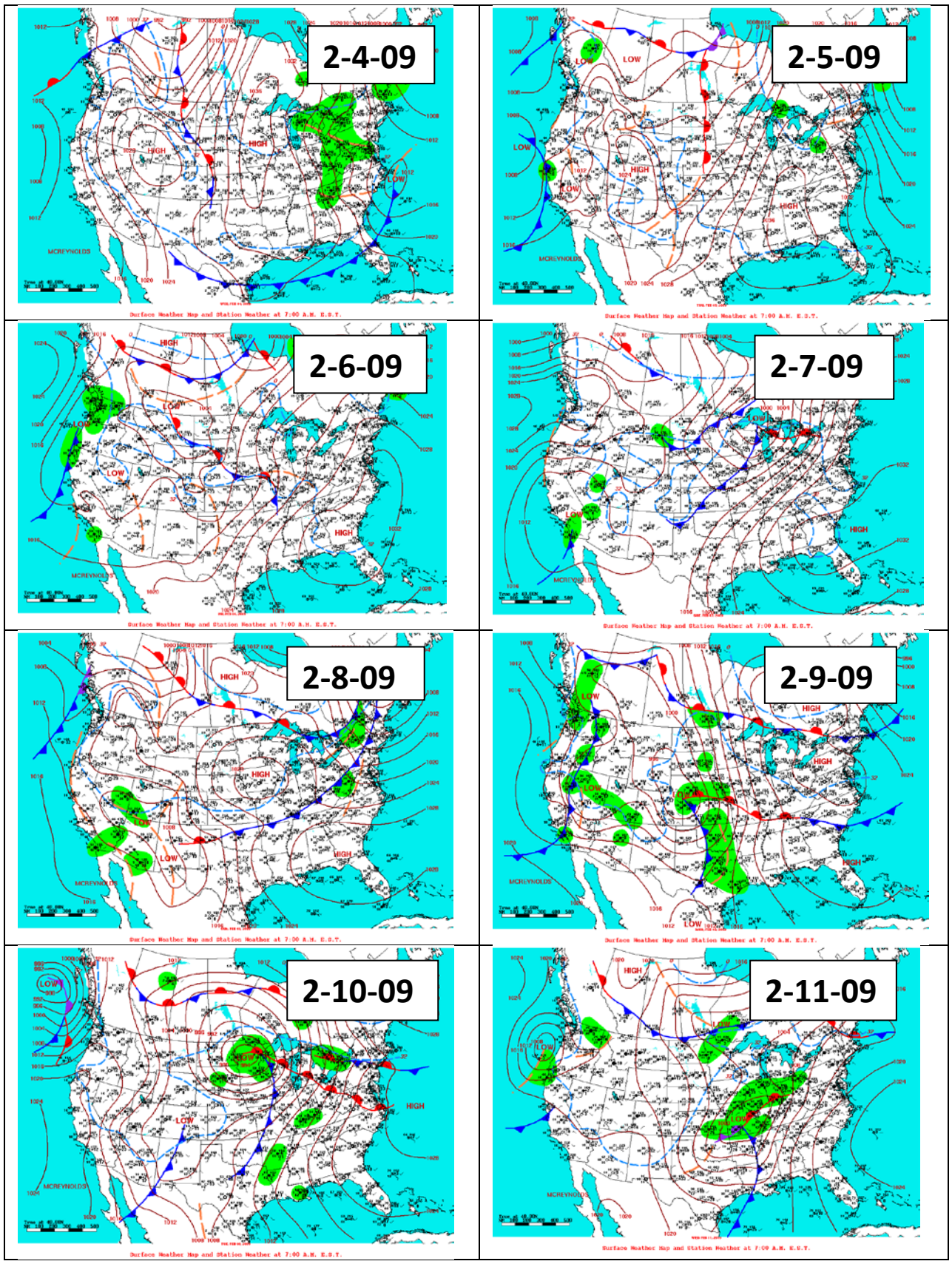
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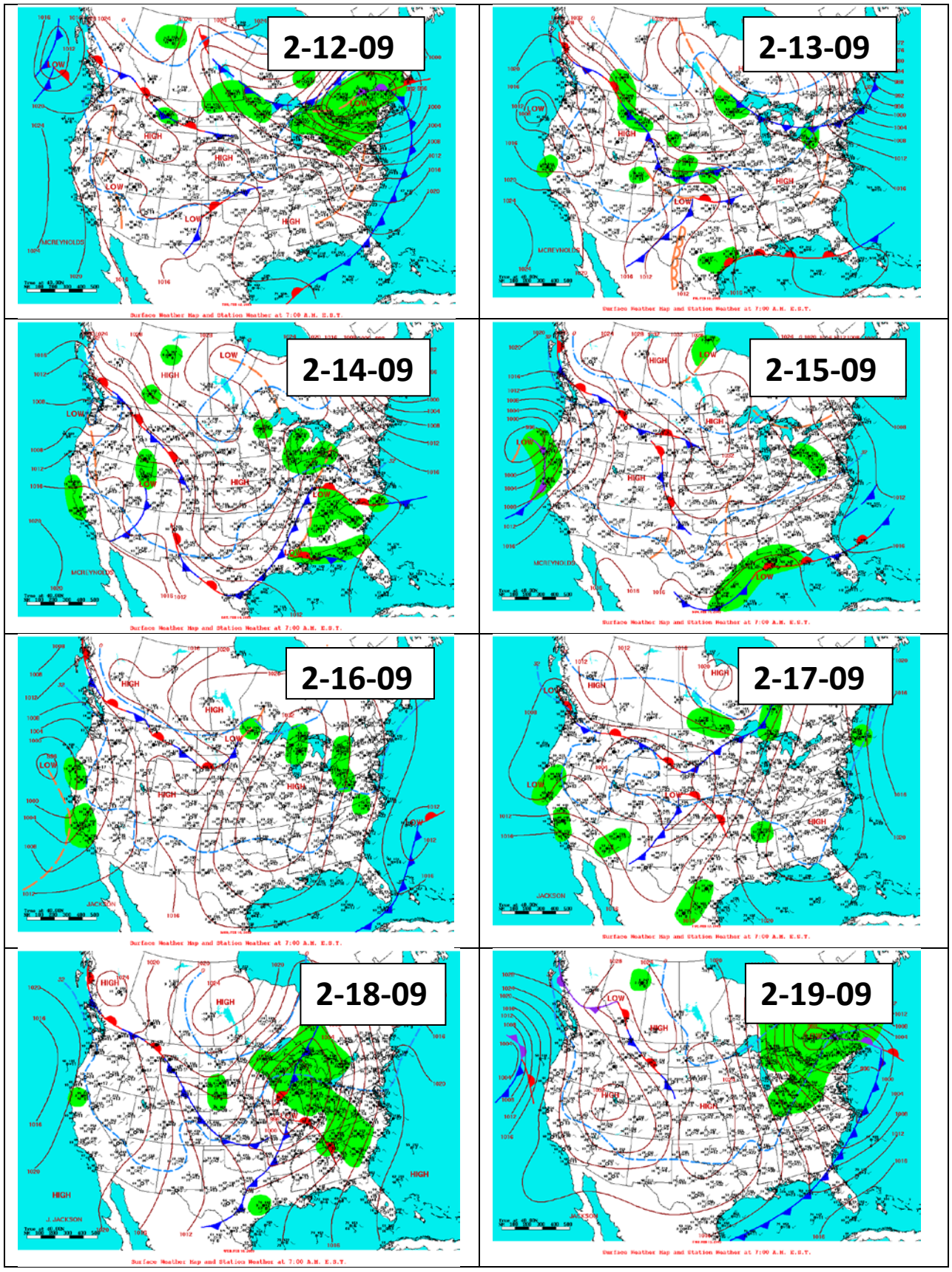
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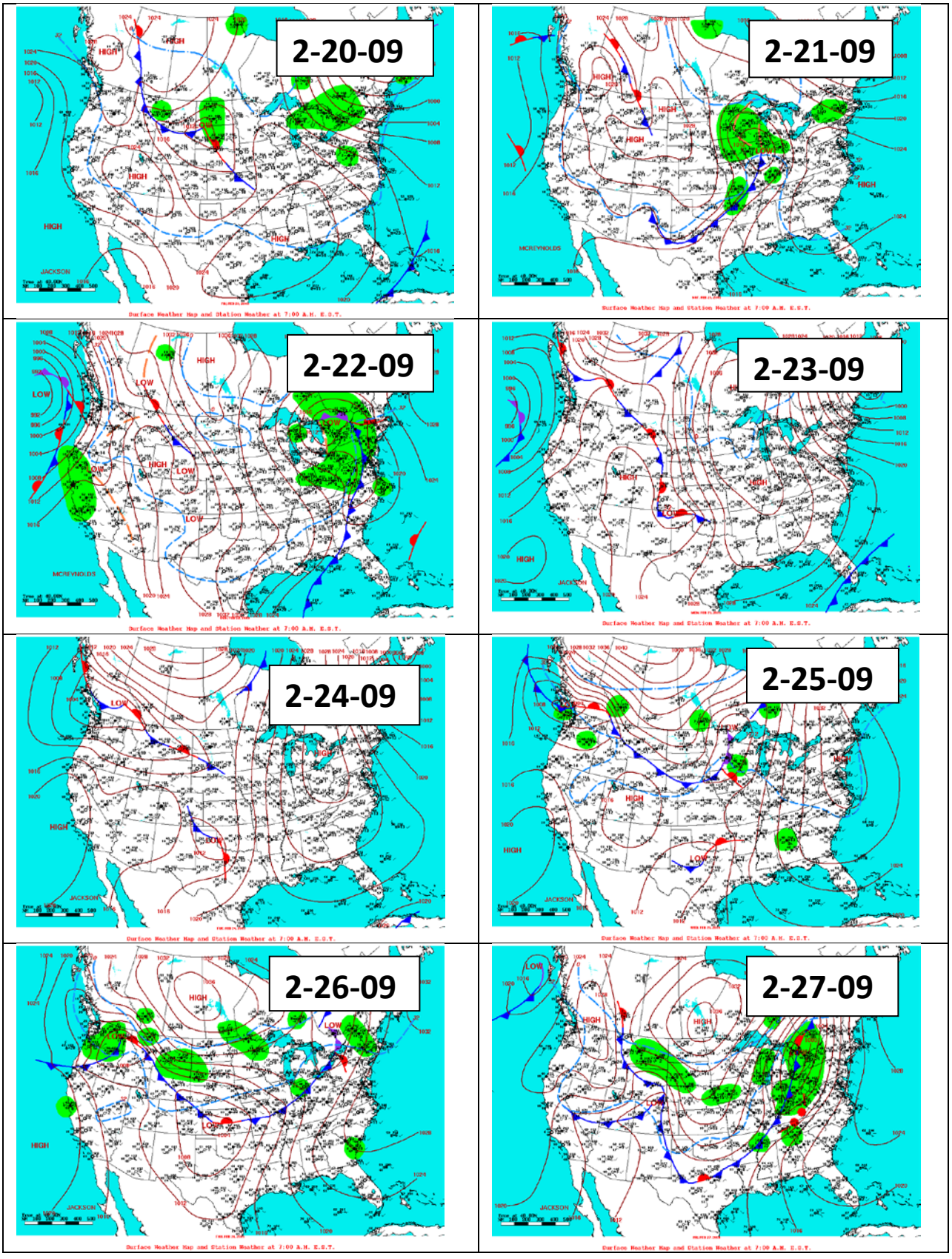
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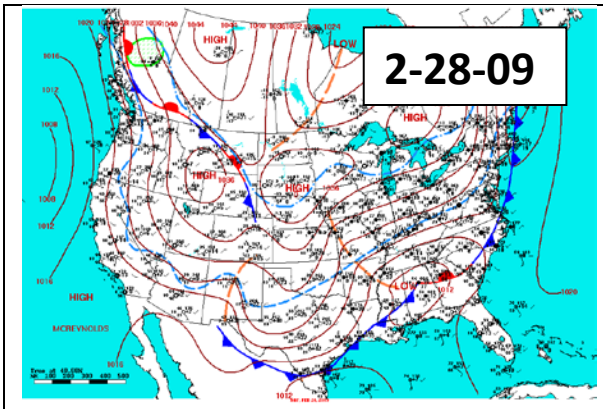
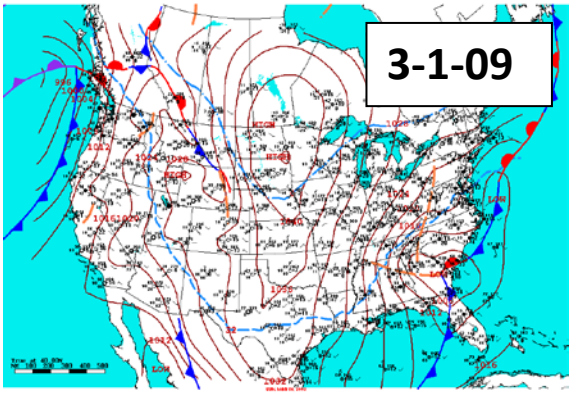
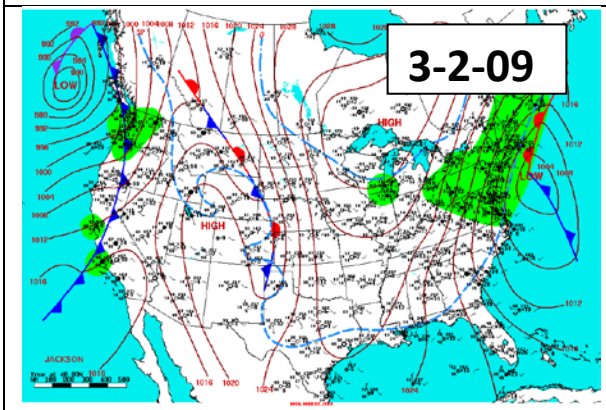
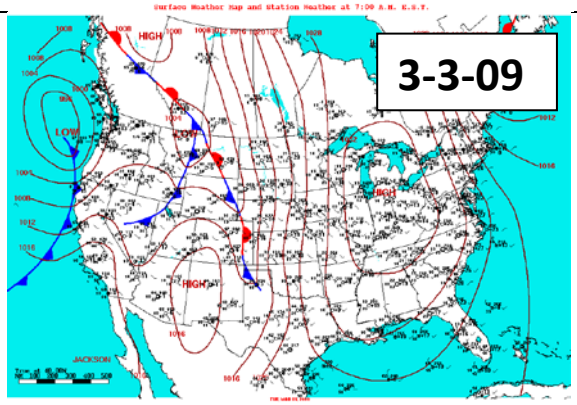
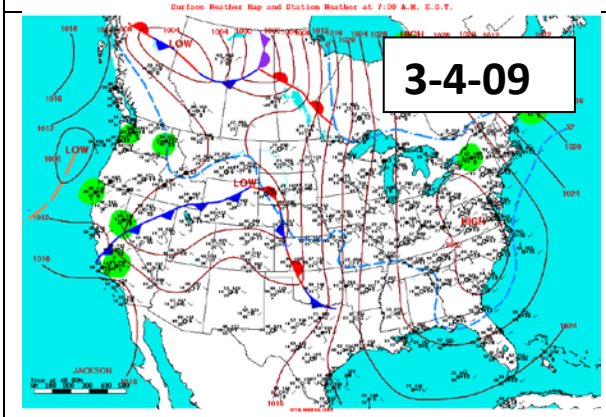
Period 8

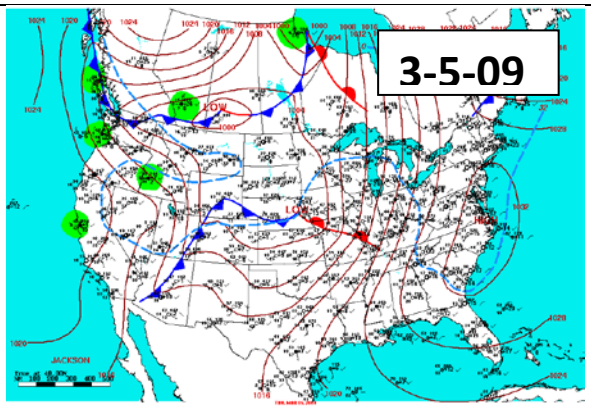


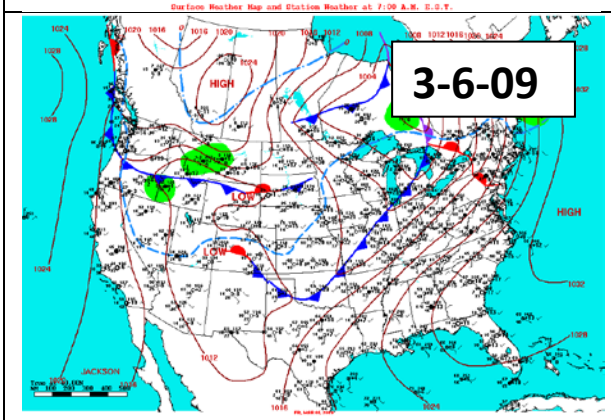


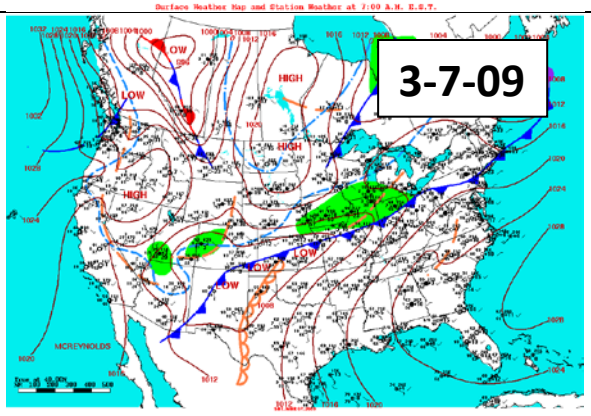


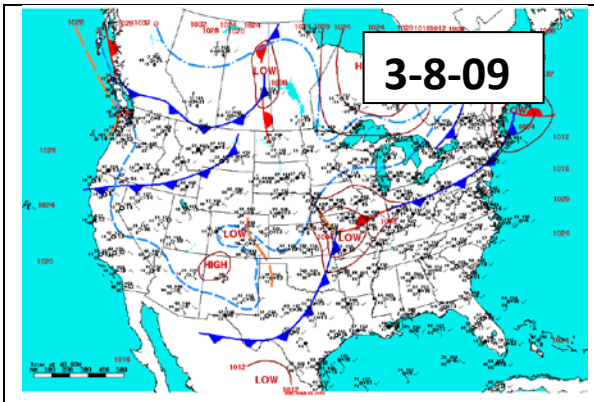








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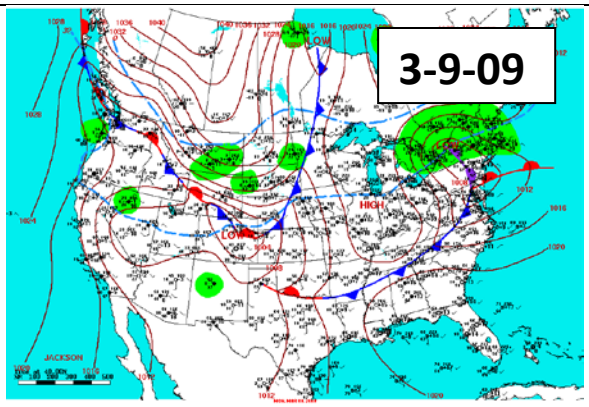
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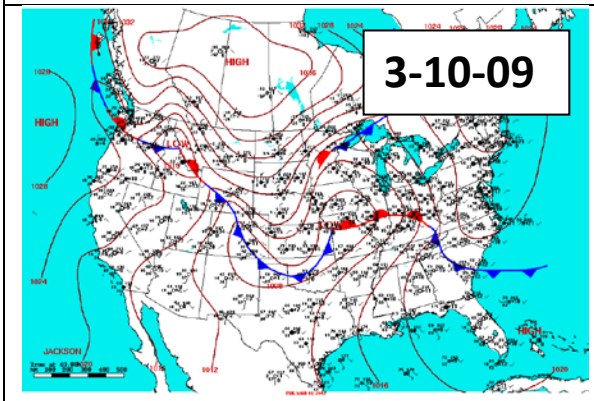
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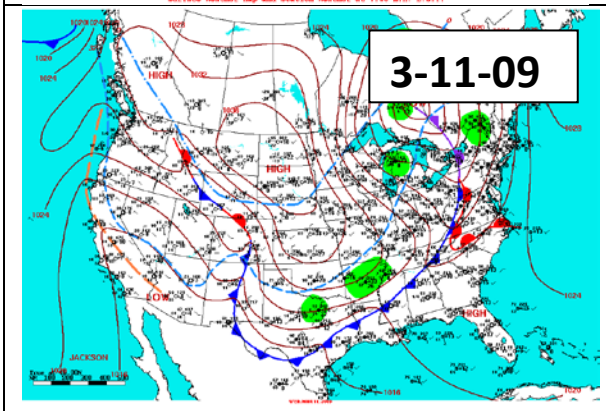
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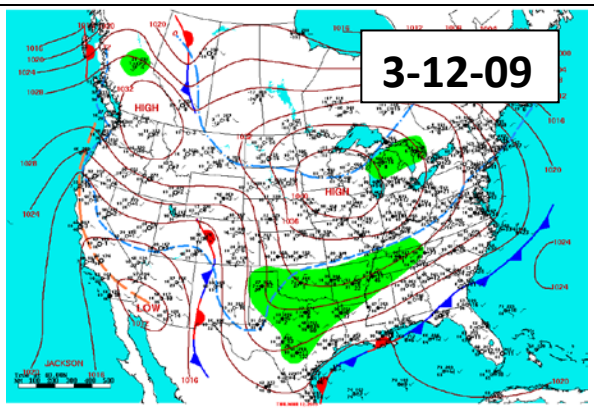
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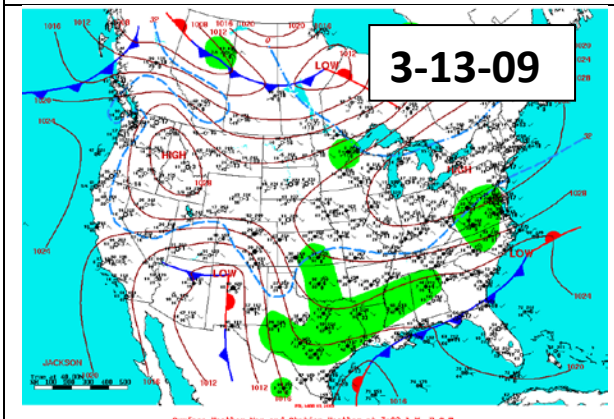
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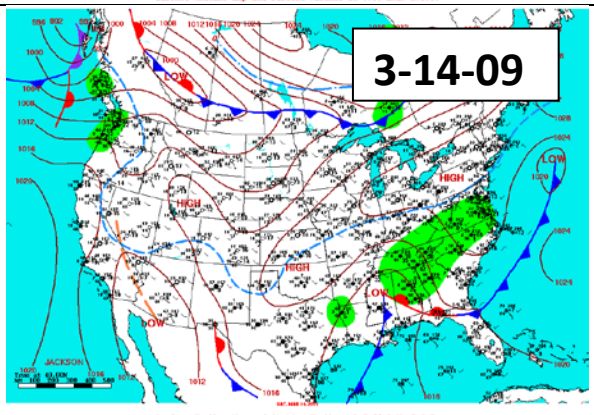
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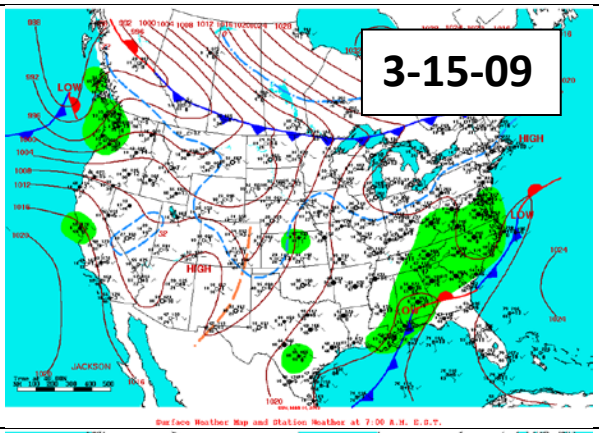
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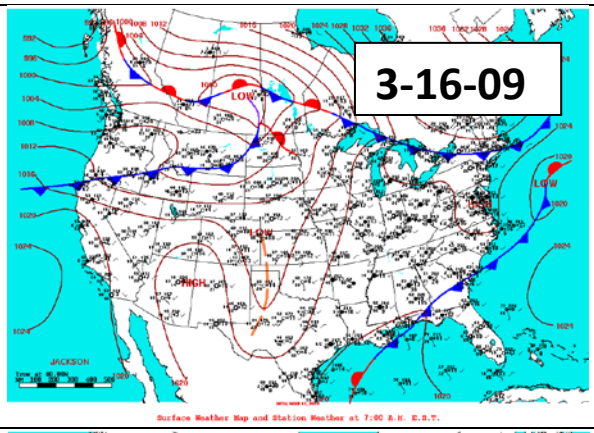
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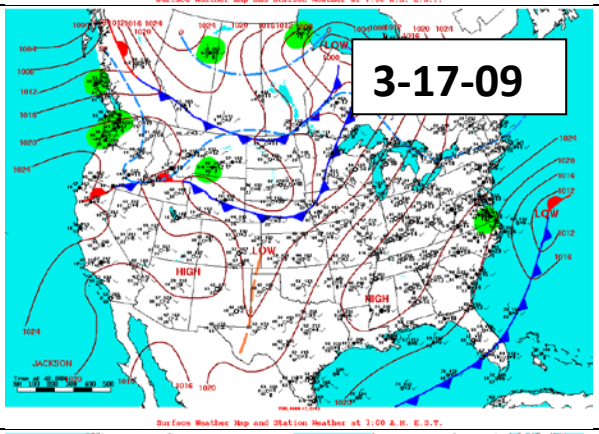
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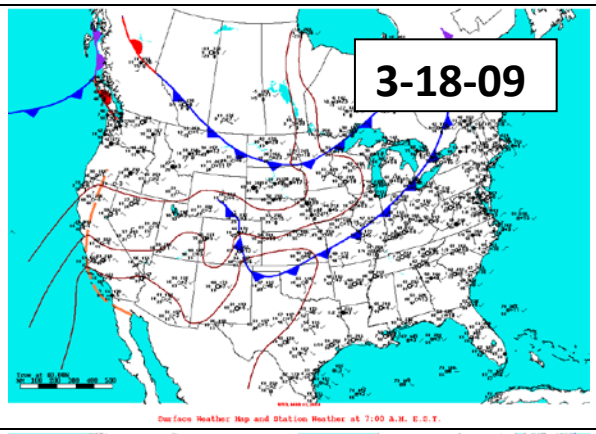
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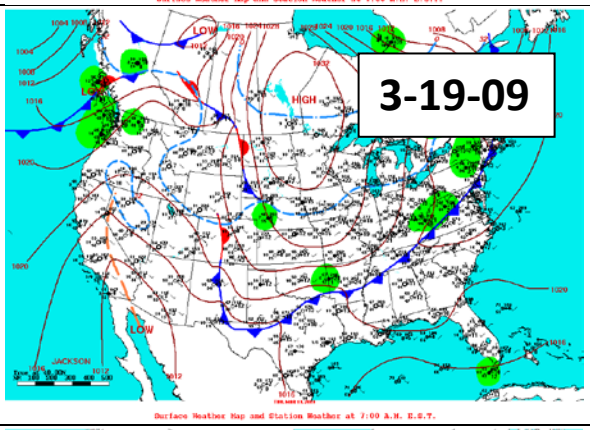
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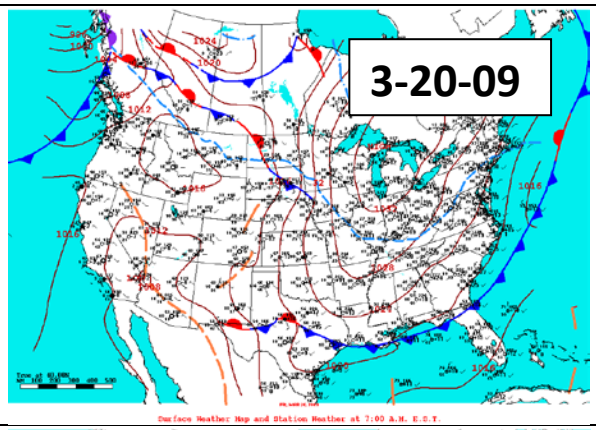
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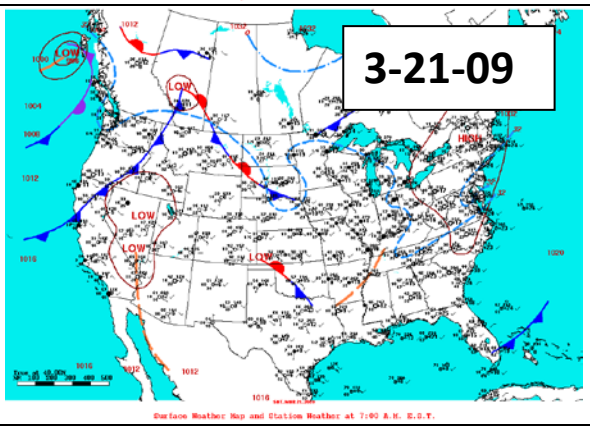
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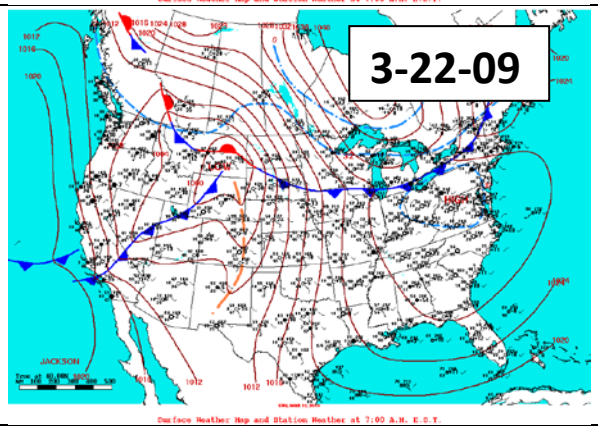
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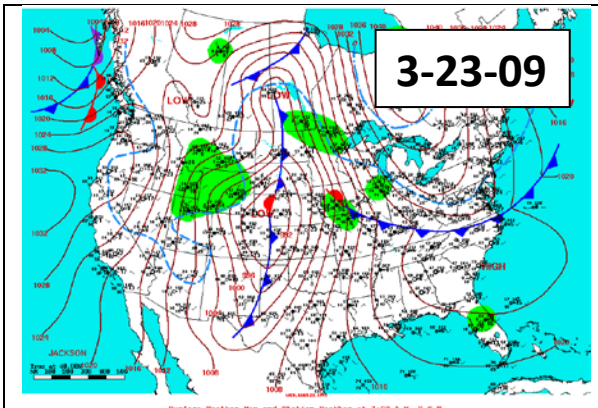
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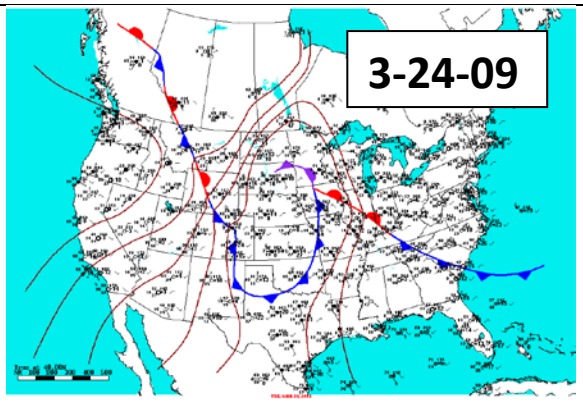
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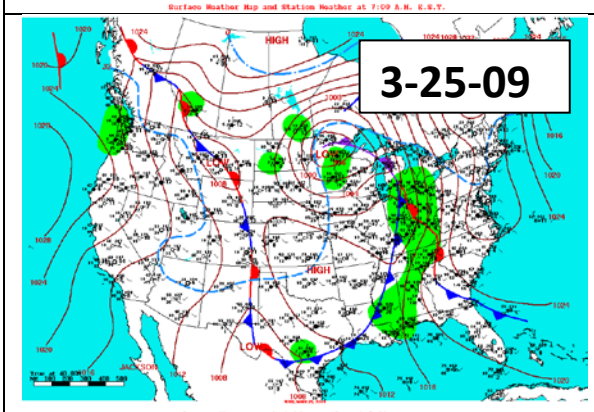
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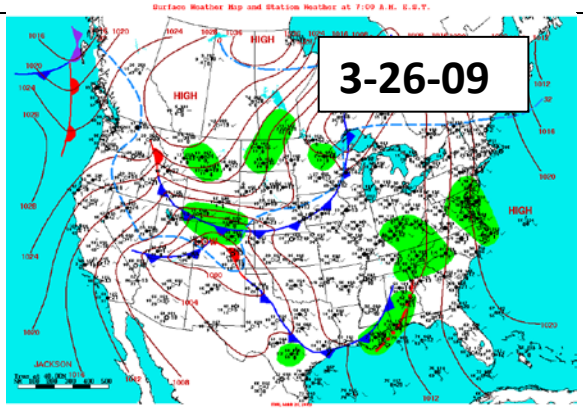
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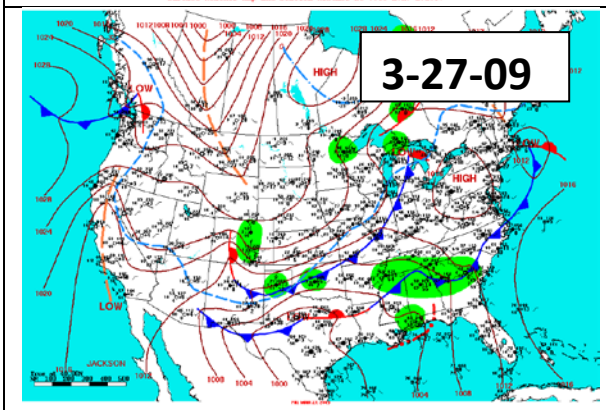
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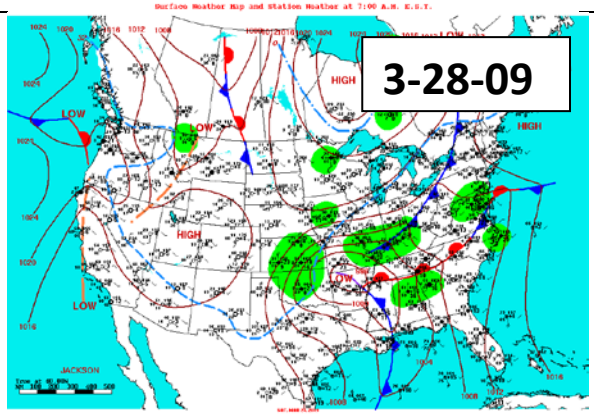
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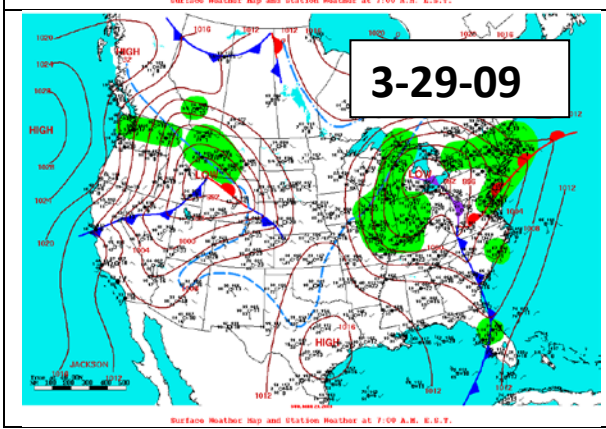
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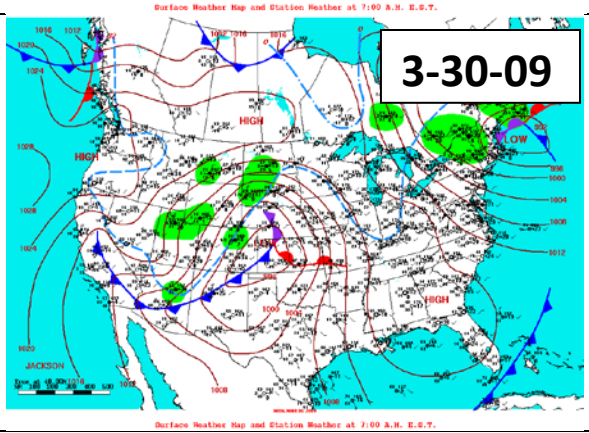
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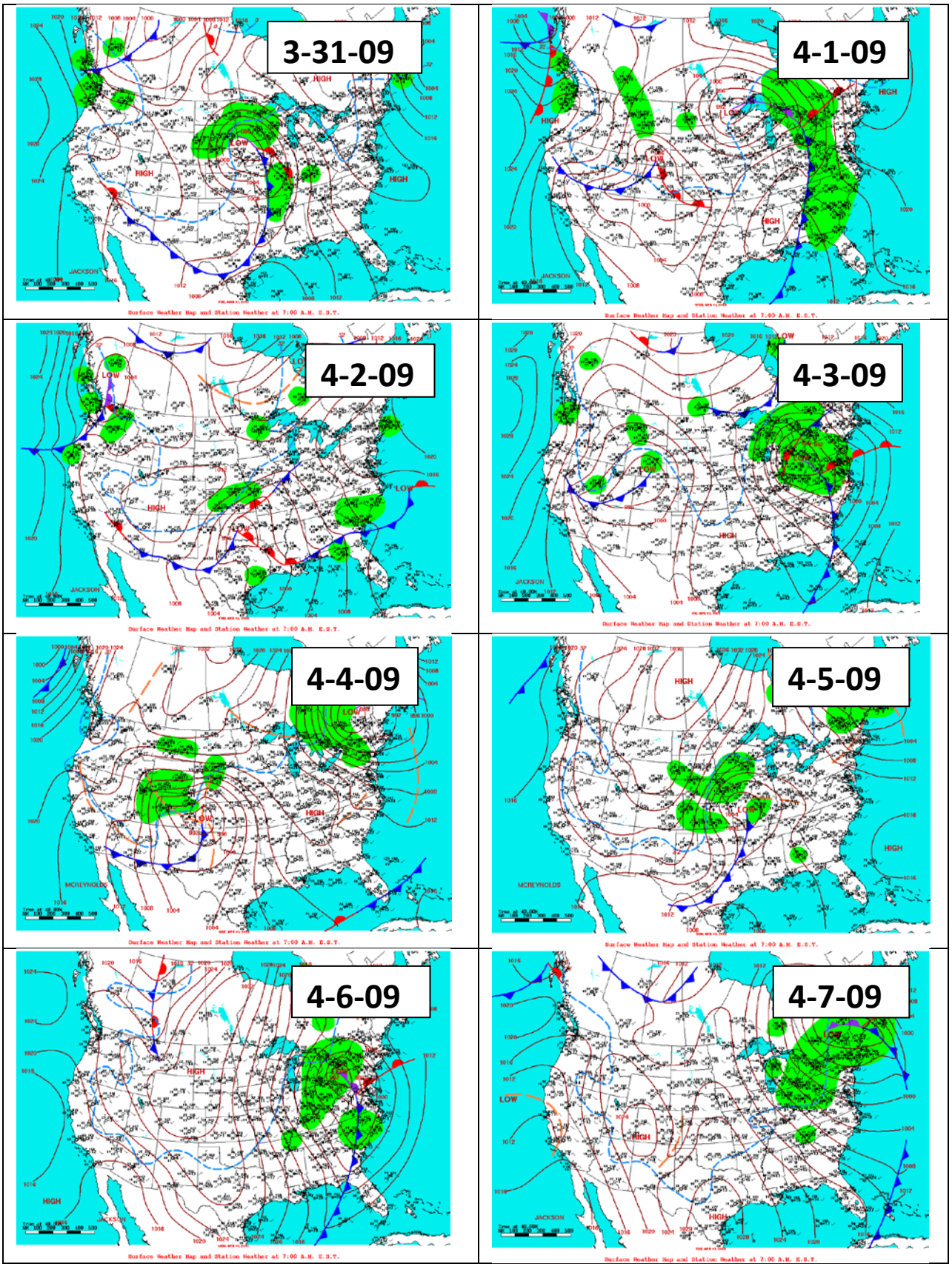
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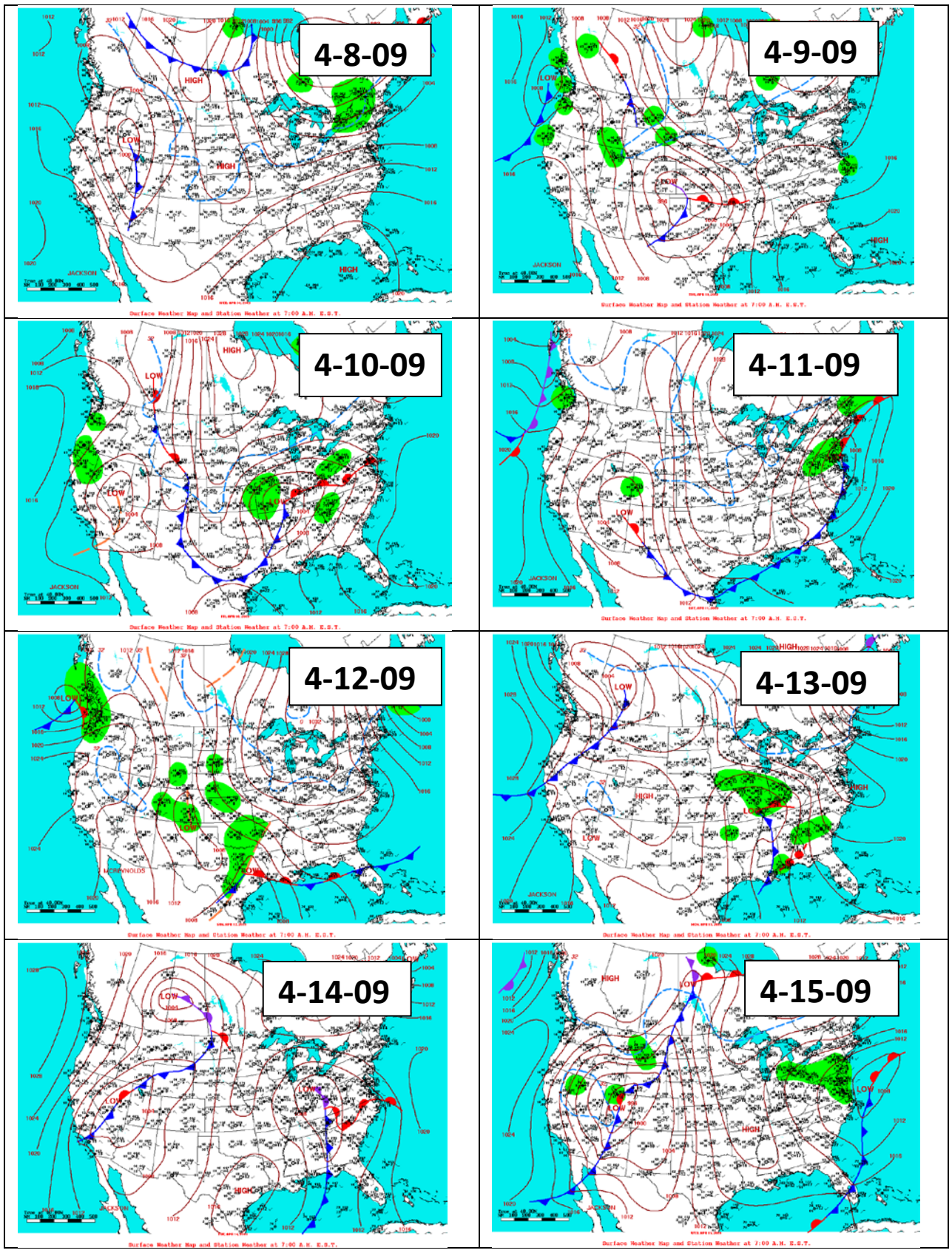
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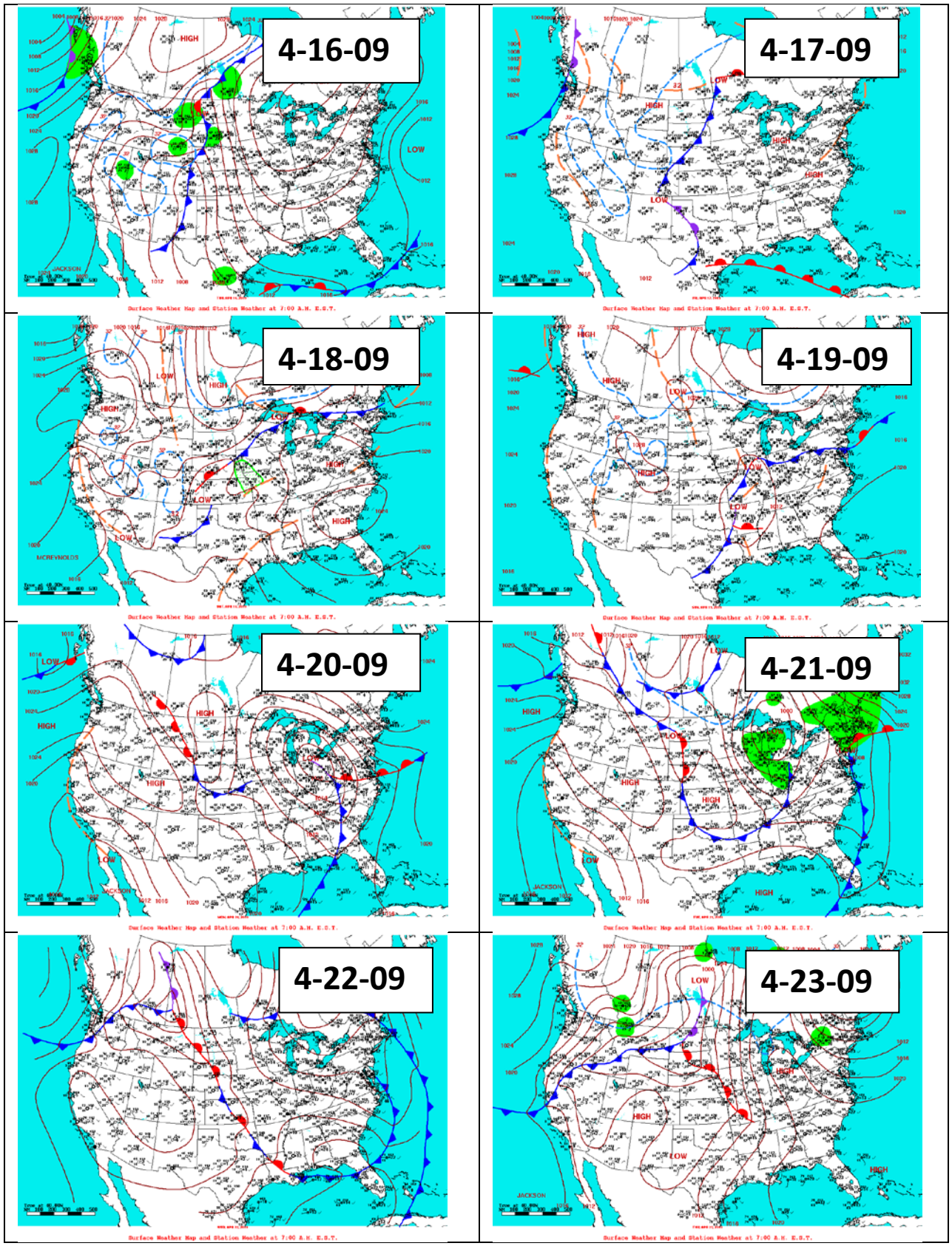
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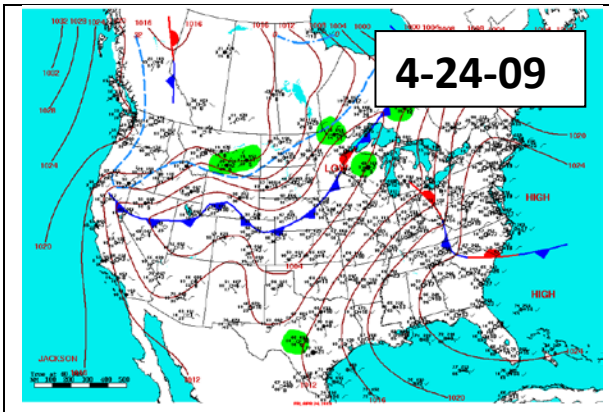
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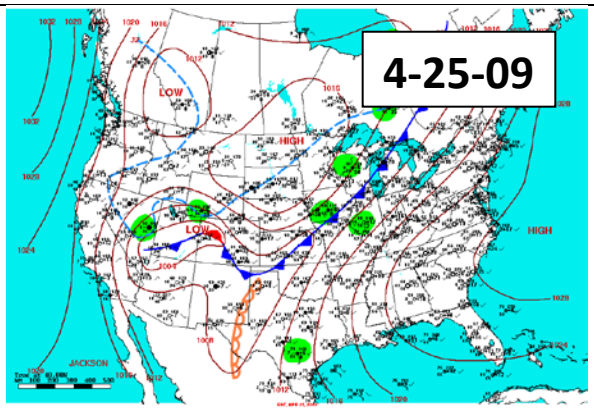
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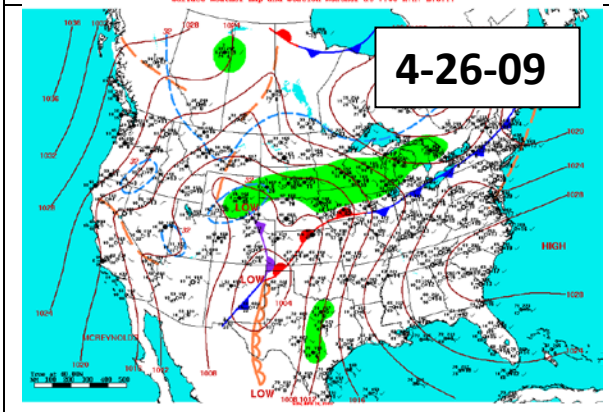
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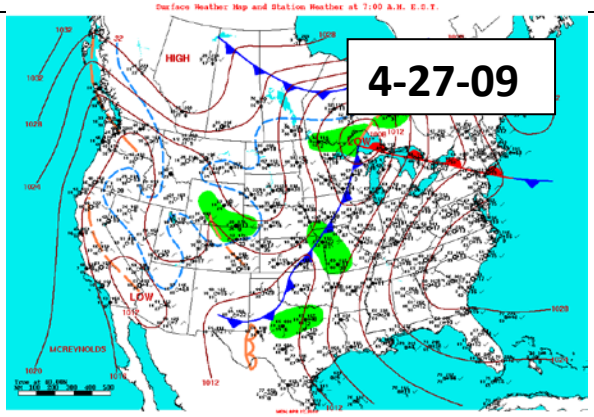
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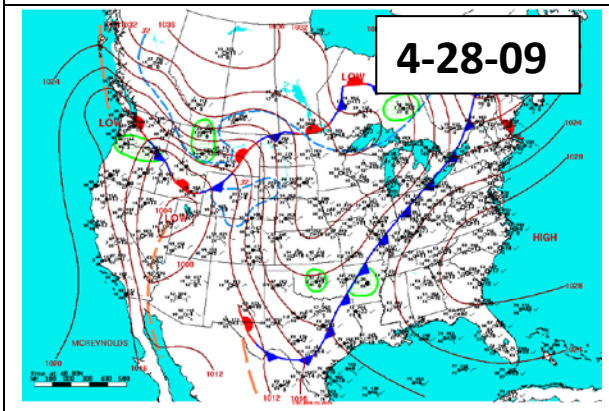
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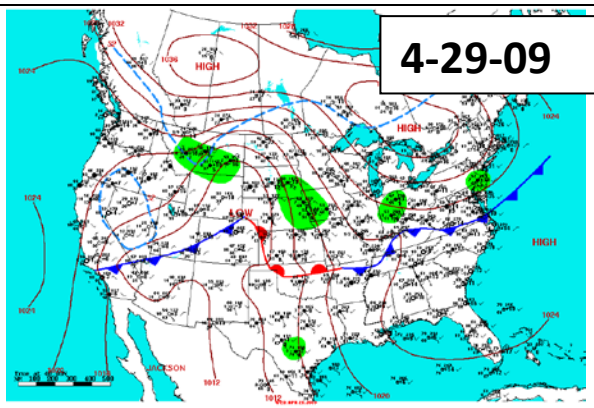
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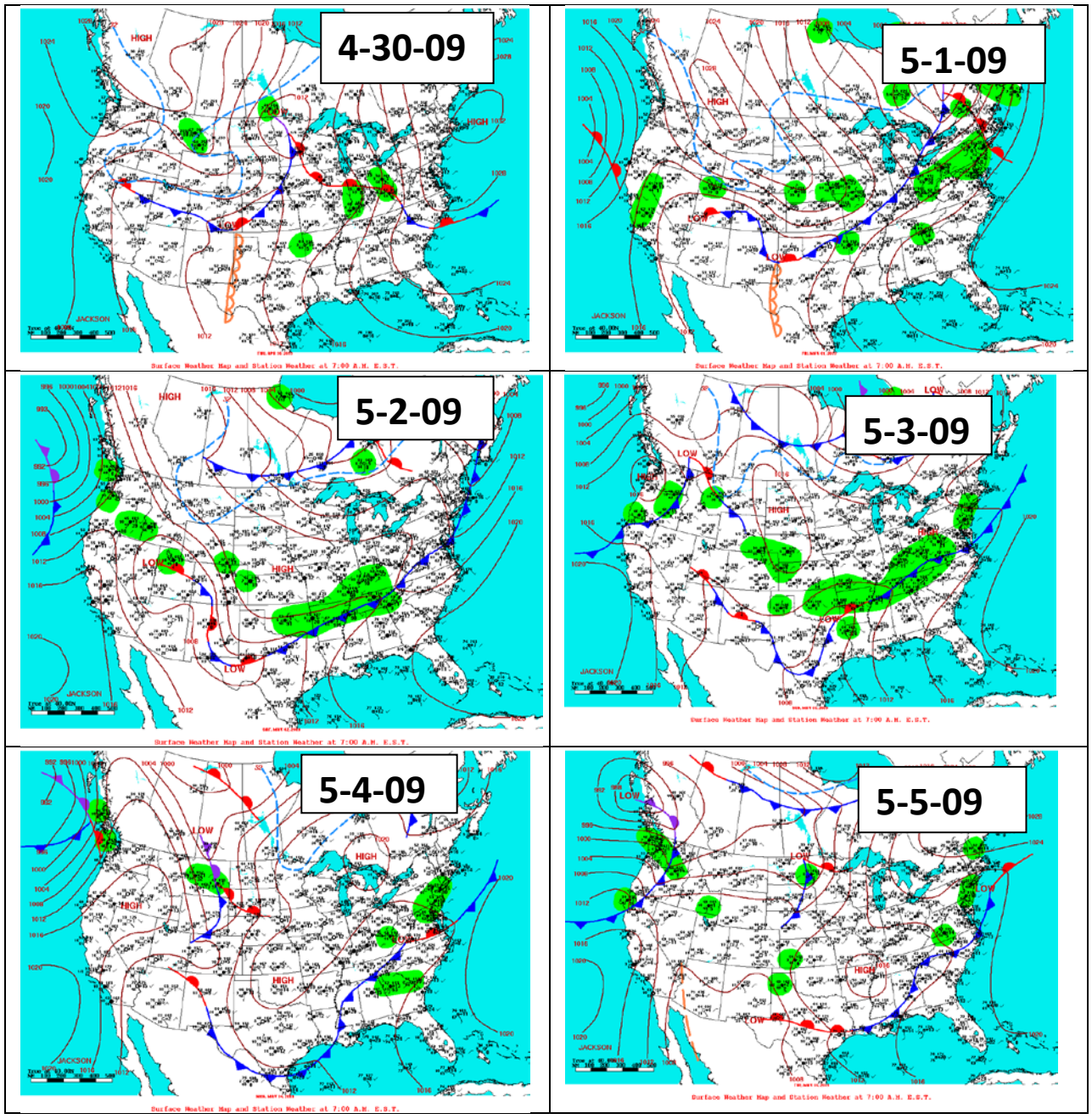
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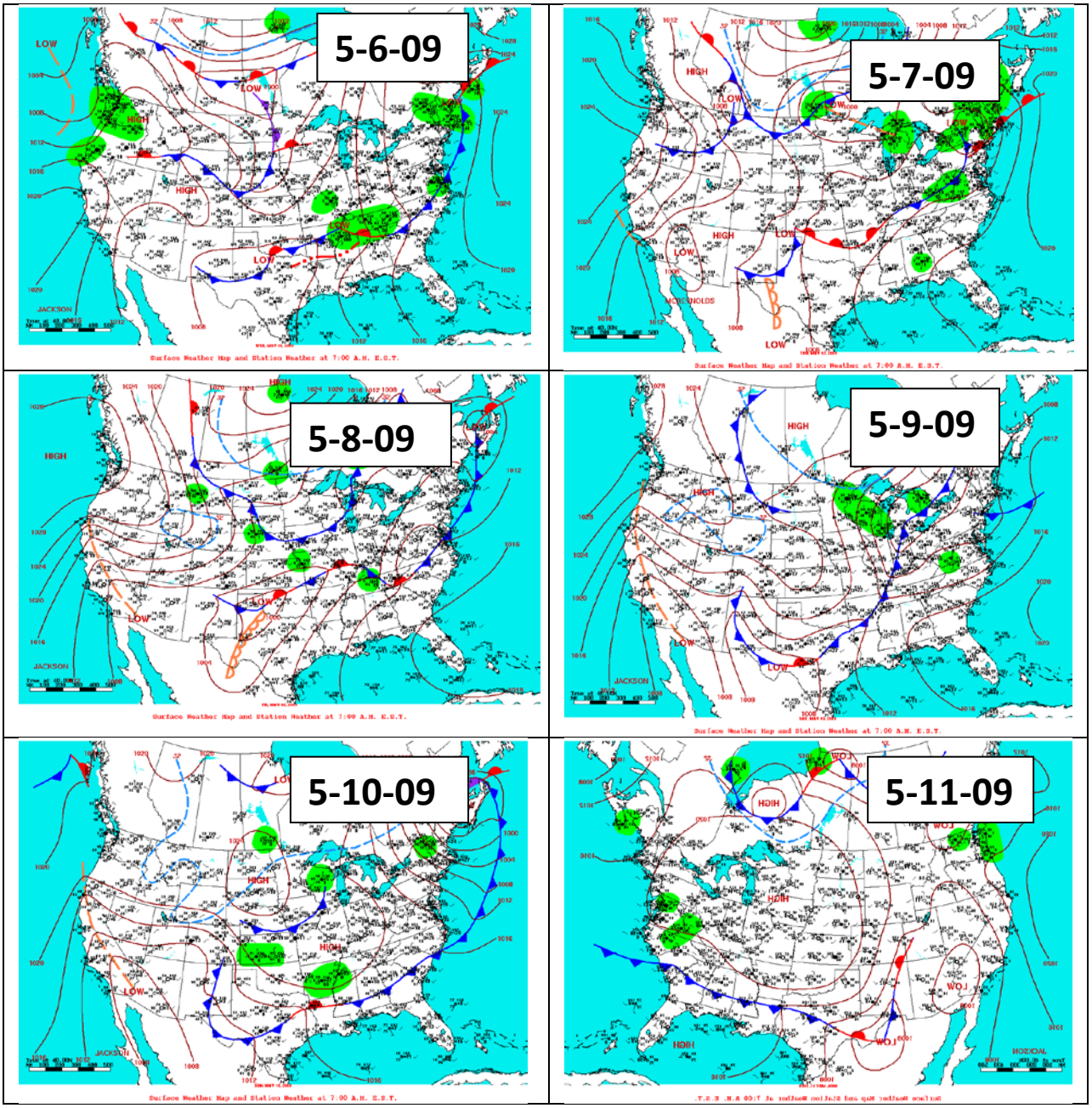
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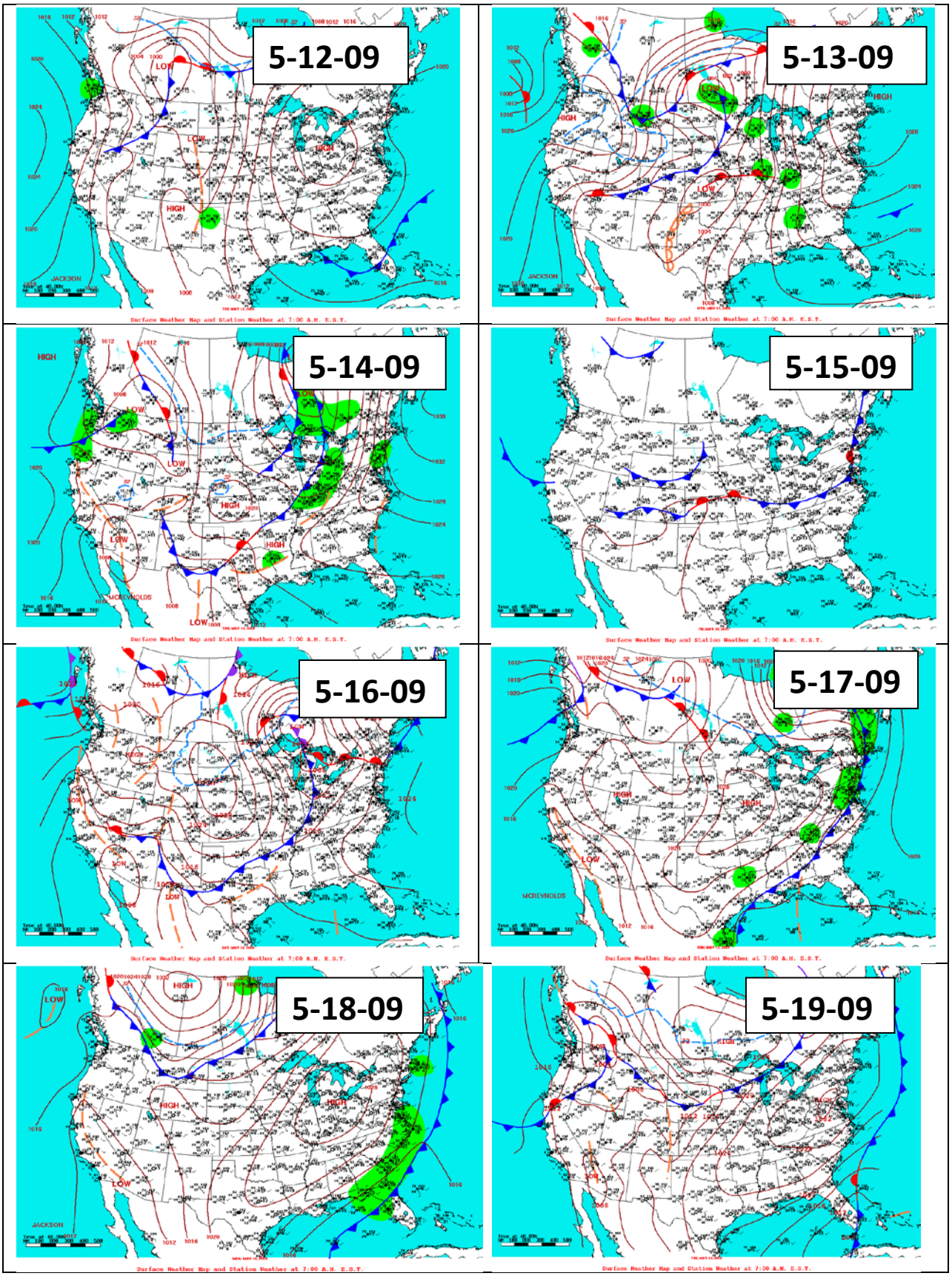
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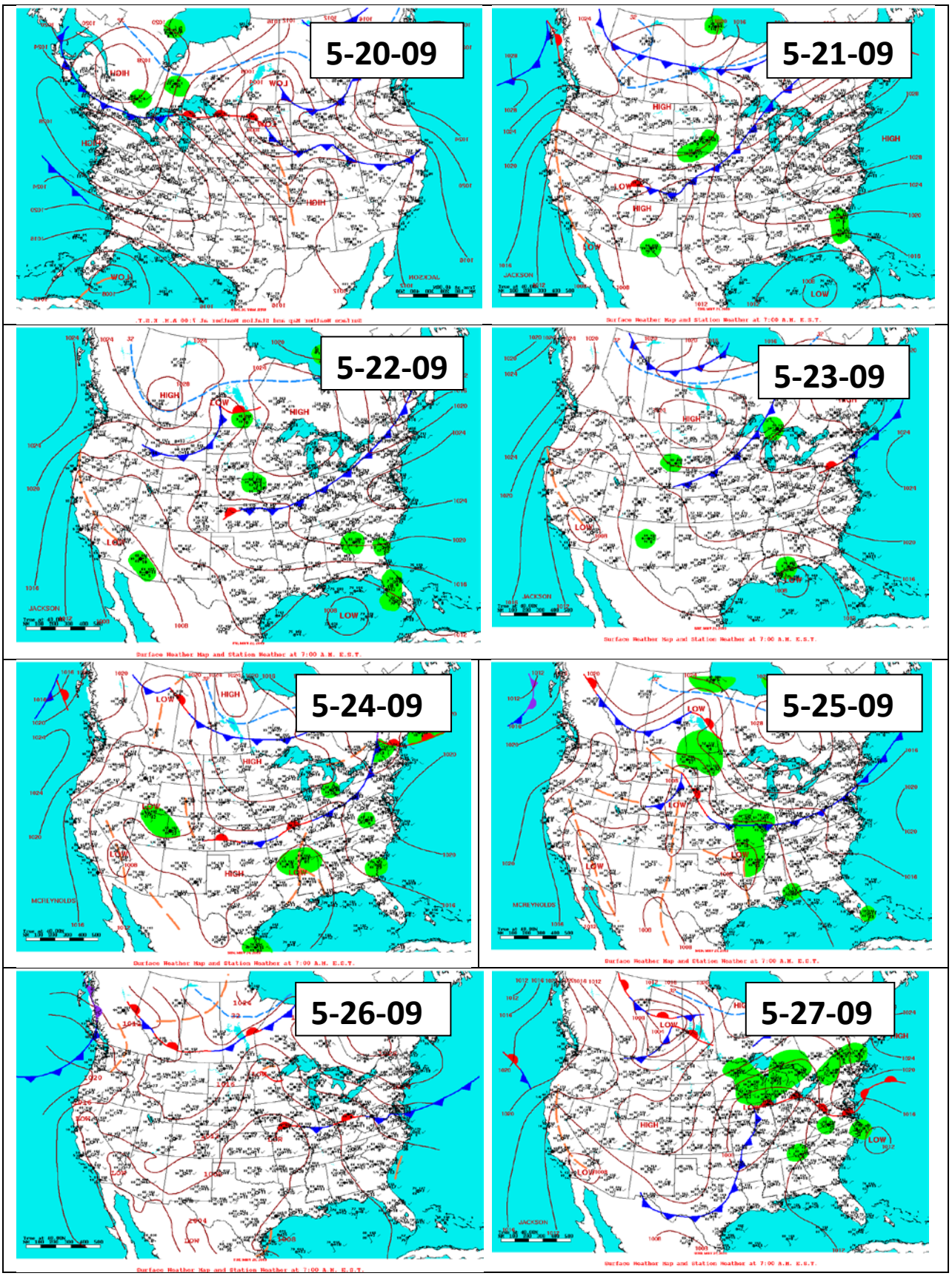
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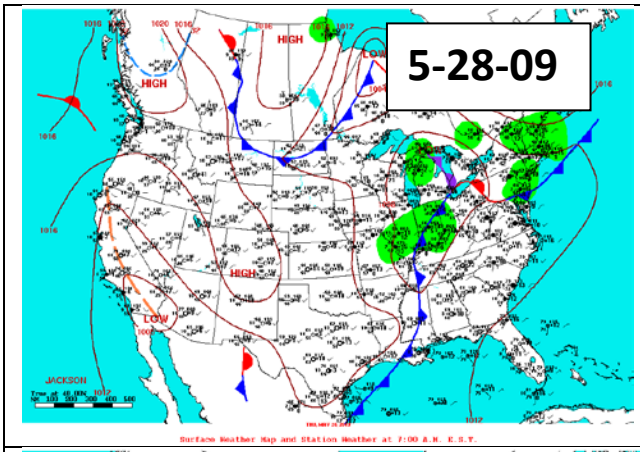
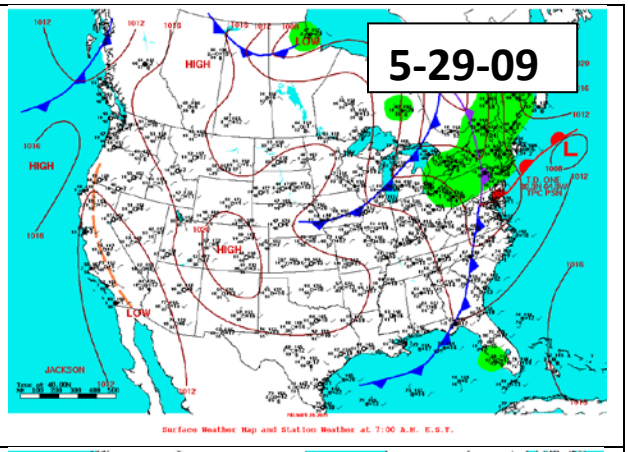
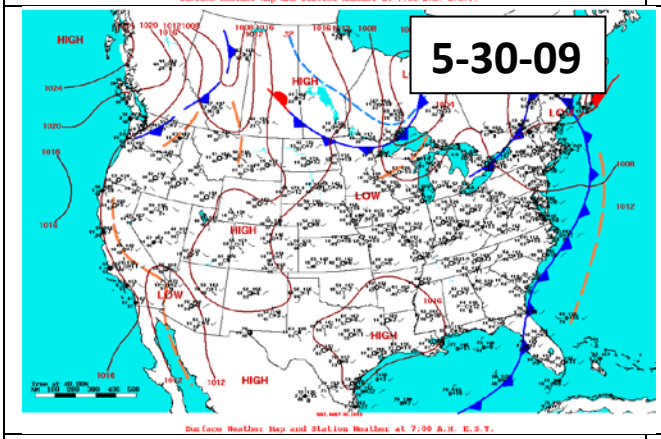
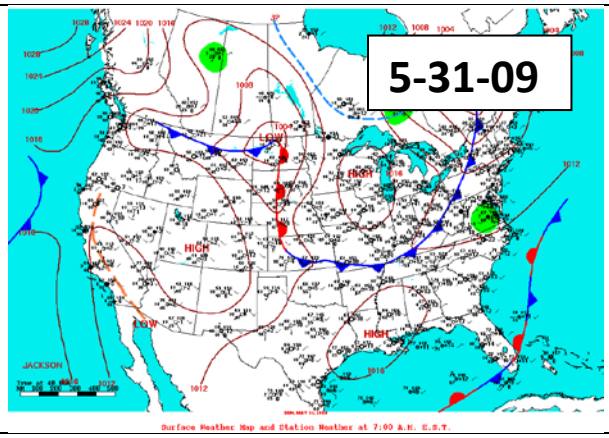
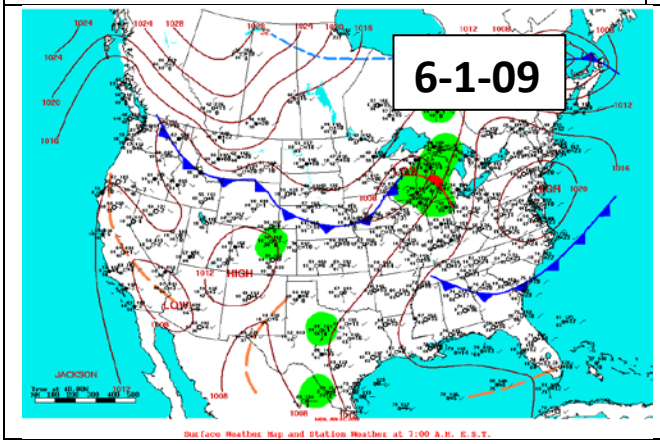


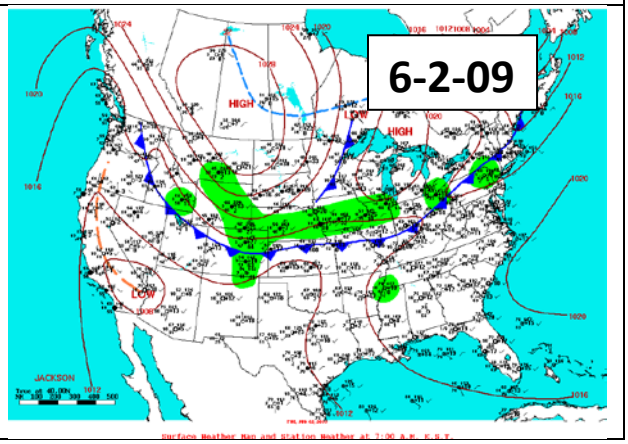


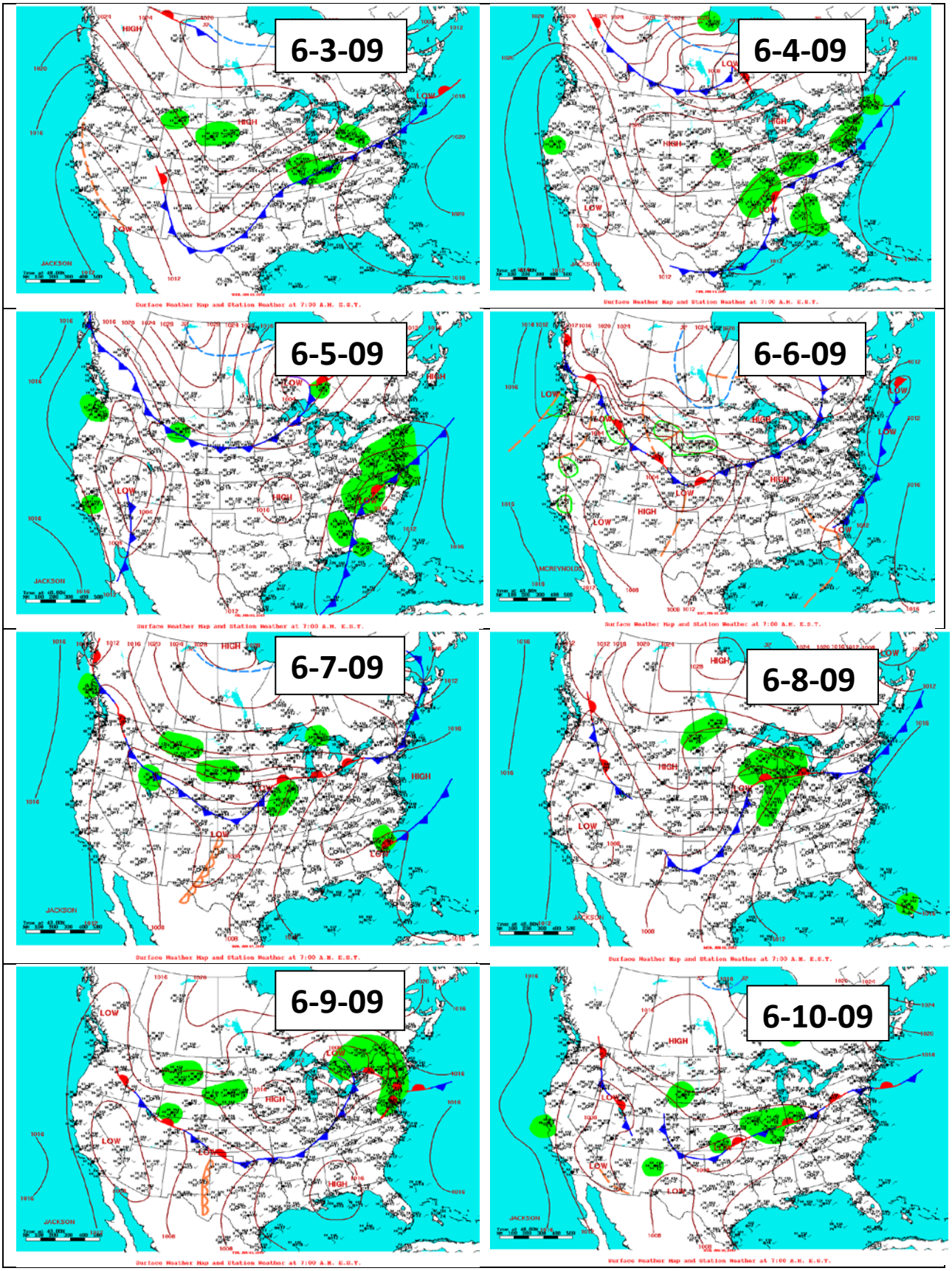




Period 9



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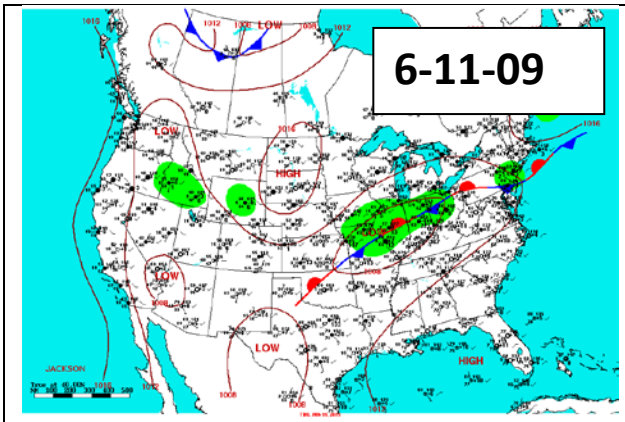
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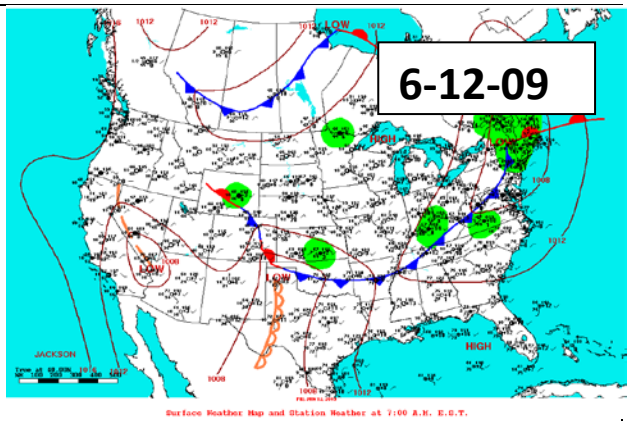
JACKSON
Surface Weather Map and Station Weather at 7:00 A.M. E.S.T.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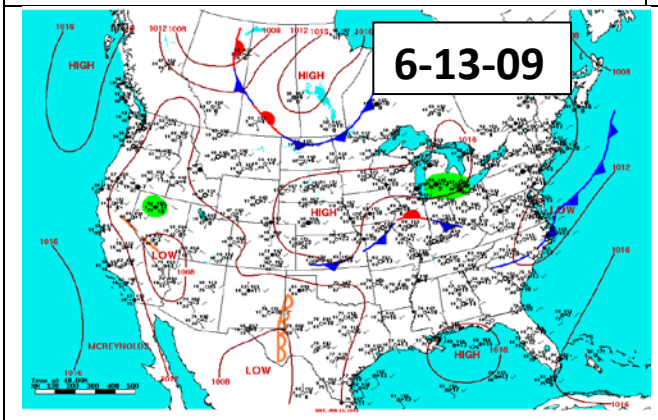
JACKSON
Surface Weather Map and Station Weather at 7:00 A.M. E.S.T.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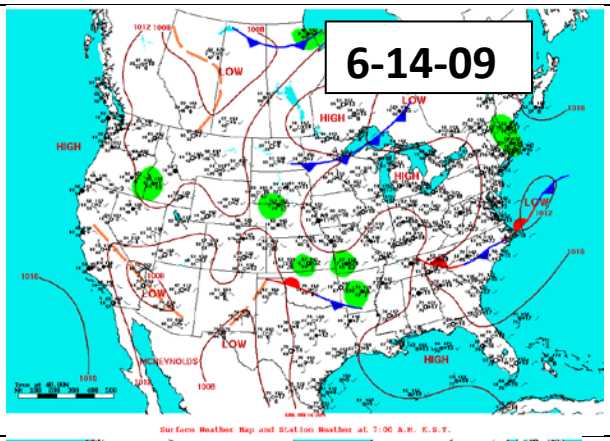
MCREYNOLDS
Surface Weather Map and Station Weather at 7:00 A.M. E.S.T.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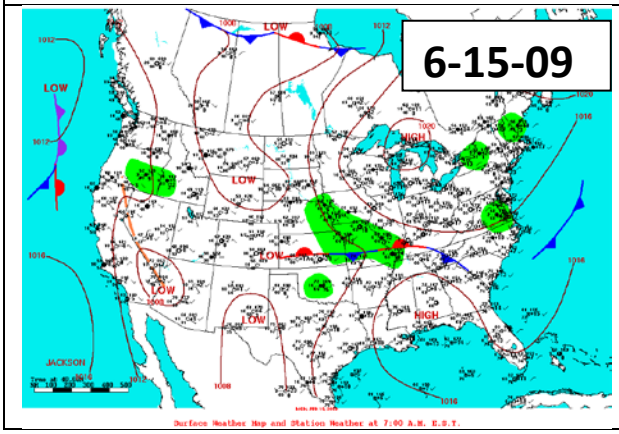
MCREYNOLDS
Surface Weather Map and Station Weather at 7:00 A.M. E.S.T.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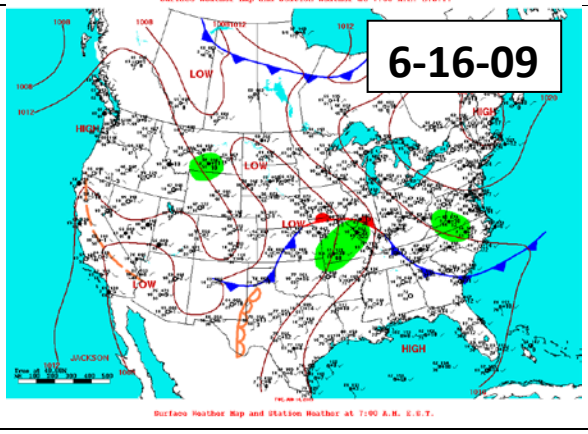
JACKSON
Surface Weather Map and Station Weather at 7:00 A.M. E.S.T.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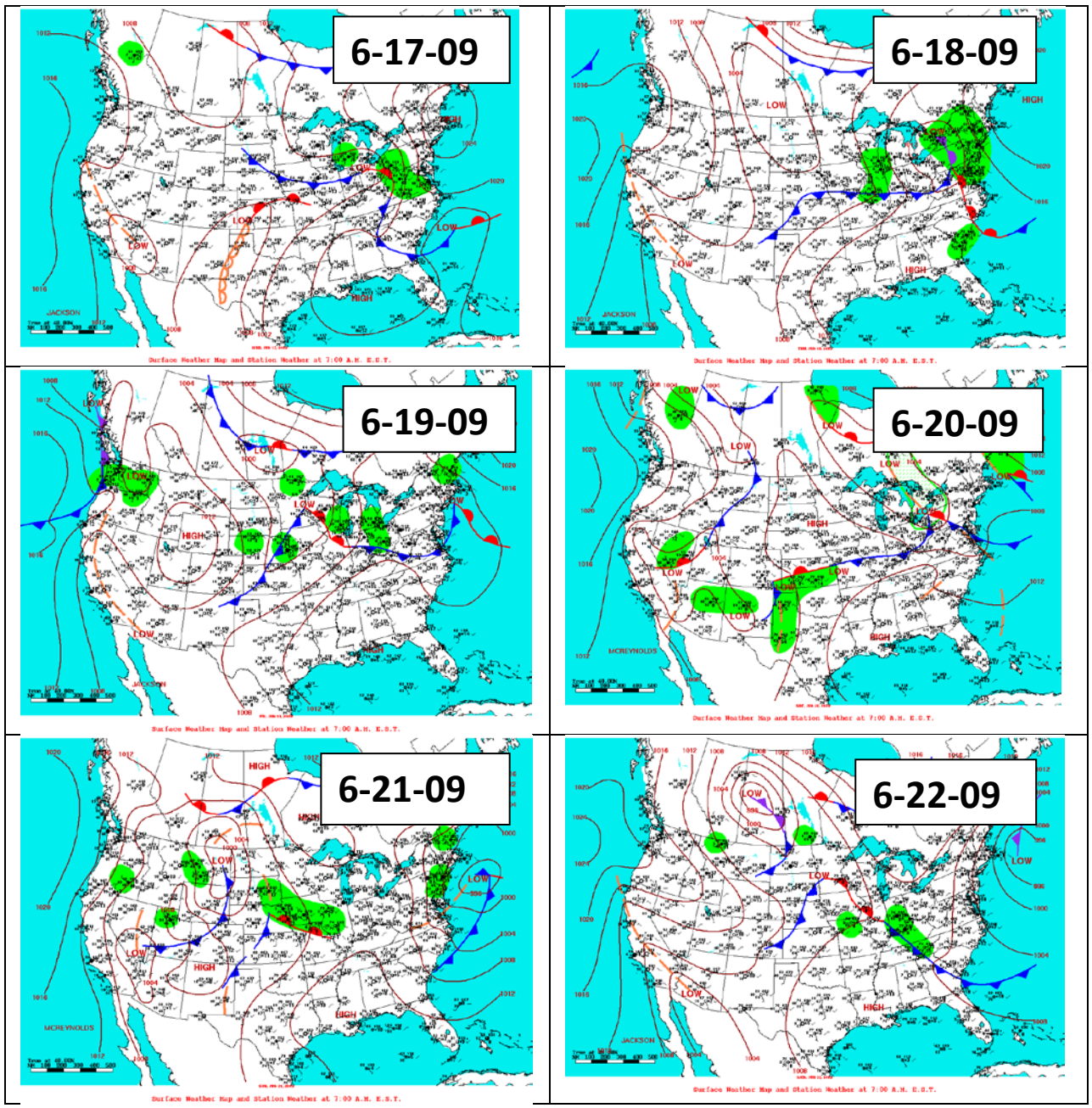
Surface Weather Map and Station Weather at 7:00 A.M. E.S.T.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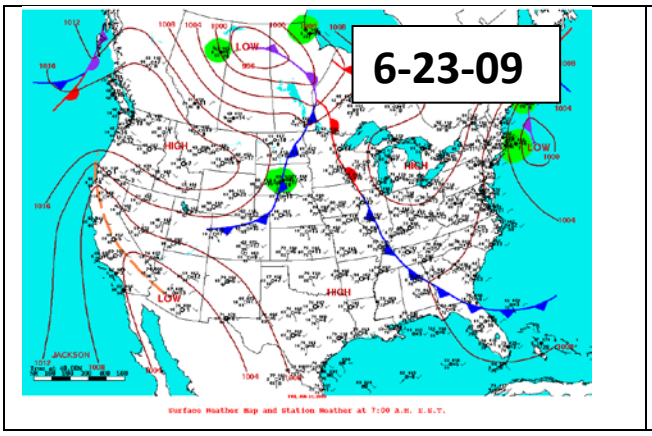
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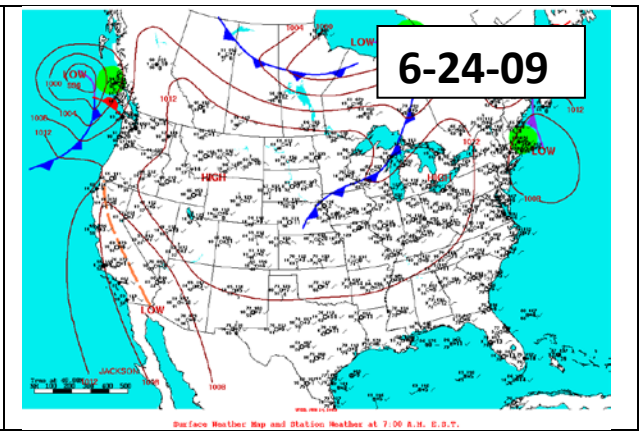
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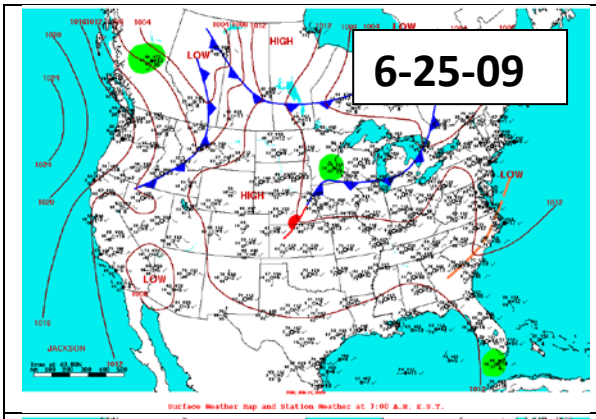
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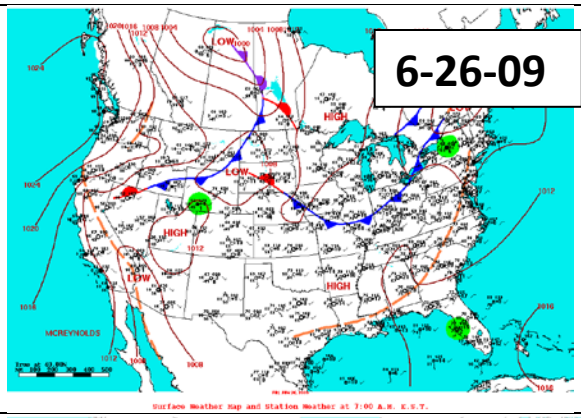
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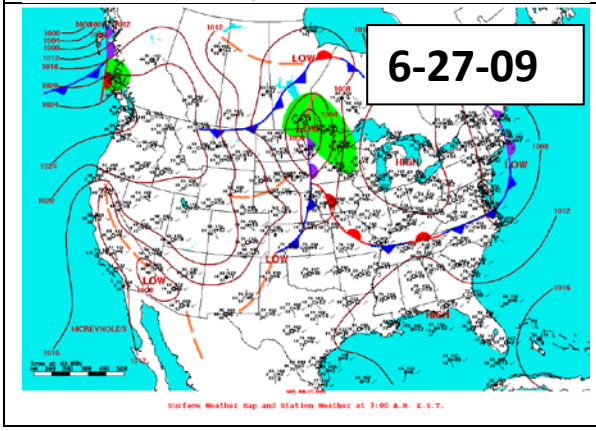
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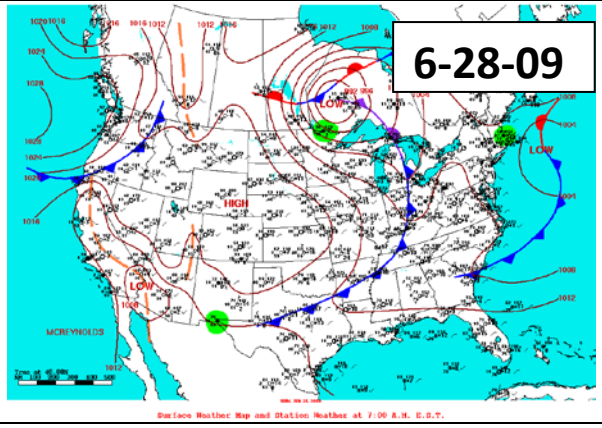
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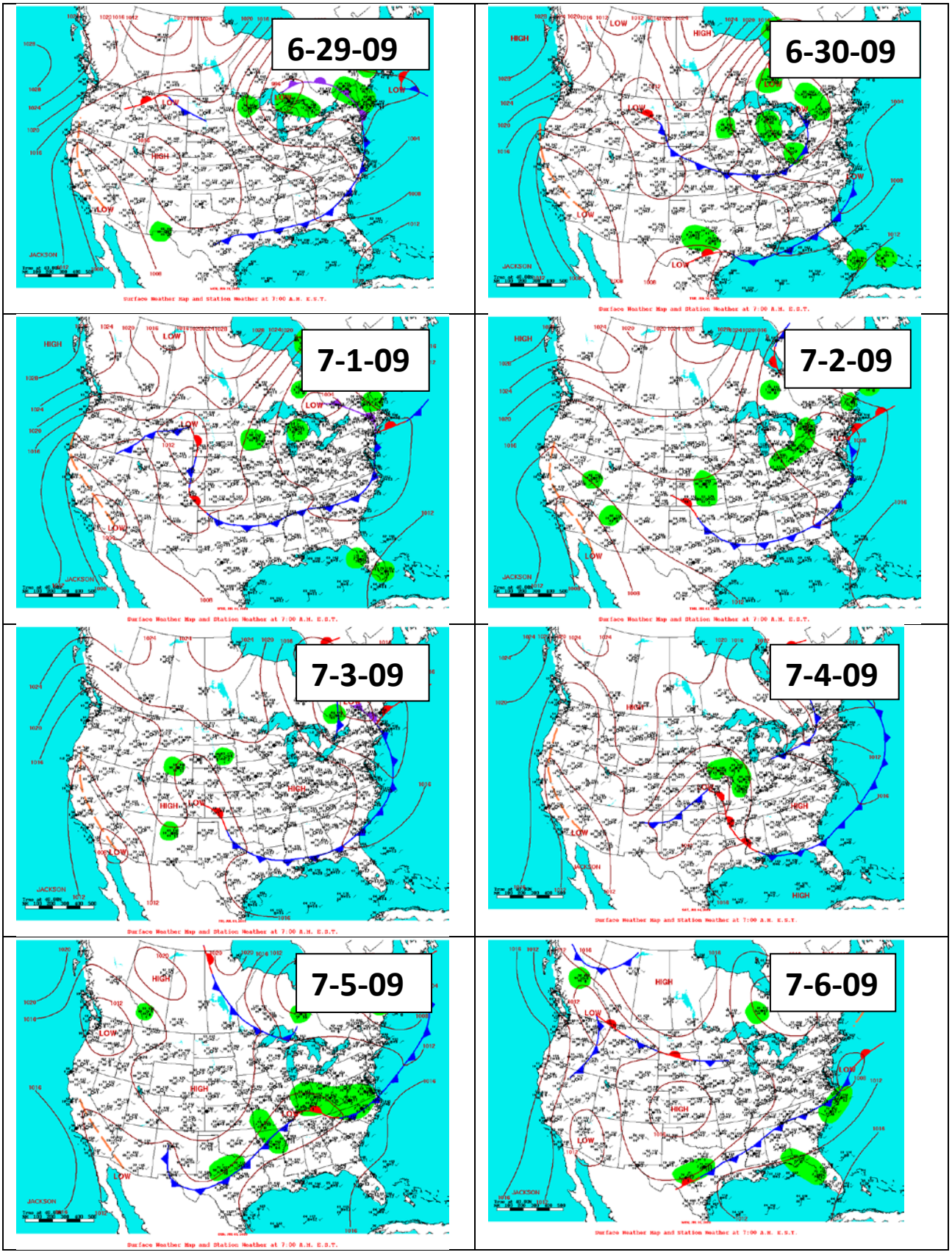
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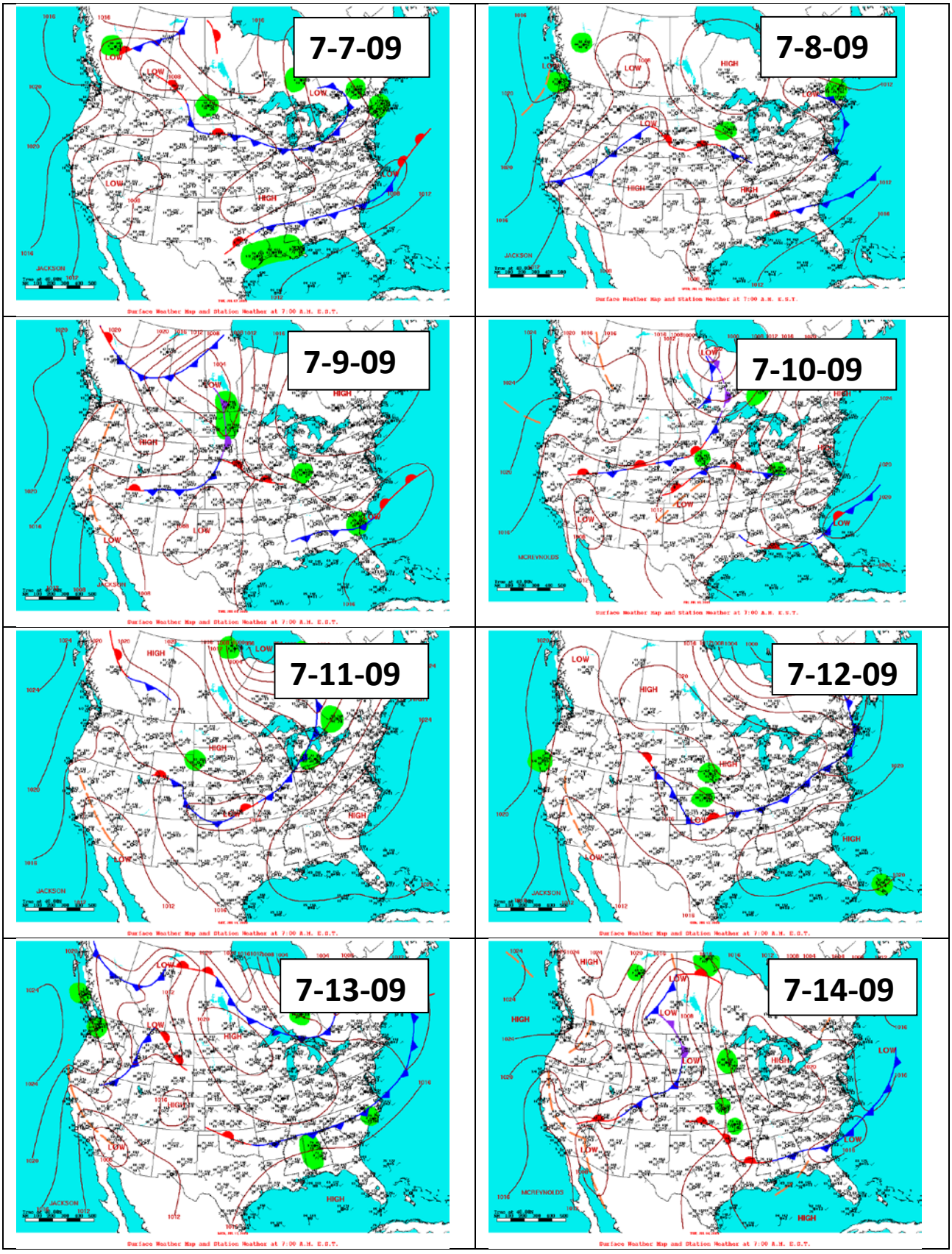
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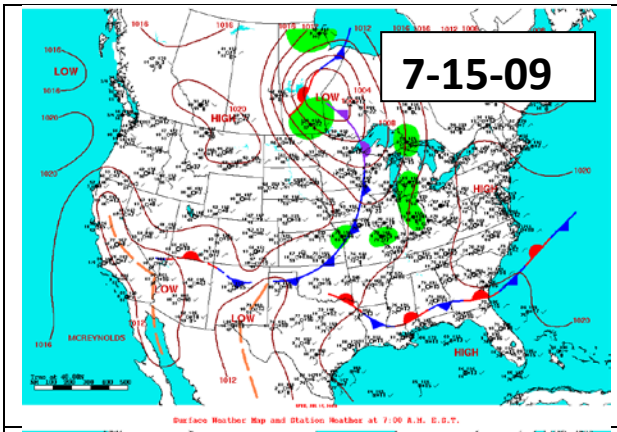
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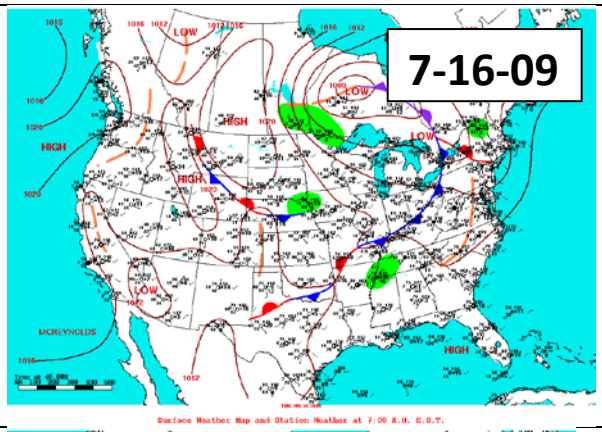
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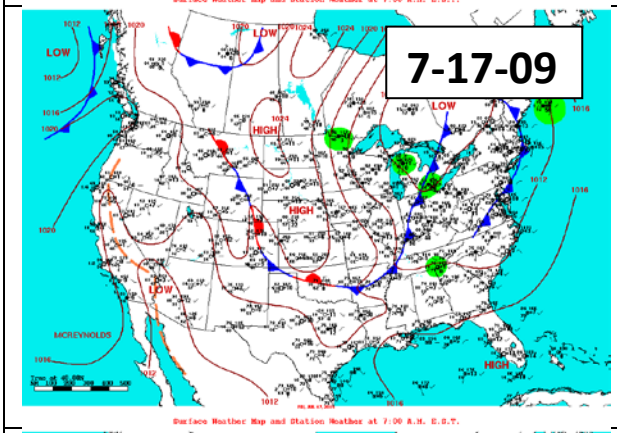
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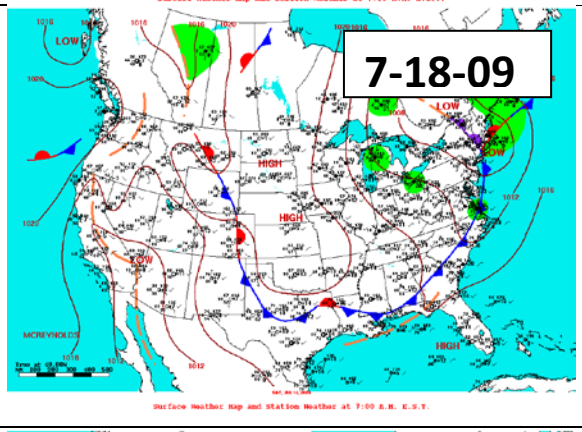
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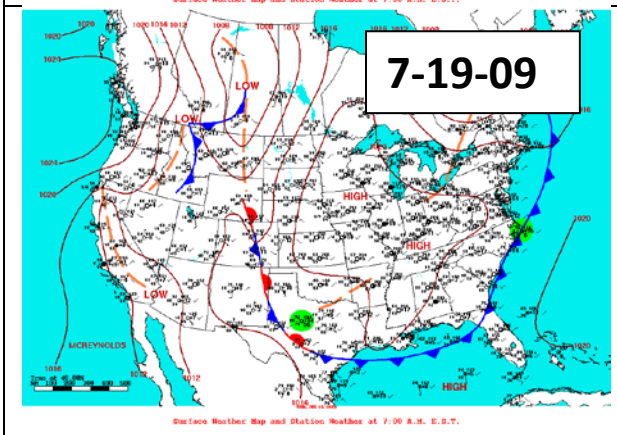
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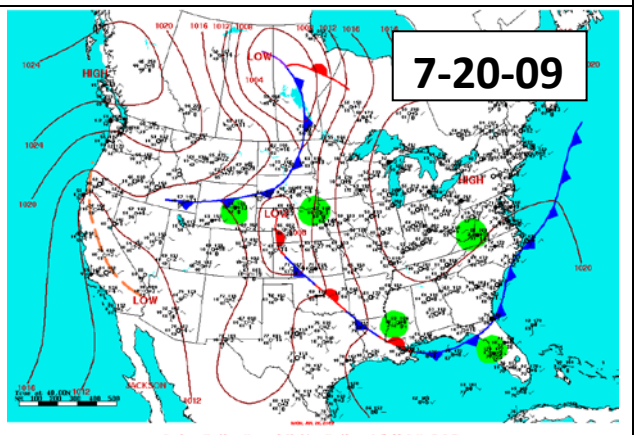
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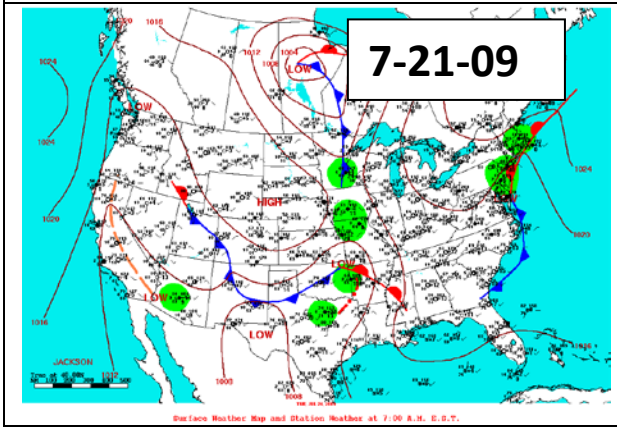
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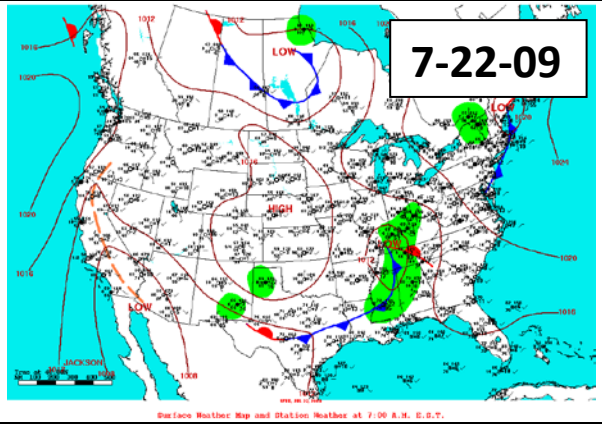
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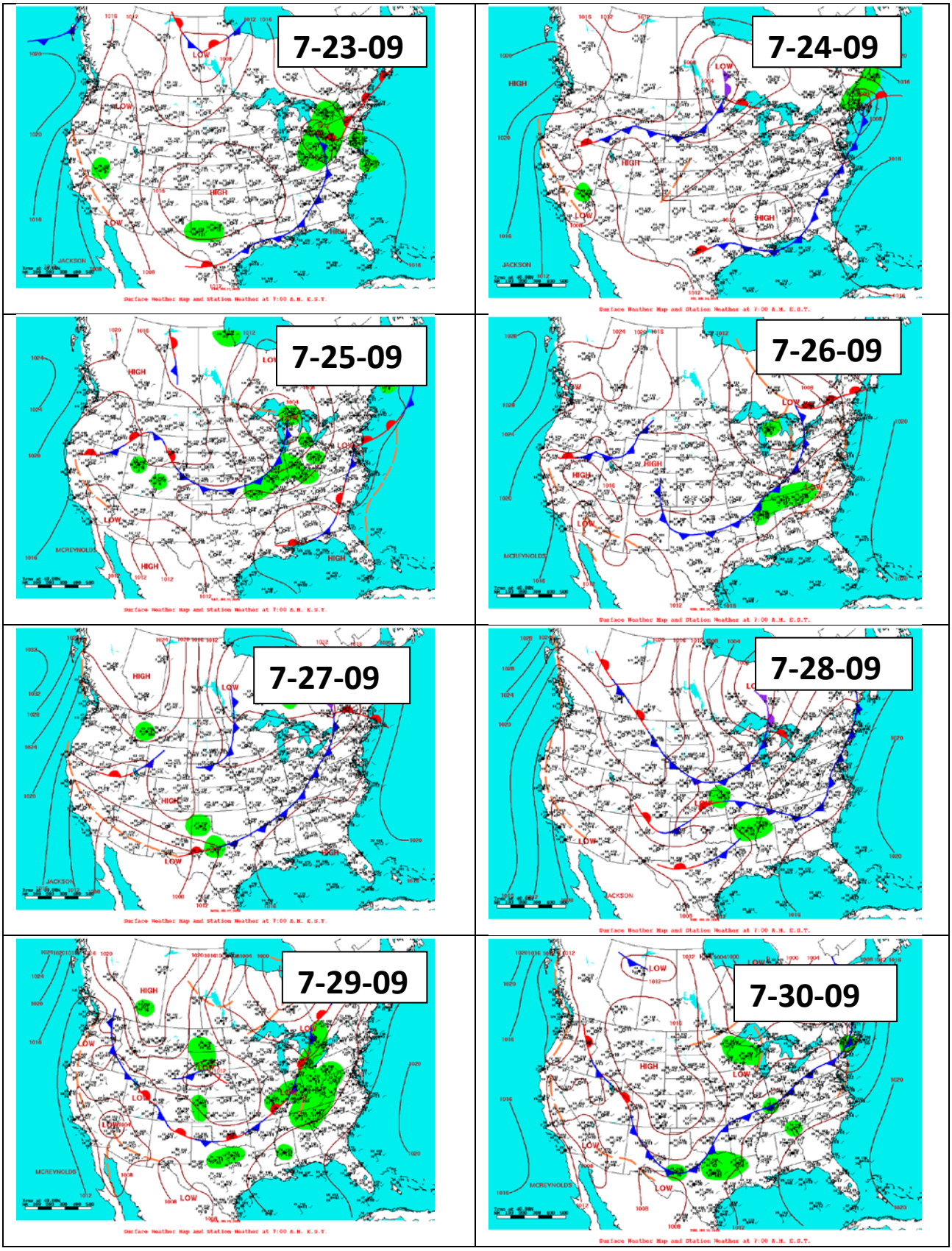
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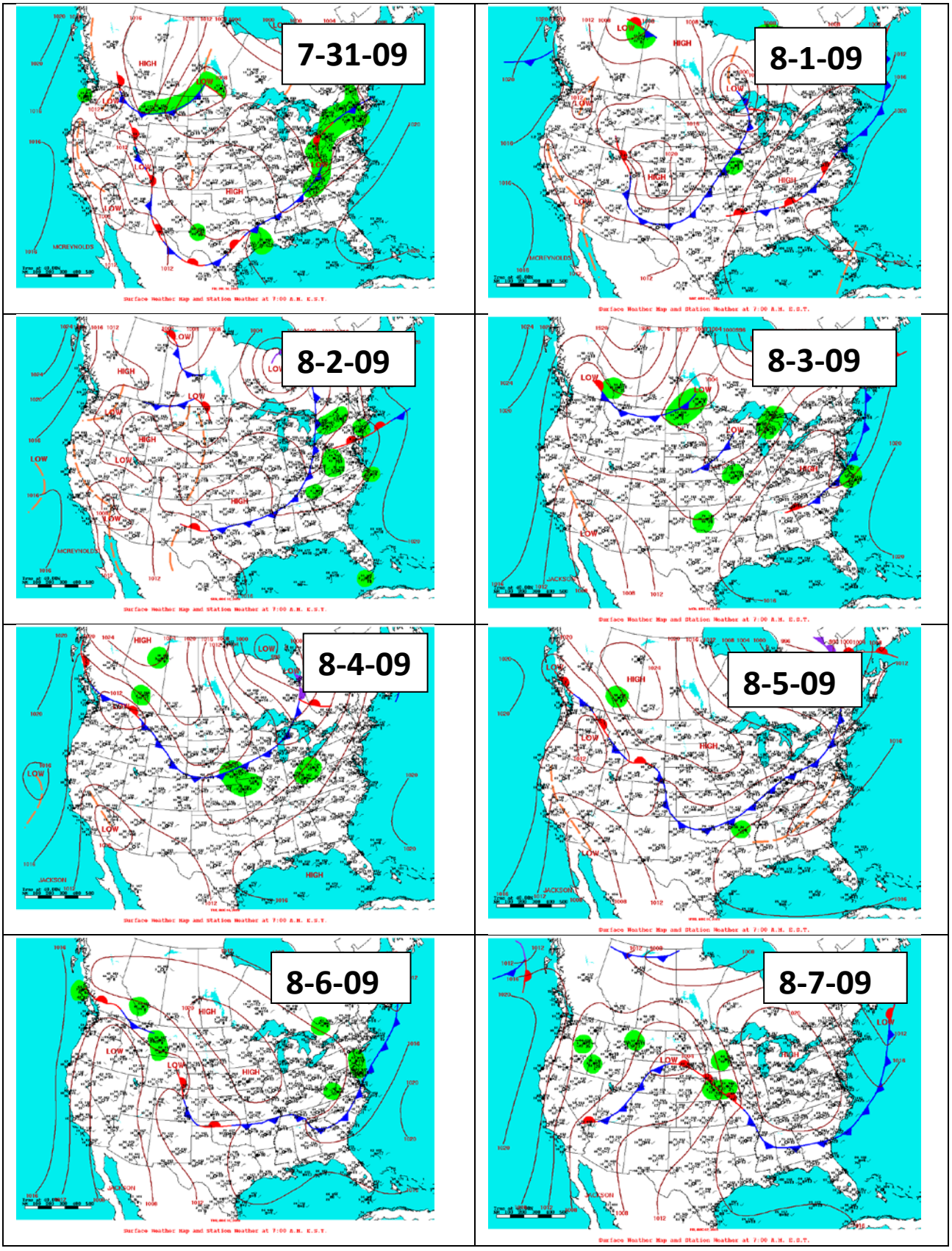
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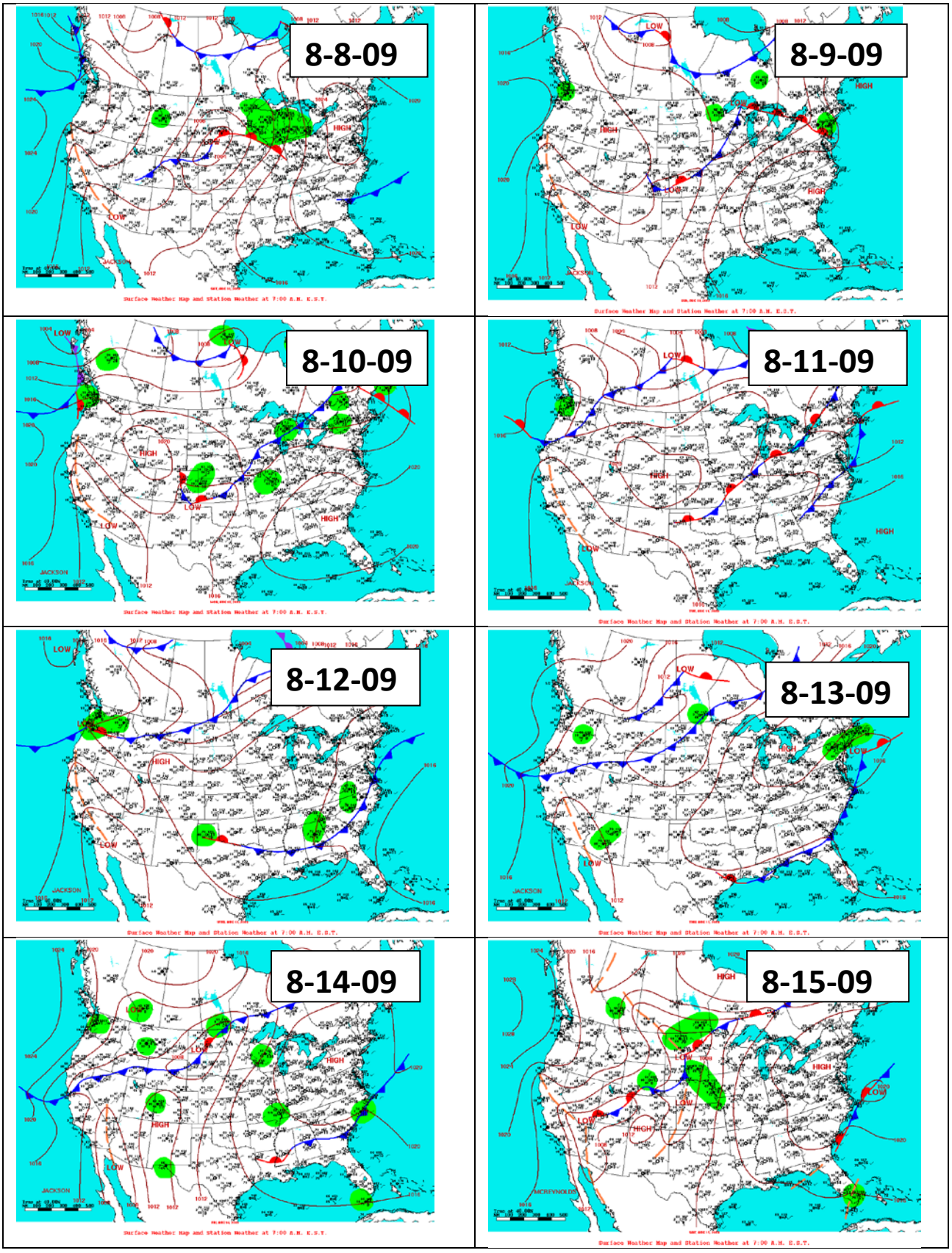
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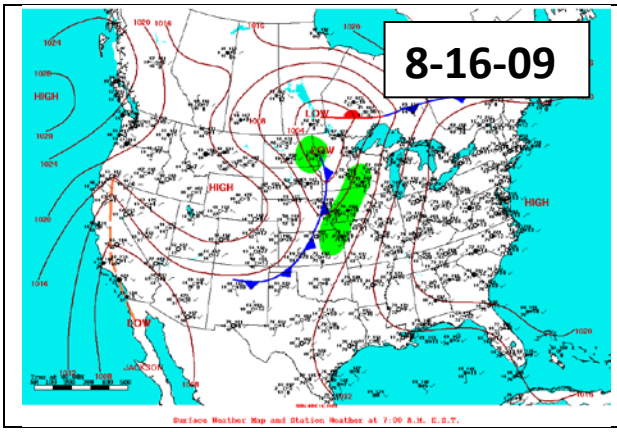
8-14-09
8-15-09


8-16-09
HIGH
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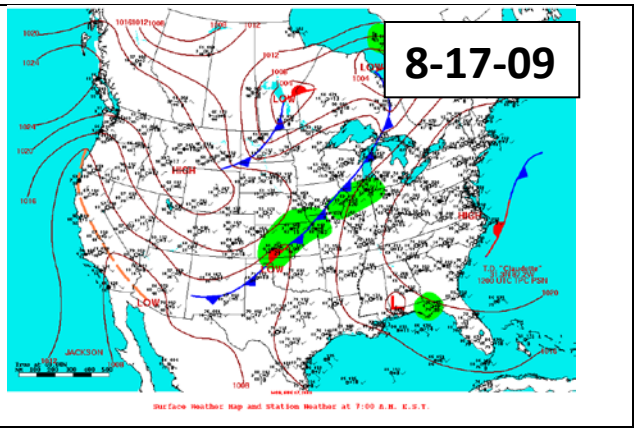
Surface Weather Map and Station Weather at 7:00 A.M. E.S.T.


8-17-09
HIGH
LOW
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HIGH
JACKSON
Surface Weather Map and Station Weather at 7:00 A.M. E.S.T.

6.10 Daily Weather conditions

Date	Barometric Pressure (kPA)	Max Solar Radiation (W m^{-2})	Wetness (%)	Air Temperature (°C)
Period 6				
9/10/2008	99.33	704	N/A	21.7
9/11/2008	99.32	915	N/A	16.8
9/12/2008	98.85	331	N/A	20.8
9/13/2008	98.30	833	N/A	23.8
9/14/2008	97.37	257	N/A	22.1
9/15/2008	98.38	998	N/A	16.2
9/16/2008	99.15	1030	N/A	16.0
9/17/2008	99.19	768	N/A	16.2
9/18/2008	99.63	764	N/A	17.6
9/19/2008	99.63	818	N/A	17.2
9/20/2008	99.36	751	N/A	18.4
9/21/2008	99.58	740	N/A	19.0
9/22/2008	99.86	717	N/A	19.7
9/23/2008	99.94	732	N/A	19.6
9/24/2008	99.75	716	N/A	19.7
9/25/2008	99.72	713	N/A	19.1
9/26/2008	99.40	745	N/A	18.4
9/27/2008	98.89	728	N/A	18.3
9/28/2008	99.07	725	N/A	17.3
9/29/2008	98.88	660	N/A	17.2
9/30/2008	98.52	926	N/A	13.8
10/1/2008	98.40	800	N/A	10.7
10/2/2008	98.58	854	N/A	11.1
10/3/2008	98.62	574	N/A	11.6
10/4/2008	99.40	699	N/A	9.6
10/5/2008	99.61	700	N/A	10.7
10/6/2008	99.58	674	N/A	15.7
10/7/2008	99.33	454	N/A	14.9
10/8/2008	98.33	246	N/A	15.2
10/9/2008	98.83	671	N/A	12.7
10/10/2008	99.35	681	N/A	13.1
10/11/2008	99.60	632	N/A	17.8
10/12/2008	99.82	658	N/A	19.2
10/13/2008	99.78	677	N/A	20.7
10/14/2008	99.52	574	N/A	18.7
10/15/2008	99.05	598	N/A	16.6
10/16/2008	99.23	820	N/A	12.5
10/17/2008	99.54	765	N/A	10.7
10/18/2008	99.66	807	N/A	10.1
10/19/2008	99.86	640	N/A	8.3

Date	Barometric Pressure (kPA)	Max Solar Radiation (W m^{-2})	Wetness (%)	Air Temperature (°C)
10/20/2008	99.40	632	N/A	10.8
10/21/2008	99.76	684	N/A	8.1
10/22/2008	100.08	631	N/A	5.6
10/23/2008	99.86	626	N/A	7.3
10/24/2008	99.02	227	N/A	10.2
10/25/2008	98.35	234	N/A	7.1
10/26/2008	98.03	614	N/A	9.5
10/27/2008	99.03	616	N/A	4.2
10/28/2008	99.72	491	N/A	2.3
10/29/2008	99.21	602	N/A	3.4
10/30/2008	99.94	568	N/A	4.0
10/31/2008	99.96	540	N/A	11.9
11/1/2008	99.80	501	N/A	12.6
11/2/2008	99.69	587	N/A	12.7
11/3/2008	99.46	525	N/A	16.5
11/4/2008	99.41	522	N/A	13.7
11/5/2008	99.01	530	N/A	12.7
11/6/2008	98.56	565	N/A	14.8
11/7/2008	98.07	529	N/A	11.9
11/8/2008	97.71	283	N/A	4.0
11/9/2008	98.25	126	N/A	1.7
11/10/2008	99.24	697	N/A	-0.3
11/11/2008	99.73	165	N/A	-1.6
11/12/2008	99.08	321	N/A	5.4
11/13/2008	98.17	501	N/A	9.4
11/14/2008	97.65	77	N/A	10.7
11/15/2008	97.86	174	N/A	5.3
11/16/2008	98.58	509	N/A	1.1
11/17/2008	99.15	296	N/A	0.1
11/18/2008	100.05	612	N/A	-3.0
11/19/2008	99.29	471	N/A	-0.6
11/20/2008	99.10	492	N/A	1.4
11/21/2008	100.01	594	N/A	-4.3
11/22/2008	100.45	375	N/A	-5.8
11/23/2008	99.83	480	N/A	-3.1
11/24/2008	98.51	157	N/A	1.3
11/25/2008	98.61	499	N/A	-0.1
11/26/2008	98.93	460	N/A	-0.8
11/27/2008	98.61	454	N/A	-0.9
11/28/2008	98.48	467	N/A	0.9
11/29/2008	98.40	560	N/A	-1.0

Date	Barometric Pressure (kPA)	Max Solar Radiation (W m^{-2})	Wetness (%)	Air Temperature (°C)
11/30/2008	96.88	124	N/A	0.5
12/1/2008	96.67	321	N/A	-0.8
12/2/2008	98.75	406	N/A	-4.4
12/3/2008	98.52	487	N/A	0.5
12/4/2008	99.31	504	N/A	-3.6
12/5/2008	99.95	574	N/A	-9.5
12/6/2008	98.39	137	N/A	-5.5
12/7/2008	99.25	484	N/A	-8.7
12/8/2008	98.98	254	N/A	-3.7
12/9/2008	98.03	34	N/A	5.2
12/10/2008	98.72	396	N/A	-0.3
Period 7				
12/11/2008	98.93	302	N/A	-4.2
12/12/2008	98.85	541	56%	-4.6
12/13/2008	99.23	174	52%	-4.6
12/14/2008	98.43	77	13%	4.3
12/15/2008	99.11	323	99%	-2.0
12/16/2008	100.35	136	94%	-9.8
12/17/2008	99.21	380	88%	-6.6
12/18/2008	99.76	332	74%	-7.8
12/19/2008	98.39	285	100%	-1.8
12/20/2008	98.79	153	94%	-4.1
12/21/2008	98.43	401	40%	-13.3
12/22/2008	99.89	445	0%	-16.8
12/23/2008	99.69	152	58%	-7.8
12/24/2008	98.21	189	94%	1.4
12/25/2008	99.91	438	15%	-9.2
12/26/2008	99.20	89	85%	-0.6
12/27/2008	98.27	103	85%	13.2
12/28/2008	98.43	519	38%	3.1
12/29/2008	98.95	426	73%	1.0
12/30/2008	98.76	421	70%	0.6
12/31/2008	99.04	450	24%	-3.1
1/1/2009	99.41	316	27%	-6.0
1/2/2009	98.25	360	13%	-0.7
1/3/2009	98.81	456	26%	-3.7
1/4/2009	98.54	73	73%	1.8
1/5/2009	99.43	482	22%	-4.7

Date	Barometric Pressure (kPA)	Max Solar Radiation (W m^{-2})	Wetness (%)	Air Temperature (°C)
1/6/2009	98.05	136	76%	-4.2
1/7/2009	96.60	282	99%	-2.3
1/8/2009	97.73	255	71%	-9.0
1/9/2009	98.84	527	75%	-6.5
1/10/2009	98.62	100	97%	-3.1
1/11/2009	99.04	336	87%	-5.5
1/12/2009	99.13	271	92%	-5.0
1/13/2009	98.64	537	73%	-4.4
1/14/2009	98.94	264	87%	-14.3
1/15/2009	100.12	490	48%	-19.7
1/16/2009	100.90	569	23%	-24.3
1/17/2009	99.20	619	37%	-12.8
1/18/2009	97.95	579	76%	-7.4
1/19/2009	98.01	610	92%	-10.2
1/20/2009	98.59	509	80%	-12.1
1/21/2009	98.85	646	72%	-10.0
1/22/2009	98.50	512	72%	-3.5
1/23/2009	98.27	639	65%	-0.3
1/24/2009	99.78	523	25%	-7.9
1/25/2009	99.94	506	5%	-14.2
1/26/2009	100.08	373	16%	-11.3
1/27/2009	99.98	156	13%	-8.9
1/28/2009	98.60	553	73%	-8.0
1/29/2009	98.53	351	92%	-8.2
1/30/2009	98.77	560	33%	-9.2
1/31/2009	98.81	543	61%	-12.0
2/1/2009	98.18	653	64%	1.6
2/2/2009	98.82	804	66%	-4.2
2/3/2009	98.80	632	65%	-9.8
2/4/2009	99.79	714	69%	-11.1
2/5/2009	100.21	570	66%	-14.0
2/6/2009	99.30	587	36%	-5.7
2/7/2009	98.65	564	99%	7.9
2/8/2009	99.54	558	80%	3.7
2/9/2009	99.51	465	98%	1.7
2/10/2009	98.28	496	72%	11.3

Date	Barometric Pressure (kPA)	Max Solar Radiation (W m^{-2})	Wetness (%)	Air Temperature (°C)
2/11/2009	97.37	427	97%	11.3
2/12/2009	98.28	609	15%	3.2
2/13/2009	99.18	628	7%	0.6
2/14/2009	98.88	706	51%	-0.3
2/15/2009	99.52	735	35%	-2.5
2/16/2009	99.94	842	39%	-2.9
2/17/2009	99.20	636	33%	-1.4
2/18/2009	97.06	266	72%	3.8
2/19/2009	98.22	826	41%	-6.5
2/20/2009	99.06	643	0%	-7.6
2/21/2009	98.54	388	40%	-4.4
2/22/2009	99.29	873	3%	-6.4
2/23/2009	100.40	797	16%	-8.6
2/24/2009	100.06	706	65%	-5.3
2/25/2009	99.38	708	5%	-0.3
Period 8				
3/11/2009	100.18	654	73%	0.2
3/12/2009	100.65	692	48%	-3.8
3/13/2009	100.21	758	56%	-2.0
3/14/2009	99.47	789	59%	1.9
3/15/2009	99.09	787	57%	6.0
3/16/2009	99.24	829	11%	9.2
3/17/2009	99.25	762	63%	11.8
3/18/2009	98.96	720	54%	12.3
3/19/2009	99.57	814	4%	6.3
3/20/2009	100.17	816	18%	-0.4
3/21/2009	100.03	809	0%	5.1
3/22/2009	99.97	807	49%	8.3
3/23/2009	99.73	725	14%	7.0
3/24/2009	98.98	810	1%	11.1
3/25/2009	98.06	795	36%	13.5
3/26/2009	98.39	906	24%	7.9
3/27/2009	98.53	774	55%	7.9
3/28/2009	98.07	745	10%	4.9
3/29/2009	96.76	270	95%	3.8
3/30/2009	98.60	851	56%	3.6
3/31/2009	98.23	311	15%	8.7
4/1/2009	97.89	859	42%	7.8
4/2/2009	97.94	926	6%	12.0

Date	Barometric Pressure (kPA)	Max Solar Radiation (W m^{-2})	Wetness (%)	Air Temperature (°C)
4/3/2009	96.91	691	65%	7.3
4/4/2009	98.60	862	42%	4.3
4/5/2009	98.08	132	43%	5.9
4/6/2009	97.37	824	64%	2.5
4/7/2009	97.97	1062	7%	1.7
4/8/2009	97.77	1053	12%	4.6
4/9/2009	98.15	891	35%	7.6
4/10/2009	98.30	303	32%	7.5
4/11/2009	99.27	892	3%	5.7
4/12/2009	99.75	931	13%	5.5
4/13/2009	98.59	230	49%	3.9
4/14/2009	97.92	186	100%	5.2
4/15/2009	98.92	562	71%	5.9
4/16/2009	99.90	914	64%	9.3
4/17/2009	99.98	925	55%	11.2
4/18/2009	99.24	821	51%	13.6
4/19/2009	98.40	203	92%	13.5
4/20/2009	97.40	954	79%	8.3
4/21/2009	97.54	747	95%	5.2
4/22/2009	98.10	1041	72%	7.4
4/23/2009	98.93	907	34%	8.9
4/24/2009	98.48	908	31%	19.6
4/25/2009	98.80	989	6%	22.6
4/26/2009	99.13	907	27%	22.6
4/27/2009	99.08	920	7%	22.0
4/28/2009	99.52	274	98%	14.6
4/29/2009	99.84	384	88%	10.0
4/30/2009	98.72	633	99%	15.0
5/1/2009	98.53	831	97%	15.3
5/2/2009	98.77	1124	93%	11.6
5/3/2009	98.59	869	55%	13.5
5/4/2009	98.77	969	38%	14.2
5/5/2009	98.80	1106	7%	15.3
5/6/2009	98.35	309	84%	14.0
5/7/2009	98.09	1057	69%	15.5
5/8/2009	97.90	453	67%	15.4
5/9/2009	98.03	773	40%	13.1
5/10/2009	99.15	943	44%	10.4
5/11/2009	99.27	1091	39%	9.9
5/12/2009	99.45	926	33%	10.1
5/13/2009	98.68	388	46%	11.8

Date	Barometric Pressure (kPA)	Max Solar Radiation (W m^{-2})	Wetness (%)	Air Temperature (°C)
5/14/2009	98.43	969	28%	15.6
5/15/2009	99.18	815	56%	11.2
5/16/2009	98.52	1097	73%	11.9
5/17/2009	99.67	939	17%	N/A
5/18/2009	99.88	937	48%	N/A
5/19/2009	99.75	900	50%	N/A
5/20/2009	99.62	921	40%	N/A
5/21/2009	99.29	918	30%	N/A
5/22/2009	99.22	981	59%	N/A
5/23/2009	99.06	932	48%	N/A
5/24/2009	98.80	899	60%	N/A
5/25/2009	98.80	732	53%	N/A
5/26/2009	98.33	1018	47%	N/A
5/27/2009	97.87	1053	67%	N/A
5/28/2009	97.79	279	91%	N/A
Period 9				
5/29/2009	98.29	982	42%	16.9
5/30/2009	98.33	855	40%	16.6
5/31/2009	98.44	920	9%	17.8
6/1/2009	98.46	861	16%	19.8
6/2/2009	98.82	949	82%	18.3
6/3/2009	99.04	603	100%	15.1
6/4/2009	98.95	1018	100%	14.4
6/5/2009	98.63	942	100%	16.6
6/6/2009	98.57	1024	100%	20.0
6/7/2009	98.49	612	100%	21.2
6/8/2009	98.27	792	100%	22.6
6/9/2009	98.44	1136	77%	20.4
6/10/2009	98.44	847	0%	17.8
6/11/2009	98.02	683	0%	19.3
6/12/2009	98.45	981	0%	18.7
6/13/2009	98.65	1056	0%	19.6
6/14/2009	98.70	1045	0%	20.4
6/15/2009	98.82	818	0%	21.7
6/16/2009	98.64	384	35%	20.0
6/17/2009	98.31	970	62%	20.9
6/18/2009	98.38	922	65%	19.2
6/19/2009	98.06	875	59%	25.5
6/20/2009	97.98	1044	53%	24.3
6/21/2009	98.27	1204	67%	25.1
6/22/2009	98.22	1018	99%	24.6
6/23/2009	98.44	898	59%	25.8

Date	Barometric Pressure (kPA)	Max Solar Radiation (W m^{-2})	Wetness (%)	Air Temperature (°C)
6/24/2009	98.51	944	63%	26.2
6/25/2009	98.30	952	76%	27.3
6/26/2009	98.15	1006	100%	27.2
6/27/2009	98.41	1020	100%	23.8
6/28/2009	98.02	941	100%	25.2
6/29/2009	97.59	1052	100%	21.7
6/30/2009	97.53	934	100%	18.5
7/1/2009	97.85	903	100%	16.8
7/2/2009	98.46	809	100%	17.1
7/3/2009	98.99	1149	100%	20.4
7/4/2009	98.94	350	100%	18.4
7/5/2009	98.53	1058	100%	20.2
7/6/2009	98.41	1053	100%	21.6
7/7/2009	98.32	973	100%	21.3
7/8/2009	98.64	728	99%	19.4
7/9/2009	99.00	964	99%	20.3
7/10/2009	99.15	813	99%	22.0
7/11/2009	98.96	1019	79%	23.8
7/12/2009	99.04	1023	51%	20.9
7/13/2009	98.97	1048	44%	19.9
7/14/2009	99.19	1235	35%	18.1
7/15/2009	98.76	833	17%	21.1
7/16/2009	98.58	942	38%	22.4
7/17/2009	98.27	1052	34%	19.3
7/18/2009	98.65	963	54%	16.3
7/19/2009	99.15	1091	39%	18.0
7/20/2009	99.17	1034	56%	18.4
7/21/2009	98.98	965	51%	20.0
7/22/2009	98.73	514	98%	18.4
7/23/2009	98.51	924	99%	20.3
7/24/2009	98.51	977	100%	19.7
7/25/2009	97.96	1011	100%	21.4
7/26/2009	98.22	1006	100%	20.9
7/27/2009	98.56	926	100%	21.0
7/28/2009	98.30	983	100%	21.9
7/29/2009	98.07	1036	100%	20.8
7/30/2009	98.43	898	100%	18.6
7/31/2009	98.52	1033	100%	20.3
8/1/2009	98.76	852	100%	19.2
8/2/2009	98.59	956	100%	19.7
8/3/2009	98.62	1008	100%	19.4

Date	Barometric Pressure (kPA)	Max Solar Radiation (W m^{-2})	Wetness (%)	Air Temperature (°C)
8/4/2009	98.38	640	100%	22.6
8/5/2009	98.81	924	100%	21.5
8/6/2009	99.09	955	79%	19.0
8/7/2009	99.27	491	76%	17.7
8/8/2009	98.98	889	100%	23.1
8/9/2009	98.88	913	100%	27.1
8/10/2009	98.79	1080	76%	26.1
8/11/2009	98.72	1005	74%	23.3
8/12/2009	98.98	999	55%	19.9
8/13/2009	99.17	954	53%	21.4
8/14/2009	99.26	969	53%	21.9
8/15/2009	99.16	824	52%	22.6
8/16/2009	99.02	944	93%	25.5
8/17/2009	98.99	965	71%	24.4
8/18/2009	98.84	797	72%	21.7
8/19/2009	98.64	874	64%	21.8
8/20/2009	97.92	948	59%	21.4
8/21/2009	98.05	958	57%	19.7
8/22/2009	98.52	776	66%	16.6
8/23/2009	98.97	832	60%	16.5
8/24/2009	99.17	N/A	100%	14.3

6.11 Daily Lagoon conditions

Lagoon temperature, pH and oxidation-reduction potential

Date	Temperature, °C		Lagoon pH	Lagoon ORP (mV)
	Air	Lagoon		
Period 6				
9/10/2008	21.7	N/A	N/A	N/A
9/11/2008	16.8	N/A	N/A	N/A
9/12/2008	20.8	N/A	N/A	N/A
9/13/2008	23.8	N/A	N/A	N/A
9/14/2008	22.1	N/A	N/A	N/A
9/15/2008	16.2	N/A	N/A	N/A
9/16/2008	16.0	N/A	N/A	N/A
9/17/2008	16.2	N/A	N/A	N/A
9/18/2008	17.6	N/A	N/A	N/A
9/19/2008	17.2	21.5	8.3	-394
9/20/2008	18.4	21.2	8.3	-478
9/21/2008	19.0	21.3	8.3	-494
9/22/2008	19.7	21.6	8.3	-512
9/23/2008	19.6	21.3	8.3	-522
9/24/2008	19.7	21.2	8.3	-531
9/25/2008	19.1	21.3	8.3	-517
9/26/2008	18.4	21.6	8.3	-503
9/27/2008	18.3	21.5	8.3	-515
9/28/2008	17.3	20.9	8.3	-524
9/29/2008	17.2	20.6	8.3	-522
9/30/2008	13.8	20.0	8.3	-516
10/1/2008	10.7	19.0	8.3	-510
10/2/2008	11.1	18.4	8.4	-518
10/3/2008	11.6	18.2	8.4	-501
10/4/2008	9.6	17.5	8.4	-513
10/5/2008	10.7	17.1	8.4	-509
10/6/2008	15.7	16.5	8.4	-506
10/7/2008	14.9	16.1	8.4	-515
10/8/2008	15.2	16.2	8.4	-518
10/9/2008	12.7	16.3	8.3	-518
10/10/2008	13.1	16.3	8.2	N/A
10/11/2008	17.8	16.2	8.2	-492
10/12/2008	19.2	16.7	8.2	-491
10/13/2008	20.7	17.2	8.2	-501
10/14/2008	18.7	17.8	8.2	-501

Date	Temperature, °C		Lagoon pH	Lagoon ORP (mV)
	Air	Lagoon		
10/15/2008	16.6	17.5	8.2	-502
10/16/2008	12.5	17.5	8.2	-489
10/17/2008	10.7	16.8	8.2	-485
10/18/2008	10.1	16.3	8.2	-496
10/19/2008	8.3	15.5	8.2	-511
10/20/2008	10.8	15.1	8.2	-515
10/21/2008	8.1	15.0	8.2	-499
10/22/2008	5.6	13.9	8.2	-500
10/23/2008	7.3	12.9	8.2	-497
10/24/2008	10.2	12.6	8.2	-516
10/25/2008	7.1	12.0	8.2	-527
10/26/2008	9.5	11.3	8.2	-529
10/27/2008	4.2	10.9	8.2	-527
10/28/2008	2.3	N/A	N/A	N/A
10/29/2008	3.4	N/A	N/A	N/A
10/30/2008	4.0	N/A	N/A	N/A
10/31/2008	11.9	N/A	N/A	N/A
11/1/2008	12.6	N/A	N/A	N/A
11/2/2008	12.7	N/A	N/A	N/A
11/3/2008	16.5	N/A	N/A	N/A
11/4/2008	13.7	N/A	N/A	N/A
11/5/2008	12.7	N/A	N/A	N/A
11/6/2008	14.8	N/A	N/A	N/A
11/7/2008	11.9	N/A	N/A	N/A
11/8/2008	4.0	N/A	N/A	N/A
11/9/2008	1.7	N/A	N/A	N/A
11/10/2008	-0.3	N/A	N/A	N/A
11/11/2008	-1.6	N/A	N/A	N/A
11/12/2008	5.4	N/A	N/A	N/A
11/13/2008	9.4	N/A	N/A	N/A
11/14/2008	10.7	N/A	N/A	N/A
11/15/2008	5.3	N/A	N/A	N/A
11/16/2008	1.1	N/A	N/A	N/A
11/17/2008	0.1	N/A	N/A	N/A
11/18/2008	-3.0	N/A	N/A	N/A
11/19/2008	-0.6	N/A	N/A	N/A
11/20/2008	1.4	N/A	N/A	N/A
11/21/2008	-4.3	N/A	N/A	N/A
11/22/2008	-5.8	N/A	N/A	N/A
11/23/2008	-3.1	N/A	N/A	N/A
11/24/2008	1.3	N/A	N/A	N/A
11/25/2008	-0.1	N/A	N/A	N/A

Date	Temperature, °C		Lagoon pH	Lagoon ORP (mV)
	Air	Lagoon		
11/26/2008	-0.8	N/A	N/A	N/A
11/27/2008	-0.9	N/A	N/A	N/A
11/28/2008	0.9	N/A	N/A	N/A
11/29/2008	-1.0	N/A	N/A	N/A
11/30/2008	0.5	N/A	N/A	N/A
12/1/2008	-0.8	N/A	N/A	N/A
12/2/2008	-4.4	N/A	N/A	N/A
12/3/2008	0.5	N/A	N/A	N/A
12/4/2008	-3.6	N/A	N/A	N/A
12/5/2008	-9.5	N/A	N/A	N/A
12/6/2008	-5.5	N/A	N/A	N/A
12/7/2008	-8.7	N/A	N/A	N/A
12/8/2008	-3.7	N/A	N/A	N/A
12/9/2008	5.2	N/A	N/A	N/A
12/10/2008	-0.3	N/A	N/A	N/A
Period 7				
12/11/2008	-4.2	N/A	N/A	N/A
12/12/2008	-4.6	N/A	N/A	N/A
12/13/2008	-4.6	N/A	N/A	N/A
12/14/2008	4.3	N/A	N/A	N/A
12/15/2008	-2.0	N/A	N/A	N/A
12/16/2008	-9.8	N/A	N/A	N/A
12/17/2008	-6.6	N/A	N/A	N/A
12/18/2008	-7.8	N/A	N/A	N/A
12/19/2008	-1.8	N/A	N/A	N/A
12/20/2008	-4.1	N/A	N/A	N/A
12/21/2008	-13.3	N/A	N/A	N/A
12/22/2008	-16.8	N/A	N/A	N/A
12/23/2008	-7.8	N/A	N/A	N/A
12/24/2008	1.4	N/A	N/A	N/A
12/25/2008	-9.2	N/A	N/A	N/A
12/26/2008	-0.6	N/A	N/A	N/A
12/27/2008	13.2	N/A	N/A	N/A
12/28/2008	3.1	N/A	N/A	N/A
12/29/2008	1.0	N/A	N/A	N/A
12/30/2008	0.6	N/A	N/A	N/A
12/31/2008	-3.1	N/A	N/A	N/A
1/1/2009	-6.0	N/A	N/A	N/A
1/2/2009	-0.7	N/A	N/A	N/A
1/3/2009	-3.7	N/A	N/A	N/A
1/4/2009	1.8	N/A	N/A	N/A

Date	Temperature, °C		Lagoon pH	Lagoon ORP (mV)
	Air	Lagoon		
1/5/2009	-4.7	N/A	N/A	N/A
1/6/2009	-4.2	N/A	N/A	N/A
1/7/2009	-2.3	N/A	N/A	N/A
1/8/2009	-9.0	N/A	N/A	N/A
1/9/2009	-6.5	N/A	N/A	N/A
1/10/2009	-3.1	N/A	N/A	N/A
1/11/2009	-5.5	N/A	N/A	N/A
1/12/2009	-5.0	N/A	N/A	N/A
1/13/2009	-4.4	N/A	N/A	N/A
1/14/2009	-14.3	N/A	N/A	N/A
1/15/2009	-19.7	N/A	N/A	N/A
1/16/2009	-24.3	N/A	N/A	N/A
1/17/2009	-12.8	N/A	N/A	N/A
1/18/2009	-7.4	N/A	N/A	N/A
1/19/2009	-10.2	N/A	N/A	N/A
1/20/2009	-12.1	N/A	N/A	N/A
1/21/2009	-10.0	N/A	N/A	N/A
1/22/2009	-3.5	N/A	N/A	N/A
1/23/2009	-0.3	N/A	N/A	N/A
1/24/2009	-7.9	N/A	N/A	N/A
1/25/2009	-14.2	N/A	N/A	N/A
1/26/2009	-11.3	N/A	N/A	N/A
1/27/2009	-8.9	N/A	N/A	N/A
1/28/2009	-8.0	N/A	N/A	N/A
1/29/2009	-8.2	N/A	N/A	N/A
1/30/2009	-9.2	N/A	N/A	N/A
1/31/2009	-12.0	N/A	N/A	N/A
2/1/2009	1.6	N/A	N/A	N/A
2/2/2009	-4.2	N/A	N/A	N/A
2/3/2009	-9.8	N/A	N/A	N/A
2/4/2009	-11.1	N/A	N/A	N/A
2/5/2009	-14.0	N/A	N/A	N/A
2/6/2009	-5.7	N/A	N/A	N/A
2/7/2009	7.9	N/A	N/A	N/A
2/8/2009	3.7	N/A	N/A	N/A
2/9/2009	1.7	N/A	N/A	N/A
2/10/2009	11.3	N/A	N/A	N/A
2/11/2009	11.3	N/A	N/A	N/A
2/12/2009	2.2	N/A	N/A	N/A
Period 8				
3/11/2009	0.2	N/A	N/A	N/A
3/12/2009	-3.8	N/A	N/A	N/A

Date	Temperature, °C		Lagoon pH	Lagoon ORP (mV)
	Air	Lagoon		
3/13/2009	-2.0	N/A	N/A	N/A
3/14/2009	1.9	N/A	N/A	N/A
3/15/2009	6.0	N/A	N/A	N/A
3/16/2009	9.2	N/A	N/A	N/A
3/17/2009	11.8	N/A	N/A	N/A
3/18/2009	12.3	N/A	N/A	N/A
3/19/2009	6.3	N/A	N/A	N/A
3/20/2009	-0.4	N/A	N/A	N/A
3/21/2009	5.1	N/A	N/A	N/A
3/22/2009	8.3	N/A	N/A	N/A
3/23/2009	7.0	N/A	N/A	N/A
3/24/2009	11.1	N/A	N/A	N/A
3/25/2009	13.5	N/A	N/A	N/A
3/26/2009	7.9	N/A	N/A	N/A
3/27/2009	7.9	N/A	N/A	N/A
3/28/2009	4.9	N/A	N/A	N/A
3/29/2009	3.8	N/A	N/A	N/A
3/30/2009	3.6	N/A	N/A	N/A
3/31/2009	8.7	N/A	N/A	N/A
4/1/2009	7.8	N/A	N/A	N/A
4/2/2009	12.0	N/A	N/A	N/A
4/3/2009	7.3	N/A	N/A	N/A
4/4/2009	4.3	N/A	N/A	N/A
4/5/2009	5.9	N/A	N/A	N/A
4/6/2009	2.5	N/A	N/A	N/A
4/7/2009	1.7	N/A	N/A	N/A
4/8/2009	4.6	N/A	N/A	N/A
4/9/2009	7.6	N/A	N/A	N/A
4/10/2009	7.5	N/A	N/A	N/A
4/11/2009	5.7	N/A	N/A	N/A
4/12/2009	5.5	N/A	N/A	N/A
4/13/2009	3.9	N/A	N/A	N/A
4/14/2009	5.2	N/A	N/A	N/A
4/15/2009	5.9	N/A	N/A	N/A
4/16/2009	9.3	N/A	N/A	N/A
4/17/2009	11.2	N/A	N/A	N/A
4/18/2009	13.6	N/A	N/A	N/A
4/19/2009	13.5	N/A	N/A	N/A
4/20/2009	8.3	N/A	N/A	N/A
4/21/2009	5.2	N/A	N/A	N/A
4/22/2009	7.4	N/A	N/A	N/A

Date	Temperature, °C		Lagoon pH	Lagoon ORP (mV)
	Air	Lagoon		
4/23/2009	8.9	N/A	N/A	N/A
4/24/2009	19.6	N/A	N/A	N/A
4/25/2009	22.6	N/A	N/A	N/A
4/26/2009	22.6	N/A	N/A	N/A
4/27/2009	22.0	N/A	N/A	N/A
4/28/2009	14.6	N/A	N/A	N/A
4/29/2009	10.0	N/A	N/A	N/A
4/30/2009	15.0	N/A	N/A	N/A
5/1/2009	15.3	N/A	N/A	N/A
5/2/2009	11.6	N/A	N/A	N/A
5/3/2009	13.5	N/A	N/A	N/A
5/4/2009	14.2	N/A	N/A	N/A
5/5/2009	15.3	N/A	N/A	N/A
5/6/2009	14.0	N/A	N/A	N/A
5/7/2009	15.5	N/A	N/A	N/A
5/8/2009	15.4	N/A	N/A	N/A
5/9/2009	13.1	N/A	N/A	N/A
5/10/2009	10.4	N/A	N/A	N/A
5/11/2009	9.9	N/A	N/A	N/A
5/12/2009	10.1	N/A	N/A	N/A
5/13/2009	11.8	N/A	N/A	N/A
5/14/2009	15.6	N/A	N/A	N/A
5/15/2009	11.2	N/A	N/A	N/A
5/16/2009	11.9	N/A	N/A	N/A
5/17/2009	N/A	N/A	N/A	N/A
5/18/2009	N/A	N/A	N/A	N/A
5/19/2009	N/A	N/A	N/A	N/A
5/20/2009	N/A	N/A	N/A	N/A
5/21/2009	N/A	N/A	N/A	N/A
5/22/2009	N/A	N/A	N/A	N/A
5/23/2009	N/A	N/A	N/A	N/A
5/24/2009	N/A	N/A	N/A	N/A
5/25/2009	N/A	N/A	N/A	N/A
5/26/2009	N/A	N/A	N/A	N/A
5/27/2009	N/A	N/A	N/A	N/A
5/28/2009	N/A	N/A	N/A	N/A
Period 9				
5/29/2009	16.9	19.6	7.1	-301
5/30/2009	16.6	19.7	7.1	-357
5/31/2009	17.8	19.8	7.1	-394
6/1/2009	19.8	19.9	7.1	-400
6/2/2009	18.3	20.5	7.1	-417

Date	Temperature, °C		Lagoon pH	Lagoon ORP (mV)
	Air	Lagoon		
6/3/2009	15.1	20.3	7.0	-445
6/4/2009	14.4	20.3	7.0	-463
6/5/2009	16.6	20.3	7.0	-464
6/6/2009	20.0	20.5	7.0	-473
6/7/2009	21.2	20.7	7.0	-468
6/8/2009	22.6	20.9	7.0	-466
6/9/2009	20.4	21.5	7.0	-462
6/10/2009	17.8	21.5	7.0	-460
6/11/2009	19.3	21.5	7.0	-467
6/12/2009	18.7	21.5	7.1	-458
6/13/2009	19.6	21.8	7.1	-463
6/14/2009	20.4	22.0	7.1	-465
6/15/2009	21.7	22.3	7.1	-466
6/16/2009	20.0	N/A	7.1	-469
6/17/2009	20.9	N/A	7.1	-470
6/18/2009	19.2	22.4	7.1	-322
6/19/2009	25.5	22.8	7.1	-382
6/20/2009	24.3	23.6	7.1	-423
6/21/2009	25.1	24.2	7.1	-446
6/22/2009	24.6	24.7	7.1	-459
6/23/2009	25.8	25.3	7.1	-459
6/24/2009	26.2	26.0	7.1	-463
6/25/2009	27.3	26.6	7.1	-471
6/26/2009	27.2	27.6	7.1	-475
6/27/2009	23.8	27.5	7.1	-470
6/28/2009	25.2	27.6	7.1	-490
6/29/2009	21.7	27.1	7.1	-476
6/30/2009	18.5	26.3	7.1	-481
7/1/2009	16.8	25.4	7.1	-466
7/2/2009	17.1	24.6	7.2	-465
7/3/2009	20.4	24.3	7.2	-459
7/4/2009	18.4	24.3	7.2	-462
7/5/2009	20.2	24.0	7.2	-467
7/6/2009	21.6	24.5	7.2	-452
7/7/2009	21.3	24.9	7.2	-466
7/8/2009	19.4	24.7	7.2	-463
7/9/2009	20.3	24.4	7.2	-470
7/10/2009	22.0	24.8	7.1	-442
7/11/2009	23.8	25.2	7.1	-395
7/12/2009	20.9	25.5	7.1	-431
7/13/2009	19.9	25.6	7.1	-450

Date	Temperature, °C		Lagoon pH	Lagoon ORP (mV)
	Air	Lagoon		
7/14/2009	18.1	25.4	7.2	-465
7/15/2009	21.1	24.9	7.2	-471
7/16/2009	22.4	25.2	7.2	-487
7/17/2009	19.3	25.4	7.2	-493
7/18/2009	16.3	24.6	7.2	-485
7/19/2009	18.0	24.3	7.2	-490
7/20/2009	18.4	24.4	7.2	-487
7/21/2009	20.0	24.5	7.2	-488
7/22/2009	18.4	24.4	7.2	-485
7/23/2009	20.3	24.1	7.2	-477
7/24/2009	19.7	24.2	7.2	-487
7/25/2009	21.4	24.6	7.2	-487
7/26/2009	20.9	24.6	7.2	-490
7/27/2009	21.0	24.9	7.2	-490
7/28/2009	21.9	25.1	7.2	-486
7/29/2009	20.8	25.2	7.2	-487
7/30/2009	18.6	24.9	7.2	-477
7/31/2009	20.3	25.1	7.2	-459
8/1/2009	19.2	25.1	7.2	-436
8/2/2009	19.7	25.0	7.2	-471
8/3/2009	19.4	25.0	7.2	-489
8/4/2009	22.6	25.1	7.2	-494
8/5/2009	21.5	24.9	7.2	-506
8/6/2009	19.0	25.0	7.2	-496
8/7/2009	17.7	24.8	7.2	-505
8/8/2009	23.1	24.3	7.2	-500
8/9/2009	27.1	25.1	7.2	-505
8/10/2009	26.1	26.3	7.2	-509
8/11/2009	23.3	26.3	7.2	-509
8/12/2009	19.9	25.7	7.1	-485
8/13/2009	21.4	25.7	7.2	-482
8/14/2009	21.9	25.9	7.2	-491
8/15/2009	22.6	26.4	7.2	-483
8/16/2009	25.5	26.2	7.1	-482
8/17/2009	24.4	26.8	7.2	-482
8/18/2009	21.7	N/A	N/A	N/A
8/19/2009	21.8	N/A	N/A	N/A
8/20/2009	21.4	N/A	N/A	N/A
8/21/2009	19.7	N/A	N/A	N/A
8/22/2009	16.6	N/A	N/A	N/A
8/23/2009	16.5	N/A	N/A	N/A
8/24/2009	14.3	N/A	N/A	N/A

6.12 Daily Site Emissions and Data completeness

6.12.1 Daily NH_3 emission using RPM emissions model

Column headings for the following table are:

Date: Month/Day/Year
Valid values: Number of ½ hour periods with valid emissions data
Direction limited: Number of ½ hour periods invalidated because wind was from an excluded wind direction
Missing downwind NH_3: Number of ½ hour periods invalidated because at least 1 TDL path was either missing or else had invalid concentration values
Emission average ($\mu gm^{-2}s^{-1}$): Daily average emission calculated from the valid ½ hour periods
Emissions SD ($\mu gm^{-2}s^{-1}$): Daily emission standard deviation of the valid ½ hour periods
Emission minimum ($\mu gm^{-2}s^{-1}$): Daily minimum emission of the valid ½ hour periods
Emission maximum ($\mu gm^{-2}s^{-1}$): Daily maximum emission of the valid ½ hour periods
Emission average (kgd^{-1}): Daily average emission calculated from the valid ½ hour periods; totaled over the source area
Emission average ($gd^{-1}hd^{-1}$): Daily average emission calculated from the valid ½ hour periods; totaled over the source area on a per head basis
Emission average ($gd^{-1}AU^{-1}$): Daily average emission calculated from the valid ½ hour periods; totaled over the source area on a per animal unit basis

	Valid values	Cause for invalid values		Emission						
Date		Direction limited	Missing downwind NH_3	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
9/16/2008	6	0	4	28.1	6.8	14.7	33.7	23.0	8.9	6.6
9/17/2008	0	0	45	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/18/2008	0	0	32	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/19/2008	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/20/2008	2	0	44	52.1	30.5	30.5	73.7	42.8	16.4	12.2
9/21/2008	2	0	44	51.1	9.7	44.2	57.9	41.9	16.1	11.9
9/22/2008	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/23/2008	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/24/2008	1	0	42	27.4	N/A	27.4	27.4	22.5	8.6	6.4
9/25/2008	0	0	46	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/26/2008	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/27/2008	14	0	32	68.6	9.9	49.5	84.2	56.3	21.6	16.0
9/28/2008	22	0	19	41.8	19.6	17.9	81.1	34.3	13.2	9.8
9/29/2008	15	0	33	42.9	22.7	16.8	77.9	35.3	13.6	10.0
9/30/2008	27	0	15	26.8	13.4	8.4	63.2	22.0	8.5	6.3
10/1/2008	28	0	2	28.2	13.2	8.4	58.9	23.2	8.9	6.6
10/2/2008	27	0	12	24.3	6.5	13.7	37.9	20.0	7.7	5.7
10/3/2008	1	0	41	7.4	N/A	7.4	7.4	6.0	2.3	1.7
10/4/2008	9	0	34	30.8	13.7	16.8	50.5	25.2	9.7	7.2

	Valid values	Cause for invalid values		Emission						
Date		Direction limited	Missing downwind NH_3	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
10/5/2008	1	0	45	0.0	N/A	0.0	0.0	0.0	0.0	0.0
10/6/2008	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/7/2008	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/8/2008	0	0	36	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/9/2008	0	0	11	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/10/2008	17	0	7	39.0	8.4	16.8	49.5	32.0	12.3	9.1
10/11/2008	43	0	0	36.1	8.0	20.0	51.6	29.6	11.4	8.4
10/12/2008	34	0	4	31.9	15.1	13.7	64.2	26.2	10.1	7.5
10/13/2008	46	0	0	33.8	17.6	10.5	70.5	27.7	10.7	7.9
10/14/2008	25	0	18	31.0	14.2	8.4	56.8	25.4	9.8	7.2
10/15/2008	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/16/2008	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/17/2008	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/18/2008	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/19/2008	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/20/2008	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/21/2008	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/22/2008	14	0	33	35.6	5.5	27.4	47.4	29.3	11.3	8.3
10/23/2008	32	0	0	36.7	8.7	20.0	52.6	30.2	11.6	8.6
10/24/2008	29	0	0	28.3	10.2	11.6	44.2	23.2	8.9	6.6
10/25/2008	11	0	7	34.1	10.7	17.9	48.4	28.0	10.8	8.0
10/26/2008	26	0	1	31.1	11.7	13.7	57.9	25.5	9.8	7.3
10/27/2008	25	0	2	17.9	5.5	7.4	30.5	14.7	5.6	4.2
10/28/2008	11	0	0	13.0	5.5	6.3	21.1	10.7	4.1	3.0
10/29/2008	33	0	0	18.5	5.7	9.5	32.6	15.2	5.8	4.3
10/30/2008	23	0	3	27.5	7.1	11.6	41.1	22.5	8.7	6.4
10/31/2008	21	0	5	34.3	12.6	16.8	55.8	28.1	10.8	8.0
11/1/2008	29	0	1	10.6	23.8	-20.0	74.7	8.7	3.3	2.5
11/2/2008	19	0	0	27.4	8.4	15.8	44.2	22.5	8.7	6.4
11/3/2008	25	0	0	31.8	15.8	17.9	95.8	26.1	10.0	7.4
11/4/2008	28	0	1	19.1	9.4	6.3	45.3	15.7	6.0	4.5
11/5/2008	37	0	0	26.6	19.3	1.1	86.3	21.8	8.4	6.2
11/6/2008	45	0	0	37.3	16.1	11.6	74.7	30.6	11.8	8.7
11/7/2008	38	0	1	37.6	18.6	15.8	87.4	30.9	11.9	8.8
11/8/2008	21	0	24	27.5	3.4	18.9	32.6	22.6	8.7	6.4
11/9/2008	38	0	4	22.1	2.7	16.8	27.4	18.1	7.0	5.2
11/10/2008	10	0	1	14.3	3.8	8.4	20.0	11.8	4.5	3.3
11/11/2008	5	0	1	14.9	2.7	12.6	17.9	12.3	4.7	3.5
11/12/2008	29	0	1	20.5	6.4	10.5	33.7	16.8	6.5	4.8
11/13/2008	22	0	12	32.7	8.5	14.7	49.5	26.9	10.3	7.7
11/14/2008	5	0	27	27.4	8.8	14.7	36.8	22.5	8.6	6.4
11/15/2008	38	0	1	28.8	8.0	12.6	43.2	23.6	9.1	6.7

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11/16/2008	27	0	4	23.4	5.8	14.7	38.9	19.2	7.4	5.5
11/17/2008	13	0	16	15.4	4.0	5.3	22.1	12.6	4.9	3.6
11/18/2008	0	0	19	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11/19/2008	0	0	30	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11/20/2008	5	0	0	33.1	3.5	27.4	36.8	27.1	10.4	7.7
11/21/2008	27	0	2	15.4	5.2	5.3	29.5	12.6	4.9	3.6
11/22/2008	12	0	21	13.8	5.7	5.3	21.1	11.3	4.3	3.2
11/23/2008	1	0	11	21.1	N/A	21.1	21.1	17.3	6.6	4.9
11/24/2008	32	0	9	18.8	7.2	9.5	46.3	15.4	5.9	4.4
11/25/2008	43	0	0	16.2	4.4	7.4	26.3	13.3	5.1	3.8
11/26/2008	22	0	10	8.8	4.0	3.2	14.7	7.2	2.8	2.0
11/27/2008	6	0	14	12.8	4.8	4.2	17.9	10.5	4.0	3.0
11/28/2008	23	0	3	14.8	3.5	8.4	21.1	12.1	4.7	3.5
11/29/2008	14	0	7	10.5	8.2	1.1	28.4	8.6	3.3	2.5
11/30/2008	3	0	18	15.8	4.6	12.6	21.1	13.0	5.0	3.7
12/1/2008	16	0	7	26.1	10.1	11.6	42.1	21.4	8.2	6.1
12/2/2008	14	0	13	16.2	3.9	10.5	24.2	13.3	5.1	3.8
12/3/2008	10	0	19	29.5	9.1	22.1	47.4	24.2	9.3	6.9
12/4/2008	30	0	5	14.2	2.9	10.5	21.1	11.6	4.5	3.3
12/5/2008	11	0	11	10.5	3.5	6.3	15.8	8.6	3.3	2.5
12/6/2008	0	0	43	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/7/2008	4	0	38	6.1	1.6	5.3	8.4	5.0	1.9	1.4
12/8/2008	3	0	8	15.8	2.8	13.7	18.9	13.0	5.0	3.7
12/9/2008	0	0	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/10/2008	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/11/2008	0	0	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/12/2008	3	0	1	35.1	16.4	16.8	48.4	28.8	11.1	8.2
12/13/2008	0	0	43	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/14/2008	0	0	38	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/15/2008	6	0	20	29.5	5.9	18.9	34.7	24.2	9.3	6.9
12/16/2008	0	0	31	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/17/2008	1	0	8	3.2	N/A	3.2	3.2	2.6	1.0	0.7
12/18/2008	5	0	34	4.8	1.4	3.2	6.3	4.0	1.5	1.1
12/19/2008	0	0	22	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/20/2008	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/21/2008	0	0	40	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/22/2008	0	0	38	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/23/2008	0	0	28	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/24/2008	1	0	25	8.4	N/A	8.4	8.4	6.9	2.7	2.0
12/25/2008	4	0	20	7.1	1.6	5.3	8.4	5.8	2.2	1.7
12/26/2008	1	0	47	31.6	N/A	31.6	31.6	25.9	10.0	7.4
12/27/2008	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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12/28/2008	0	0	47	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/29/2008	0	0	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/30/2008	2	0	2	21.6	8.2	15.8	27.4	17.7	6.8	5.0
12/31/2008	0	0	43	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/1/2009	0	0	42	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/2/2009	0	0	43	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/3/2009	5	0	26	23.6	19.8	2.1	42.1	19.4	7.4	5.5
1/4/2009	0	0	38	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/5/2009	0	0	22	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/6/2009	0	0	28	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/7/2009	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/8/2009	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/9/2009	2	0	8	17.4	2.2	15.8	18.9	14.3	5.5	4.1
1/10/2009	5	0	29	16.2	1.2	14.7	17.9	13.3	5.1	3.8
1/11/2009	0	0	26	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/12/2009	0	0	39	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/13/2009	0	0	34	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/14/2009	0	0	33	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/15/2009	0	0	37	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/16/2009	0	0	39	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/17/2009	1	0	45	1.1	N/A	1.1	1.1	0.9	0.3	0.2
1/18/2009	0	0	19	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/19/2009	4	0	19	5.3	3.7	2.1	9.5	4.3	1.7	1.2
1/20/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/21/2009	0	0	47	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/22/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/23/2009	0	0	37	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/24/2009	0	0	36	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/25/2009	0	0	35	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/26/2009	0	0	38	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/27/2009	0	0	31	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/28/2009	0	0	42	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/29/2009	0	0	47	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/30/2009	0	0	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/31/2009	0	0	45	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/1/2009	0	0	42	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/2/2009	0	0	16	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/3/2009	1	0	34	12.6	N/A	12.6	12.6	10.4	4.0	3.0
2/4/2009	0	0	24	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/5/2009	2	0	41	4.2	0.0	4.2	4.2	3.5	1.3	1.0
2/6/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/7/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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2/8/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/9/2009	0	0	46	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/10/2009	0	0	47	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/11/2009	4	0	23	31.6	9.5	22.1	42.1	25.9	10.0	7.4
2/12/2009	12	0	30	16.1	4.0	9.5	21.1	13.2	5.1	3.8
2/13/2009	21	0	2	8.4	3.2	3.2	14.7	6.9	2.7	2.0
2/14/2009	17	0	28	13.5	3.9	9.5	22.1	11.1	4.3	3.2
2/15/2009	31	0	2	9.5	3.8	3.2	22.1	7.8	3.0	2.2
2/16/2009	22	0	5	9.3	4.4	3.2	21.1	7.6	2.9	2.2
2/17/2009	1	0	40	28.4	N/A	28.4	28.4	23.3	9.0	6.6
2/18/2009	12	0	27	19.5	6.1	10.5	29.5	16.0	6.1	4.6
2/19/2009	1	0	37	7.4	N/A	7.4	7.4	6.0	2.3	1.7
2/20/2009	4	0	35	8.7	3.5	6.3	13.7	7.1	2.7	2.0
2/21/2009	0	0	45	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/22/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/23/2009	0	0	42	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/24/2009	0	0	45	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/25/2009	0	0	29	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3/11/2009	0	0	9	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3/12/2009	1	0	27	11.6	N/A	11.6	11.6	9.5	3.7	2.7
3/13/2009	11	0	33	20.0	4.5	12.6	25.3	16.4	6.3	4.7
3/14/2009	30	0	2	17.1	5.3	9.5	26.3	14.1	5.4	4.0
3/15/2009	41	0	0	18.6	7.5	9.5	37.9	15.3	5.9	4.3
3/16/2009	23	0	0	21.3	5.4	14.7	40.0	17.5	6.7	5.0
3/17/2009	23	0	0	28.5	39.8	-21.1	120.0	23.4	9.0	6.7
3/18/2009	31	0	2	27.2	15.3	-4.2	51.6	22.3	8.6	6.4
3/19/2009	31	0	6	14.8	4.9	5.3	30.5	12.2	4.7	3.5
3/20/2009	29	0	3	18.7	7.7	6.3	34.7	15.3	5.9	4.4
3/21/2009	34	0	1	16.7	4.2	8.4	27.4	13.7	5.3	3.9
3/22/2009	39	0	0	20.1	6.8	1.1	34.7	16.5	6.3	4.7
3/23/2009	26	0	0	32.2	6.4	20.0	45.3	26.5	10.2	7.5
3/24/2009	23	0	0	34.4	9.0	23.2	52.6	28.2	10.9	8.0
3/25/2009	17	0	4	36.3	13.0	12.6	53.7	29.8	11.5	8.5
3/26/2009	22	0	2	17.2	4.5	9.5	30.5	14.1	5.4	4.0
3/27/2009	11	0	1	19.3	4.2	12.6	27.4	15.9	6.1	4.5
3/28/2009	18	0	17	42.7	9.9	22.1	58.9	35.0	13.5	10.0
3/29/2009	5	0	17	34.1	11.7	13.7	42.1	28.0	10.8	8.0
3/30/2009	5	0	37	25.1	12.1	6.3	40.0	20.6	7.9	5.9
3/31/2009	40	0	0	26.4	8.0	16.8	52.6	21.6	8.3	6.2
4/1/2009	8	0	30	19.5	7.1	12.6	30.5	16.0	6.1	4.6
4/2/2009	33	0	4	23.9	10.5	9.5	43.2	19.6	7.6	5.6
4/3/2009	5	0	33	26.9	19.7	9.5	52.6	22.1	8.5	6.3

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4/4/2009	5	0	43	8.6	2.3	6.3	11.6	7.1	2.7	2.0
4/5/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/6/2009	3	0	30	11.9	1.6	10.5	13.7	9.8	3.8	2.8
4/7/2009	1	0	7	7.4	N/A	7.4	7.4	6.0	2.3	1.7
4/8/2009	3	0	37	17.9	2.1	15.8	20.0	14.7	5.6	4.2
4/9/2009	16	0	3	11.2	5.3	4.2	22.1	9.2	3.5	2.6
4/10/2009	4	0	33	36.3	23.0	22.1	70.5	29.8	11.5	8.5
4/11/2009	35	0	4	18.8	3.5	13.7	29.5	15.5	5.9	4.4
4/12/2009	36	0	8	23.8	11.1	-9.5	47.4	19.6	7.5	5.6
4/13/2009	25	0	11	37.5	3.6	29.5	43.2	30.8	11.8	8.8
4/14/2009	18	0	14	20.9	5.8	12.6	30.5	17.2	6.6	4.9
4/15/2009	33	0	6	16.2	3.1	8.4	25.3	13.3	5.1	3.8
4/16/2009	29	0	10	29.1	10.8	7.4	49.5	23.9	9.2	6.8
4/17/2009	28	0	1	27.0	12.3	1.1	58.9	22.2	8.5	6.3
4/18/2009	23	0	1	28.5	16.5	12.6	72.6	23.4	9.0	6.7
4/19/2009	28	0	9	30.9	12.5	3.2	61.1	25.4	9.8	7.2
4/20/2009	5	0	27	24.2	4.3	17.9	29.5	19.9	7.6	5.7
4/21/2009	0	0	36	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/22/2009	10	0	23	15.3	3.6	9.5	20.0	12.5	4.8	3.6
4/23/2009	31	0	6	24.7	7.0	15.8	41.1	20.2	7.8	5.8
4/24/2009	25	0	12	28.8	6.7	20.0	52.6	23.6	9.1	6.7
4/25/2009	12	0	1	33.0	6.3	26.3	46.3	27.1	10.4	7.7
4/26/2009	38	0	0	42.1	20.0	20.0	89.5	34.6	13.3	9.9
4/27/2009	28	0	13	40.6	7.1	29.5	56.8	33.3	12.8	9.5
4/28/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/29/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/30/2009	1	0	42	35.8	N/A	35.8	35.8	29.4	11.3	8.4
5/1/2009	26	0	3	22.0	4.0	14.7	29.5	18.1	7.0	5.2
5/2/2009	27	0	4	25.9	6.8	8.4	33.7	21.3	8.2	6.1
5/3/2009	20	0	3	22.1	7.2	13.7	35.8	18.1	7.0	5.2
5/4/2009	17	0	10	45.1	13.7	20.0	62.1	37.0	14.2	10.5
5/5/2009	36	0	1	36.8	8.3	23.2	57.9	30.2	11.6	8.6
5/6/2009	38	0	0	25.7	5.7	13.7	37.9	21.1	8.1	6.0
5/7/2009	9	0	38	21.5	3.0	14.7	25.3	17.7	6.8	5.0
5/8/2009	15	0	29	18.5	6.4	10.5	33.7	15.1	5.8	4.3
5/9/2009	0	0	47	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/10/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/11/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/12/2009	22	0	16	36.3	13.3	9.5	57.9	29.8	11.4	8.5
5/13/2009	38	0	3	29.0	6.3	18.9	41.1	23.8	9.2	6.8
5/14/2009	12	0	36	31.4	5.3	24.2	43.2	25.8	9.9	7.3
5/15/2009	0	0	43	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Valid values	Cause for invalid values		Emission						
Date		Direction limited	Missing downwind NH_3	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
5/16/2009	1	0	47	9.5	N/A	9.5	9.5	7.8	3.0	2.2
5/17/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/18/2009	13	0	31	37.9	7.7	24.2	48.4	31.1	12.0	8.9
5/19/2009	22	0	21	21.8	8.1	8.4	40.0	17.9	6.9	5.1
5/20/2009	34	0	11	31.4	16.8	7.4	56.8	25.7	9.9	7.3
5/21/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/22/2009	0	0	46	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/23/2009	3	0	43	24.6	14.3	15.8	41.1	20.2	7.8	5.7
5/24/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/25/2009	0	0	23	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/26/2009	1	0	8	21.1	N/A	21.1	21.1	17.3	6.6	4.9
5/27/2009	2	0	46	25.8	5.2	22.1	29.5	21.2	8.1	6.0
5/28/2009	0	0	47	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/29/2009	0	0	47	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/30/2009	6	0	35	22.1	6.4	15.8	30.5	18.1	7.0	5.2
5/31/2009	5	0	42	26.5	7.9	15.8	33.7	21.8	8.4	6.2
6/1/2009	27	0	20	24.2	8.4	9.5	38.9	19.9	7.7	5.7
6/2/2009	1	0	28	20.0	N/A	20.0	20.0	16.4	6.3	4.7
6/3/2009	8	0	1	38.9	5.8	32.6	48.4	32.0	12.3	9.1
6/4/2009	4	0	42	29.2	10.4	16.8	42.1	24.0	9.2	6.8
6/5/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/6/2009	10	0	38	23.8	8.3	9.5	33.7	19.5	7.5	5.6
6/7/2009	26	0	17	19.5	6.4	7.4	30.5	16.0	6.1	4.6
6/8/2009	21	0	18	24.9	6.8	10.5	35.8	20.4	7.8	5.8
6/9/2009	0	0	40	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/10/2009	21	0	27	56.5	14.5	30.5	81.1	46.4	17.8	13.2
6/11/2009	26	0	16	38.5	19.3	10.5	68.4	31.6	12.2	9.0
6/12/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/13/2009	1	0	47	24.2	N/A	24.2	24.2	19.9	7.6	5.7
6/14/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/15/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/16/2009	0	0	44	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/17/2009	18	0	26	37.7	12.9	14.7	64.2	31.0	11.9	8.8
6/18/2009	7	0	40	37.1	14.9	16.8	57.9	30.5	11.7	8.7
6/19/2009	3	0	45	56.5	28.7	24.2	78.9	46.4	17.8	13.2
6/20/2009	10	0	13	28.0	12.5	6.3	46.3	23.0	8.8	6.5
6/21/2009	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/22/2009	0	0	22	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/23/2009	6	0	39	60.7	19.0	30.5	82.1	49.8	19.2	14.2
6/24/2009	20	0	16	66.5	25.2	27.4	118.9	54.6	21.0	15.6
6/25/2009	23	0	16	64.9	27.5	31.6	135.8	53.3	20.5	15.2
6/26/2009	34	0	8	68.2	30.0	6.3	120.0	56.0	21.5	15.9

	Valid values	Cause for invalid values		Emission						
Date		Direction limited	Missing downwind NH_3	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
6/27/2009	13	0	21	57.7	25.4	24.2	98.9	47.3	18.2	13.5
6/28/2009	26	0	15	43.4	21.7	11.6	92.6	35.6	13.7	10.1
6/29/2009	28	0	17	39.8	13.2	22.1	64.2	32.7	12.6	9.3
6/30/2009	31	0	7	40.6	12.7	16.8	63.2	33.3	12.8	9.5
7/1/2009	29	0	4	28.4	7.7	9.5	44.2	23.3	9.0	6.6
7/2/2009	37	0	0	29.8	15.4	6.3	60.0	24.4	9.4	7.0
7/3/2009	32	0	0	37.0	12.4	14.7	68.4	30.4	11.7	8.7
7/4/2009	20	0	19	50.1	30.8	13.7	110.5	41.1	15.8	11.7
7/5/2009	10	0	38	53.2	13.5	23.2	69.5	43.6	16.8	12.4
7/6/2009	9	0	38	44.1	6.6	33.7	52.6	36.2	13.9	10.3
7/7/2009	10	0	37	68.3	30.2	25.3	108.4	56.1	21.6	16.0
7/8/2009	13	0	35	63.7	17.7	22.1	88.4	52.3	20.1	14.9
7/9/2009	19	0	26	54.6	29.0	23.2	126.3	44.8	17.2	12.8
7/10/2009	13	0	22	39.4	13.7	9.5	56.8	32.3	12.4	9.2
7/11/2009	3	0	44	23.9	8.8	16.8	33.7	19.6	7.5	5.6
7/12/2009	0	0	47	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/13/2009	14	0	30	72.9	24.4	16.8	111.6	59.8	23.0	17.0
7/14/2009	28	0	12	66.1	15.2	49.5	109.5	54.2	20.9	15.5
7/15/2009	35	0	3	45.1	14.0	15.8	78.9	37.1	14.3	10.6
7/16/2009	34	0	7	40.2	18.8	11.6	84.2	33.0	12.7	9.4
7/17/2009	22	0	0	37.7	10.4	22.1	61.1	30.9	11.9	8.8
7/18/2009	40	0	1	22.9	13.7	7.4	65.3	18.8	7.2	5.3
7/19/2009	18	0	18	51.6	24.9	20.0	92.6	42.3	16.3	12.1
7/20/2009	5	0	37	36.0	12.0	22.1	53.7	29.5	11.4	8.4
7/21/2009	31	0	1	46.9	7.6	24.2	60.0	38.5	14.8	11.0
7/22/2009	6	0	29	41.2	19.8	12.6	63.2	33.8	13.0	9.6
7/23/2009	0	0	47	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/24/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/25/2009	12	0	36	43.0	8.9	30.5	64.2	35.3	13.6	10.1
7/26/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/27/2009	0	0	37	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/28/2009	2	0	13	59.5	11.2	51.6	67.4	48.8	18.8	13.9
7/29/2009	1	0	47	26.3	N/A	26.3	26.3	21.6	8.3	6.2
7/30/2009	8	0	40	26.8	4.9	17.9	32.6	22.0	8.5	6.3
7/31/2009	0	0	44	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/1/2009	0	0	46	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/2/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/3/2009	12	0	35	59.7	8.9	43.2	74.7	49.0	18.9	14.0
8/4/2009	24	0	18	34.0	9.3	10.5	54.7	27.9	10.7	7.9
8/5/2009	4	0	43	44.7	11.0	34.7	54.7	36.7	14.1	10.5
8/6/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/7/2009	23	0	14	35.8	7.1	22.1	49.5	29.4	11.3	8.4

	Valid values	Cause for invalid values		Emission						
Date		Direction limited	Missing downwind NH_3	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
8/8/2009	28	0	15	34.4	10.0	12.6	50.5	28.2	10.8	8.0
8/9/2009	5	0	43	39.8	2.7	36.8	44.2	32.7	12.6	9.3
8/10/2009	5	0	43	40.2	7.2	28.4	47.4	33.0	12.7	9.4
8/11/2009	16	0	32	63.7	12.6	44.2	88.4	52.3	20.1	14.9
8/12/2009	29	0	17	57.3	18.1	22.1	93.7	47.0	18.1	13.4
8/13/2009	17	0	25	42.0	18.8	12.6	91.6	34.5	13.3	9.8
8/14/2009	8	0	29	37.2	13.0	20.0	51.6	30.6	11.8	8.7
8/15/2009	0	0	44	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/16/2009	0	0	48	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/17/2009	2	0	34	38.9	3.0	36.8	41.1	32.0	12.3	9.1

6.12.2 Daily NH_3 emission using bLS emissions model

Column headings for the following table are:

Date: Month/Day/Year
Valid: Number of ½ hour periods with valid emissions data
Direction limited: Number of ½ hour periods invalidated because wind was from an excluded wind direction
Touchdown limited: Number of ½ hour periods invalidated because fraction of source area surface covered by particle touchdowns was less than 0.1
Turbulence limited: Number of ½ hour periods that the bLS model was not run because either $u_* < 0.15$ ms^{-1} or $|L| < 2$ m
Background (ppm): bLS model calculated daily average background concentration (ppm); average is over the ½ hour periods included in the valid column
Emission average ($\mu gm^{-2}s^{-1}$): Daily average emission calculated from the valid ½ hour periods
Emissions SD ($\mu gm^{-2}s^{-1}$): Daily emission standard deviation of the valid ½ hour periods
Emission minimum ($\mu gm^{-2}s^{-1}$): Daily minimum emission of the valid ½ hour periods
Emission maximum ($\mu gm^{-2}s^{-1}$): Daily maximum emission of the valid ½ hour periods
Emission average (kgd^{-1}): Daily average emission calculated from the valid ½ hour periods; totaled over the source area
Emission average ($gd^{-1}hd^{-1}$): Daily average emission calculated from the valid ½ hour periods; totaled over the source area on a per head basis
Emission average ($gd^{-1}AU^{-1}$): Daily average emission calculated from the valid ½ hour periods; totaled over the source area on a per animal unit basis

Date	Valid	Direction limited	Touchdown limited	Turbulence limited	Background (ppm)	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
9/16/2008	7	0	0	3	0.03	24.9	13.2	5.1	42.4	21.0	8.1	6.0
9/17/2008	16	0	1	22	0.11	38.1	16.1	3.0	70.2	32.1	12.3	9.1
9/18/2008	3	0	4	24	0.08	40.9	6.0	35.2	47.2	34.5	13.3	9.8
9/19/2008	4	0	13	25	0.16	4.7	4.1	1.4	10.7	3.9	1.5	1.1
9/20/2008	7	0	2	25	0.13	36.3	20.1	-4.9	56.3	30.6	11.8	8.7
9/21/2008	10	0	5	14	0.14	31.7	26.9	-3.1	89.0	26.7	10.3	7.6
9/22/2008	2	0	20	14	0.12	39.0	53.6	1.2	76.9	32.9	12.6	9.4
9/23/2008	0	0	11	19	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/24/2008	10	0	2	14	0.10	51.3	52.5	2.6	188.7	43.2	16.6	12.3
9/25/2008	10	0	4	16	0.11	65.2	46.1	-19.0	111.1	54.9	21.1	15.6
9/26/2008	15	0	6	17	0.10	60.0	19.3	13.2	89.3	50.5	19.4	14.4
9/27/2008	28	0	0	13	0.11	59.8	42.1	1.4	113.0	50.4	19.4	14.3
9/28/2008	21	0	0	15	0.04	57.1	27.5	14.1	114.5	48.1	18.5	13.7
9/29/2008	24	0	4	11	0.08	39.2	20.6	9.2	77.9	33.0	12.7	9.4
9/30/2008	28	0	0	8	0.02	25.5	20.1	0.2	65.5	21.5	8.3	6.1
10/1/2008	26	0	0	8	0.01	37.0	28.4	1.4	92.9	31.2	12.0	8.9
10/2/2008	25	0	0	12	0.05	21.3	9.4	8.3	41.7	17.9	6.9	5.1
10/3/2008	22	0	4	13	0.10	30.1	16.4	5.9	55.2	25.4	9.8	7.2
10/4/2008	21	0	1	19	0.13	23.3	15.7	-1.8	48.8	19.6	7.5	5.6
10/5/2008	5	0	10	20	0.12	23.8	12.2	6.1	38.9	20.1	7.7	5.7

Date	Valid	Direction limited	Touchdown limited	Turbulence limited	Background (ppm)	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
10/6/2008	0	0	33	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/7/2008	2	0	35	0	0.10	-3.7	0.9	-4.4	-3.1	-3.1	-1.2	-0.9
10/8/2008	13	0	10	0	0.11	-3.1	12.1	-25.1	29.2	-2.6	-1.0	-0.7
10/9/2008	1	0	4	1	0.37	13.5	N/A	13.5	13.5	11.4	4.4	3.3
10/10/2008	14	0	0	17	0.04	44.2	11.5	31.3	63.7	37.2	14.3	10.6
10/11/2008	20	0	0	18	0.03	42.2	28.4	9.7	108.3	35.5	13.7	10.1
10/12/2008	18	0	0	11	-0.01	61.7	40.6	4.0	127.8	52.0	20.0	14.8
10/13/2008	24	0	0	7	0.04	55.8	23.7	9.4	93.4	47.0	18.1	13.4
10/14/2008	34	0	0	5	0.02	35.9	14.4	14.2	74.1	30.3	11.6	8.6
10/15/2008	0	0	3	20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/16/2008	0	0	2	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/17/2008	0	0	3	13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/18/2008	0	0	2	13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/19/2008	0	0	0	14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/20/2008	0	0	0	16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/21/2008	0	0	2	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/22/2008	12	0	0	18	0.03	44.4	5.8	37.1	54.5	37.4	14.4	10.6
10/23/2008	38	0	0	3	0.05	39.1	13.5	18.6	67.0	32.9	12.7	9.4
10/24/2008	37	0	0	4	0.03	24.2	12.3	1.6	49.7	20.3	7.8	5.8
10/25/2008	40	0	0	0	0.06	19.3	3.9	11.6	27.4	16.3	6.3	4.6
10/26/2008	41	0	0	0	0.06	14.6	8.2	-10.1	26.4	12.3	4.7	3.5
10/27/2008	22	0	2	0	0.06	8.7	3.7	2.1	16.7	7.3	2.8	2.1
10/28/2008	6	0	0	0	0.07	11.0	5.1	0.9	15.0	9.3	3.6	2.6
10/29/2008	35	0	0	3	0.07	7.9	6.8	0.6	22.9	6.6	2.6	1.9
10/30/2008	17	0	0	17	0.02	35.1	19.0	1.0	67.8	29.6	11.4	8.4
10/31/2008	34	0	0	5	0.04	19.9	9.7	3.8	38.9	16.7	6.4	4.8
11/1/2008	15	0	0	15	0.12	27.8	20.0	3.9	68.3	23.4	9.0	6.7
11/2/2008	36	0	0	4	0.03	31.3	7.7	13.0	50.6	26.3	10.1	7.5
11/3/2008	31	0	0	9	0.05	30.8	12.5	14.2	62.7	25.9	10.0	7.4
11/4/2008	15	0	0	17	0.04	39.7	8.2	20.7	53.9	33.4	12.9	9.5
11/5/2008	16	0	0	10	0.05	53.4	23.5	7.8	90.9	45.0	17.3	12.8
11/6/2008	36	0	0	2	0.05	33.4	22.5	0.5	75.7	28.1	10.8	8.0
11/7/2008	35	0	0	5	0.05	31.1	12.4	13.3	60.8	26.2	10.1	7.5
11/8/2008	39	0	2	0	0.06	16.2	6.3	-6.7	32.4	13.6	5.2	3.9
11/9/2008	39	0	1	0	0.06	9.9	2.6	5.0	15.7	8.3	3.2	2.4
11/10/2008	34	0	0	4	0.06	8.1	3.4	4.9	22.1	6.8	2.6	1.9
11/11/2008	20	0	0	18	0.05	10.3	4.7	0.2	19.6	8.7	3.4	2.5
11/12/2008	41	0	0	0	0.03	16.2	4.9	8.8	32.9	13.7	5.3	3.9
11/13/2008	39	0	1	0	0.04	17.9	12.8	-8.9	44.2	15.1	5.8	4.3
11/14/2008	41	0	0	0	0.03	23.5	11.3	0.0	48.8	19.7	7.6	5.6
11/15/2008	40	0	1	0	0.04	18.3	6.8	5.0	33.4	15.4	5.9	4.4
11/16/2008	40	0	0	0	0.05	11.6	3.4	5.3	19.0	9.7	3.7	2.8
11/17/2008	11	0	0	10	0.05	10.9	4.5	7.2	22.0	9.2	3.5	2.6
11/18/2008	0	0	0	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11/19/2008	0	0	0	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Date	Valid	Direction limited	Touchdown limited	Turbulence limited	Background (ppm)	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
11/20/2008	11	0	0	0	0.08	6.3	1.4	3.7	8.5	5.3	2.0	1.5
11/21/2008	36	0	0	4	0.06	6.8	3.1	2.5	15.5	5.7	2.2	1.6
11/22/2008	17	0	0	22	0.03	7.3	4.9	2.4	20.3	6.1	2.4	1.7
11/23/2008	17	0	0	18	0.04	7.8	5.5	1.1	15.8	6.6	2.5	1.9
11/24/2008	30	0	1	6	0.05	4.0	3.5	-1.0	11.6	3.4	1.3	1.0
11/25/2008	39	0	0	1	0.06	4.9	2.4	1.5	11.4	4.1	1.6	1.2
11/26/2008	14	0	0	24	0.05	3.8	4.8	-3.0	9.2	3.2	1.2	0.9
11/27/2008	15	0	0	12	0.05	6.0	3.4	1.9	15.5	5.0	1.9	1.4
11/28/2008	36	0	0	5	0.06	4.2	3.0	-1.4	11.0	3.5	1.3	1.0
11/29/2008	11	0	0	18	0.09	12.3	8.9	2.0	25.2	10.3	4.0	2.9
11/30/2008	21	0	2	12	0.07	9.2	3.3	4.2	20.0	7.8	3.0	2.2
12/1/2008	41	0	0	0	0.07	3.1	4.5	-7.6	20.1	2.6	1.0	0.8
12/2/2008	41	0	0	0	0.06	4.4	4.8	-4.5	15.2	3.7	1.4	1.1
12/3/2008	39	0	2	0	0.04	16.0	8.3	-8.7	37.8	13.4	5.2	3.8
12/4/2008	39	0	0	0	0.06	0.9	4.3	-9.5	7.0	0.8	0.3	0.2
12/5/2008	40	0	0	0	0.06	-2.7	2.3	-7.1	3.1	-2.3	-0.9	-0.6
12/6/2008	33	0	0	0	0.05	3.8	5.0	-7.2	19.7	3.2	1.2	0.9
12/7/2008	37	0	0	4	0.06	-0.2	2.8	-7.8	5.0	-0.1	0.0	0.0
12/8/2008	29	0	0	0	0.03	6.4	1.9	2.0	10.4	5.4	2.1	1.5
12/9/2008	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/10/2008	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/11/2008	4	0	0	6	0.07	-4.4	0.3	-4.7	-4.0	-3.7	-1.4	-1.1
12/12/2008	39	0	0	2	0.08	-2.6	3.8	-10.4	10.3	-2.2	-0.9	-0.6
12/13/2008	35	0	0	6	0.05	5.1	3.2	-3.8	13.9	4.3	1.6	1.2
12/14/2008	40	0	0	0	0.04	7.4	3.7	1.3	16.1	6.2	2.4	1.8
12/15/2008	25	0	0	0	0.06	0.2	9.2	-22.1	13.9	0.2	0.1	0.0
12/16/2008	33	0	0	7	0.07	-2.1	3.4	-7.4	3.5	-1.8	-0.7	-0.5
12/17/2008	8	0	0	0	0.06	-1.9	4.0	-6.6	3.4	-1.6	-0.6	-0.5
12/18/2008	9	0	0	32	0.04	2.1	3.2	-2.4	7.5	1.7	0.7	0.5
12/19/2008	16	0	0	4	0.06	-2.1	4.0	-9.2	3.3	-1.8	-0.7	-0.5
12/20/2008	40	0	0	1	0.06	-0.5	2.0	-4.4	4.1	-0.4	-0.1	-0.1
12/21/2008	22	0	0	4	0.07	-6.8	8.1	-26.3	7.0	-5.7	-2.2	-1.6
12/22/2008	39	0	0	1	0.07	-8.5	2.3	-14.2	-2.2	-7.2	-2.8	-2.0
12/23/2008	27	0	0	6	0.07	1.3	2.9	-4.5	8.2	1.1	0.4	0.3
12/24/2008	27	0	0	0	0.06	-2.2	7.1	-13.5	8.9	-1.9	-0.7	-0.5
12/25/2008	31	0	1	9	0.06	-2.7	4.2	-8.7	7.4	-2.3	-0.9	-0.6
12/26/2008	40	0	0	1	0.06	2.4	2.1	-2.8	7.7	2.1	0.8	0.6
12/27/2008	34	0	3	0	0.05	7.9	4.0	-1.4	15.0	6.6	2.6	1.9
12/28/2008	31	0	6	2	0.06	-9.3	20.3	-42.2	36.7	-7.9	-3.0	-2.2
12/29/2008	14	0	0	9	0.07	-1.4	6.1	-11.6	6.0	-1.2	-0.4	-0.3
12/30/2008	3	0	0	1	0.03	13.4	5.0	7.6	16.7	11.3	4.3	3.2
12/31/2008	6	0	5	1	0.07	-10.7	13.7	-21.1	16.1	-9.0	-3.4	-2.6
1/1/2009	31	0	0	9	-0.02	15.2	4.8	5.7	23.4	12.8	4.9	3.6
1/2/2009	39	0	1	2	0.05	-3.4	9.7	-17.0	12.8	-2.9	-1.1	-0.8
1/3/2009	28	0	0	11	0.03	6.9	3.0	0.2	12.0	5.8	2.2	1.6

Date	Valid	Direction limited	Touchdown limited	Turbulence limited	Background (ppm)	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
1/4/2009	39	0	0	1	0.02	3.6	11.8	-13.6	32.9	3.0	1.2	0.9
1/5/2009	25	0	0	8	0.06	-12.8	5.0	-22.0	-4.0	-10.8	-4.2	-3.1
1/6/2009	13	0	0	17	0.04	2.5	2.8	-2.7	7.7	2.1	0.8	0.6
1/7/2009	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/8/2009	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/9/2009	12	0	0	0	0.00	12.5	6.4	5.1	23.3	10.5	4.1	3.0
1/10/2009	39	0	0	0	0.04	0.9	9.2	-15.4	16.0	0.7	0.3	0.2
1/11/2009	29	0	0	10	0.06	-5.7	2.2	-10.1	-1.4	-4.8	-1.9	-1.4
1/12/2009	28	0	0	13	0.04	-0.4	6.4	-10.4	9.8	-0.3	-0.1	-0.1
1/13/2009	38	0	0	1	0.04	-6.5	11.5	-25.1	23.3	-5.5	-2.1	-1.6
1/14/2009	20	0	6	13	0.05	-2.5	7.2	-23.6	6.4	-2.1	-0.8	-0.6
1/15/2009	33	0	1	5	0.05	-8.6	4.4	-15.7	2.9	-7.2	-2.8	-2.1
1/16/2009	19	0	1	19	0.04	-4.2	7.1	-22.9	4.1	-3.6	-1.4	-1.0
1/17/2009	31	0	0	2	0.01	6.1	9.6	-18.4	20.4	5.2	2.0	1.5
1/18/2009	3	0	2	3	0.07	-13.6	7.2	-21.9	-8.9	-11.4	-4.4	-3.3
1/19/2009	16	0	0	23	0.06	-4.7	3.2	-8.9	3.1	-4.0	-1.5	-1.1
1/20/2009	0	0	0	21	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/21/2009	0	0	1	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/22/2009	0	0	0	14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/23/2009	7	0	0	10	0.07	-19.4	3.5	-23.3	-14.5	-16.3	-6.3	-4.6
1/24/2009	37	0	0	3	0.06	-10.9	3.9	-21.3	-4.7	-9.1	-3.5	-2.6
1/25/2009	27	0	0	14	0.05	-6.1	1.9	-9.6	-2.7	-5.2	-2.0	-1.5
1/26/2009	2	0	0	36	0.08	-7.1	3.0	-9.2	-5.0	-6.0	-2.3	-1.7
1/27/2009	16	0	0	27	0.04	0.6	4.2	-10.0	5.6	0.5	0.2	0.1
1/28/2009	29	0	0	7	0.06	-7.3	8.0	-31.6	6.4	-6.2	-2.4	-1.8
1/29/2009	36	0	0	3	0.04	1.3	8.6	-26.2	18.7	1.1	0.4	0.3
1/30/2009	18	0	0	0	0.02	-5.4	6.5	-17.7	0.9	-4.5	-1.7	-1.3
1/31/2009	20	0	0	21	-0.04	17.9	6.4	-1.7	27.0	15.1	5.8	4.3
2/1/2009	33	0	0	8	-0.02	6.2	6.0	-2.2	16.8	5.2	2.0	1.5
2/2/2009	20	0	0	19	-0.01	3.2	2.9	-1.9	7.9	2.7	1.0	0.8
2/3/2009	30	0	0	8	0.03	-8.0	7.7	-21.3	6.2	-6.7	-2.6	-1.9
2/4/2009	22	0	0	15	0.01	-3.0	3.7	-10.9	4.2	-2.5	-1.0	-0.7
2/5/2009	15	0	0	20	0.00	9.8	1.6	7.1	12.3	8.3	3.2	2.4
2/6/2009	23	0	0	11	0.00	7.0	1.8	4.0	10.0	5.9	2.3	1.7
2/7/2009	33	0	0	0	0.00	12.1	10.5	5.3	62.3	10.2	3.9	2.9
2/8/2009	0	0	2	17	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/9/2009	9	0	0	12	0.01	9.8	2.8	5.1	13.1	8.3	3.2	2.4
2/10/2009	41	0	0	0	0.03	8.6	3.6	-0.8	21.8	7.2	2.8	2.1
2/11/2009	40	0	0	0	0.02	14.4	7.8	-11.1	31.4	12.2	4.7	3.5
2/12/2009	41	0	0	0	0.06	0.8	6.8	-23.5	7.1	0.7	0.3	0.2
2/13/2009	28	0	0	12	0.06	3.7	2.5	-1.4	9.4	3.1	1.2	0.9
2/14/2009	24	0	1	4	0.07	7.6	1.6	4.2	11.2	6.4	2.5	1.8
2/15/2009	23	0	0	16	0.07	3.4	3.6	-5.0	9.7	2.8	1.1	0.8
2/16/2009	24	0	0	17	0.07	3.6	4.8	-6.8	10.2	3.1	1.2	0.9
2/17/2009	30	0	0	12	0.03	9.1	6.4	2.0	22.0	7.6	2.9	2.2

Date	Valid	Direction limited	Touchdown limited	Turbulence limited	Background (ppm)	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
2/18/2009	35	0	4	0	0.04	13.4	6.2	-0.6	23.4	11.3	4.3	3.2
2/19/2009	4	0	1	1	0.06	5.7	3.5	3.0	10.6	4.8	1.9	1.4
2/20/2009	10	0	1	7	0.05	-2.2	3.6	-9.2	2.3	-1.9	-0.7	-0.5
2/21/2009	19	0	2	9	0.04	6.8	4.8	-2.0	13.3	5.8	2.2	1.6
2/22/2009	44	0	0	0	0.06	1.8	5.8	-5.6	21.4	1.5	0.6	0.4
2/23/2009	17	0	0	30	0.06	-0.7	2.5	-4.2	3.6	-0.5	-0.2	-0.2
2/24/2009	22	0	0	23	0.03	6.3	2.6	0.6	11.0	5.3	2.1	1.5
2/25/2009	27	0	0	1	0.03	3.9	1.4	2.2	6.7	3.3	1.3	0.9
3/11/2009	9	0	0	0	0.05	12.1	2.2	8.8	15.8	10.1	3.9	2.9
3/12/2009	45	0	2	1	0.05	13.7	5.1	4.6	31.0	11.6	4.4	3.3
3/13/2009	24	0	7	17	0.06	9.1	5.1	-4.5	18.8	7.7	3.0	2.2
3/14/2009	8	0	0	38	0.03	18.6	2.5	14.3	20.8	15.7	6.0	4.5
3/15/2009	15	0	0	33	0.02	23.9	5.5	13.3	35.5	20.1	7.7	5.7
3/16/2009	25	0	0	21	0.04	23.8	13.2	3.6	50.6	20.0	7.7	5.7
3/17/2009	23	0	0	11	0.09	17.9	4.1	10.6	29.5	15.1	5.8	4.3
3/18/2009	33	0	0	13	0.08	26.7	15.2	-5.4	82.1	22.5	8.7	6.4
3/19/2009	32	0	0	15	0.03	23.9	8.2	9.7	42.8	20.1	7.7	5.7
3/20/2009	33	0	0	15	0.06	17.7	5.8	9.2	42.1	14.9	5.7	4.2
3/21/2009	30	0	0	17	0.07	17.2	9.7	1.6	53.0	14.5	5.6	4.1
3/22/2009	20	0	0	22	0.06	37.4	14.5	11.7	75.7	31.5	12.1	9.0
3/23/2009	44	0	0	3	0.06	23.4	5.7	12.0	37.1	19.7	7.6	5.6
3/24/2009	48	0	0	0	0.07	18.6	3.2	8.4	25.4	15.7	6.0	4.5
3/25/2009	44	0	0	4	0.05	26.2	9.7	1.0	47.8	22.0	8.5	6.3
3/26/2009	32	0	0	15	0.04	25.4	17.4	7.1	96.2	21.4	8.2	6.1
3/27/2009	18	0	0	23	0.06	25.8	12.9	3.6	46.2	21.7	8.3	6.2
3/28/2009	48	0	0	0	0.07	21.5	7.4	9.0	36.9	18.1	7.0	5.2
3/29/2009	46	0	1	0	0.05	15.8	13.3	-43.3	57.1	13.3	5.1	3.8
3/30/2009	36	0	0	12	0.04	21.6	21.5	-0.2	91.0	18.2	7.0	5.2
3/31/2009	47	0	0	1	0.07	16.3	7.7	-1.3	32.3	13.7	5.3	3.9
4/1/2009	45	0	0	3	0.05	18.5	8.6	7.1	37.5	15.6	6.0	4.4
4/2/2009	31	0	0	13	0.07	19.3	8.0	7.1	36.3	16.3	6.3	4.6
4/3/2009	47	0	0	0	0.04	25.8	9.7	8.8	48.7	21.7	8.4	6.2
4/4/2009	4	0	9	23	0.02	9.0	6.3	0.0	14.6	7.6	2.9	2.2
4/5/2009	0	0	0	13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/6/2009	24	0	1	0	0.00	30.4	8.0	15.0	46.2	25.6	9.9	7.3
4/7/2009	35	0	0	0	0.01	20.8	5.3	10.1	31.1	17.5	6.7	5.0
4/8/2009	43	0	0	5	0.04	13.2	7.0	2.9	25.3	11.1	4.3	3.2
4/9/2009	16	0	0	29	0.02	37.6	12.5	8.1	60.6	31.7	12.2	9.0
4/10/2009	43	0	0	5	0.06	18.9	5.3	6.1	28.8	15.9	6.1	4.5
4/11/2009	46	0	0	2	0.06	17.4	5.2	10.2	33.1	14.7	5.6	4.2
4/12/2009	34	0	0	14	0.05	23.0	7.1	10.5	41.7	19.4	7.5	5.5
4/13/2009	47	0	1	0	0.06	20.2	4.7	12.1	29.7	17.0	6.5	4.8
4/14/2009	36	0	2	10	0.05	13.5	4.3	-0.8	19.5	11.4	4.4	3.2
4/15/2009	47	0	0	1	0.07	13.6	2.1	9.1	18.4	11.4	4.4	3.3
4/16/2009	19	0	0	23	0.06	33.3	7.7	22.4	49.0	28.0	10.8	8.0

Date	Valid	Direction limited	Touchdown limited	Turbulence limited	Background (ppm)	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
4/17/2009	17	0	0	21	0.06	51.2	24.7	8.5	105.9	43.1	16.6	12.3
4/18/2009	11	0	0	29	0.07	52.6	22.7	15.0	95.5	44.3	17.0	12.6
4/19/2009	21	0	1	21	0.07	26.1	7.7	13.2	43.3	22.0	8.5	6.3
4/20/2009	40	0	2	4	0.04	15.3	6.3	-0.1	29.5	12.9	5.0	3.7
4/21/2009	47	0	1	0	0.05	9.4	4.0	0.2	21.8	7.9	3.1	2.3
4/22/2009	40	0	0	7	0.03	16.6	6.1	6.9	27.5	14.0	5.4	4.0
4/23/2009	25	0	0	22	0.06	30.7	7.0	17.1	42.0	25.9	9.9	7.4
4/24/2009	48	0	0	0	0.06	32.2	14.0	14.9	69.4	27.1	10.4	7.7
4/25/2009	48	0	0	0	0.05	40.2	9.0	25.8	70.2	33.8	13.0	9.6
4/26/2009	43	0	0	5	0.10	44.8	30.9	-110.3	91.4	37.7	14.5	10.7
4/27/2009	35	0	1	1	0.08	53.4	13.4	23.1	78.8	44.9	17.3	12.8
4/28/2009	0	0	1	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/29/2009	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/30/2009	11	0	1	2	0.05	25.9	8.6	17.9	41.4	21.8	8.4	6.2
5/1/2009	41	0	0	7	0.04	26.4	7.8	15.7	45.9	22.2	8.5	6.3
5/2/2009	28	0	0	19	0.03	39.5	13.6	17.2	62.2	33.3	12.8	9.5
5/3/2009	15	0	0	24	0.01	60.8	21.6	17.9	84.4	51.2	19.7	14.6
5/4/2009	18	0	0	29	0.07	41.4	16.1	11.1	75.1	34.9	13.4	9.9
5/5/2009	20	0	0	16	0.07	43.0	18.4	25.4	101.2	36.2	13.9	10.3
5/6/2009	27	0	0	11	0.01	36.5	13.7	6.3	70.5	30.7	11.8	8.8
5/7/2009	33	0	3	10	0.04	55.6	78.0	0.9	480.8	46.8	18.0	13.3
5/8/2009	18	0	1	25	0.03	40.1	23.0	1.4	95.1	33.8	13.0	9.6
5/9/2009	15	0	7	10	0.05	33.4	15.6	6.0	63.3	28.1	10.8	8.0
5/10/2009	14	0	6	18	0.04	58.7	18.3	21.8	85.2	49.4	19.0	14.1
5/11/2009	16	0	10	15	0.05	19.8	18.1	-23.2	54.6	16.7	6.4	4.8
5/12/2009	27	0	0	20	0.03	43.1	21.4	8.9	87.8	36.3	14.0	10.3
5/13/2009	39	0	0	8	0.01	34.2	16.2	10.7	78.4	28.8	11.1	8.2
5/14/2009	29	0	18	0	0.02	41.3	17.0	-5.5	60.5	34.8	13.4	9.9
5/15/2009	20	0	0	25	0.04	53.5	19.4	0.8	78.3	45.1	17.3	12.8
5/16/2009	22	0	5	3	0.03	18.7	15.1	0.0	58.0	15.8	6.1	4.5
5/17/2009	0	0	19	18	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/18/2009	20	0	2	12	0.00	68.7	31.7	23.0	127.7	57.9	22.3	16.5
5/19/2009	40	0	0	7	0.03	66.5	39.6	12.4	143.6	56.0	21.5	16.0
5/20/2009	36	0	1	7	0.03	75.8	48.5	11.0	174.9	63.8	24.5	18.2
5/21/2009	0	0	1	16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/22/2009	11	0	1	24	0.03	58.9	51.6	0.0	134.1	49.6	19.1	14.1
5/23/2009	35	0	1	12	0.05	39.7	21.0	2.3	87.5	33.4	12.9	9.5
5/24/2009	27	0	0	14	0.10	61.8	25.6	1.0	107.5	52.0	20.0	14.8
5/25/2009	12	0	3	6	0.02	61.1	6.4	50.0	72.7	51.5	19.8	14.7
5/26/2009	9	0	0	0	0.06	89.7	52.9	16.1	160.3	75.5	29.0	21.5
5/27/2009	43	0	0	5	0.05	77.1	48.9	1.1	158.6	64.9	25.0	18.5
5/28/2009	6	0	13	9	0.04	49.7	31.5	-0.5	83.7	41.9	16.1	11.9
5/29/2009	5	0	16	14	0.02	14.5	6.1	5.7	21.9	12.2	4.7	3.5
5/30/2009	17	0	3	27	0.02	79.6	27.9	27.6	117.9	67.0	25.8	19.1
5/31/2009	25	0	7	13	0.02	36.3	28.2	-4.7	100.9	30.6	11.8	8.7

Date	Valid	Direction limited	Touchdown limited	Turbulence limited	Background (ppm)	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
6/1/2009	41	0	1	6	0.03	48.7	47.5	-16.2	142.3	41.0	15.8	11.7
6/2/2009	5	0	1	17	0.04	17.9	9.7	5.8	30.4	15.1	5.8	4.3
6/3/2009	16	0	0	1	0.01	38.4	6.0	26.5	50.5	32.3	12.4	9.2
6/4/2009	25	0	1	20	0.01	58.0	20.4	2.6	94.1	48.8	18.8	13.9
6/5/2009	15	0	7	17	0.02	37.6	24.8	7.6	97.8	31.7	12.2	9.0
6/6/2009	33	0	0	13	0.03	67.1	32.7	7.9	152.7	56.5	21.7	16.1
6/7/2009	42	0	0	4	0.02	45.3	28.9	1.5	97.9	38.2	14.7	10.9
6/8/2009	38	0	0	8	0.03	63.4	39.2	7.8	148.3	53.3	20.5	15.2
6/9/2009	18	0	10	11	0.06	30.1	21.0	2.5	66.3	25.3	9.7	7.2
6/10/2009	34	0	2	12	0.04	52.7	14.4	13.2	76.7	44.4	17.1	12.6
6/11/2009	35	0	6	5	0.02	27.9	17.0	6.8	61.0	23.5	9.0	6.7
6/12/2009	18	0	28	2	0.03	49.6	25.2	8.8	97.2	41.7	16.0	11.9
6/13/2009	20	0	5	17	0.01	39.9	21.3	13.1	85.9	33.6	12.9	9.6
6/14/2009	24	0	11	13	0.02	44.1	18.1	21.0	107.4	37.1	14.3	10.6
6/15/2009	14	0	7	27	0.02	77.0	13.7	53.1	99.1	64.8	24.9	18.5
6/16/2009	35	0	1	8	0.02	53.7	17.3	14.3	90.4	45.2	17.4	12.9
6/17/2009	29	0	7	10	0.02	47.4	33.2	2.7	108.8	39.9	15.4	11.4
6/18/2009	17	0	9	17	0.08	32.0	23.9	-8.1	83.3	26.9	10.4	7.7
6/19/2009	24	0	7	6	0.07	51.9	25.7	-2.9	95.9	43.7	16.8	12.4
6/20/2009	31	0	1	0	0.02	33.5	26.2	0.7	93.2	28.2	10.8	8.0
6/21/2009	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/22/2009	2	0	6	3	0.12	59.0	77.9	3.8	114.1	49.6	19.1	14.1
6/23/2009	14	0	4	18	0.13	56.5	37.3	-13.1	102.1	47.5	18.3	13.5
6/24/2009	18	0	0	17	0.12	92.3	43.5	4.7	173.1	77.7	29.9	22.1
6/25/2009	20	0	0	14	0.11	62.0	40.4	0.2	158.2	52.2	20.1	14.9
6/26/2009	25	0	0	13	0.06	121.9	54.6	5.8	209.3	102.6	39.5	29.2
6/27/2009	19	0	0	16	0.10	64.4	42.4	5.5	145.6	54.2	20.9	15.5
6/28/2009	31	0	0	7	0.03	46.7	34.8	1.3	139.3	39.3	15.1	11.2
6/29/2009	40	0	0	0	0.02	23.8	14.1	2.8	58.2	20.1	7.7	5.7
6/30/2009	28	0	0	11	0.02	46.5	24.9	0.3	87.4	39.1	15.0	11.1
7/1/2009	27	0	0	15	0.03	29.0	13.2	5.1	63.3	24.4	9.4	7.0
7/2/2009	29	0	0	5	0.03	32.8	21.2	4.1	82.8	27.6	10.6	7.9
7/3/2009	22	0	0	17	0.04	48.3	24.9	17.9	115.9	40.7	15.7	11.6
7/4/2009	25	0	0	13	0.04	26.5	17.9	2.4	74.8	22.3	8.6	6.4
7/5/2009	22	0	0	18	0.04	70.3	30.6	11.0	113.6	59.2	22.8	16.9
7/6/2009	19	0	0	18	0.03	64.4	26.8	18.8	106.6	54.2	20.9	15.4
7/7/2009	20	0	0	16	0.05	81.9	32.7	19.7	156.0	69.0	26.5	19.6
7/8/2009	21	0	1	20	0.06	56.7	25.6	20.2	108.3	47.7	18.4	13.6
7/9/2009	25	0	0	14	0.06	43.9	13.6	16.3	67.4	37.0	14.2	10.5
7/10/2009	13	0	0	14	0.05	45.9	33.0	3.0	110.5	38.6	14.8	11.0
7/11/2009	11	0	10	13	0.02	53.2	20.8	29.4	92.7	44.8	17.2	12.8
7/12/2009	0	0	17	13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/13/2009	22	0	1	16	0.03	71.0	47.0	7.0	145.0	59.8	23.0	17.0
7/14/2009	27	0	0	16	0.07	62.0	28.8	21.9	124.5	52.2	20.1	14.9
7/15/2009	41	0	0	6	0.02	35.2	24.8	4.0	94.4	29.6	11.4	8.4

Date	Valid	Direction limited	Touchdown limited	Turbulence limited	Background (ppm)	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
7/16/2009	26	0	0	10	0.02	40.9	24.1	12.5	89.3	34.4	13.2	9.8
7/17/2009	22	0	0	0	0.01	33.6	12.5	13.5	57.4	28.3	10.9	8.1
7/18/2009	41	0	0	7	0.01	19.5	14.6	3.4	53.9	16.4	6.3	4.7
7/19/2009	19	0	0	18	0.06	39.9	29.0	0.2	105.5	33.6	12.9	9.6
7/20/2009	21	0	1	19	0.06	30.1	18.2	9.7	86.6	25.4	9.8	7.2
7/21/2009	24	0	0	18	0.03	42.8	25.6	4.9	116.4	36.0	13.8	10.3
7/22/2009	21	0	0	25	0.02	39.9	25.8	0.1	76.6	33.6	12.9	9.6
7/23/2009	1	0	6	14	0.01	4.5	N/A	4.5	4.5	3.8	1.4	1.1
7/24/2009	23	0	0	17	0.04	87.0	27.9	2.7	130.3	73.2	28.2	20.9
7/25/2009	17	0	25	3	0.04	46.1	10.2	16.5	59.6	38.9	14.9	11.1
7/26/2009	30	0	16	2	0.01	24.1	12.7	6.0	59.8	20.3	7.8	5.8
7/27/2009	8	0	0	19	0.00	61.9	23.2	31.0	97.0	52.1	20.0	14.8
7/28/2009	12	0	1	0	0.04	72.2	43.3	5.1	124.0	60.8	23.4	17.3
7/29/2009	2	0	18	19	0.03	23.0	13.5	13.5	32.6	19.4	7.5	5.5
7/30/2009	14	0	4	23	0.03	34.3	14.1	6.1	55.2	28.9	11.1	8.2
7/31/2009	1	0	15	13	0.03	-4.8	N/A	-4.8	-4.8	-4.0	-1.6	-1.2
8/1/2009	22	0	1	18	0.02	65.4	19.5	33.0	100.7	55.1	21.2	15.7
8/2/2009	2	0	12	9	0.06	10.2	2.0	8.8	11.6	8.6	3.3	2.4
8/3/2009	30	0	5	9	0.02	89.0	44.3	20.0	165.0	75.0	28.8	21.4
8/4/2009	29	0	1	12	0.02	51.5	20.5	2.3	84.2	43.3	16.7	12.3
8/5/2009	23	0	7	14	0.04	34.1	15.5	13.8	66.5	28.7	11.1	8.2
8/6/2009	1	0	17	17	0.03	11.0	N/A	11.0	11.0	9.2	3.6	2.6
8/7/2009	19	0	1	27	0.02	30.5	14.8	7.5	55.9	25.7	9.9	7.3
8/8/2009	43	0	0	5	0.02	61.6	41.0	6.3	135.9	51.9	20.0	14.8
8/9/2009	48	0	0	0	0.04	89.4	28.4	46.3	145.8	75.3	29.0	21.5
8/10/2009	26	0	10	8	0.02	54.7	22.3	9.3	94.5	46.1	17.7	13.1
8/11/2009	19	0	5	17	0.05	48.9	30.2	7.3	115.8	41.2	15.8	11.7
8/12/2009	40	0	0	7	0.06	35.6	19.2	9.1	86.5	30.0	11.5	8.5
8/13/2009	24	0	0	13	0.07	34.3	18.7	9.2	75.6	28.9	11.1	8.2
8/14/2009	21	0	0	18	0.10	34.3	25.5	1.1	83.9	28.9	11.1	8.2
8/15/2009	7	0	12	15	0.08	21.6	9.7	10.0	36.0	18.2	7.0	5.2
8/16/2009	20	0	4	14	0.07	31.2	13.7	4.3	65.2	26.2	10.1	7.5
8/17/2009	5	0	3	3	0.01	20.5	4.0	16.2	25.2	17.3	6.7	4.9

6.12.3 Daily H_2S emission using Ratiometric emissions model

Column headings for the following table are:

Date: Month/Day/Year
Valid: Number of ½ hour periods with valid emissions data
Emission average ($\mu gm^{-2}s^{-1}$): Daily average emission calculated from the valid ½ hour periods
Emissions SD ($\mu gm^{-2}s^{-1}$): Daily emission standard deviation of the valid ½ hour periods
Emission minimum ($\mu gm^{-2}s^{-1}$): Daily minimum emission of the valid ½ hour periods
Emission maximum ($\mu gm^{-2}s^{-1}$): Daily maximum emission of the valid ½ hour periods
Emission average (kgd^{-1}): Daily average emission calculated from the valid ½ hour periods; totaled over the source area
Emission average ($gd^{-1}hd^{-1}$): Daily average emission calculated from the valid ½ hour periods; totaled over the source area on a per head basis
Emission average ($gd^{-1}AU^{-1}$): Daily average emission calculated from the valid ½ hour periods; totaled over the source area on a per animal unit basis

Date	Valid	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
9/12/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/13/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/14/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/15/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/16/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/17/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/18/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/19/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/20/2008	1	0.7	0.0	0.7	0.7	0.6	0.2	0.2
9/21/2008	1	2.5	0.0	2.5	2.5	2.0	0.8	0.6
9/22/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/23/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/24/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/25/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/26/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/27/2008	11	8.9	30.8	-5.4	21.6	7.3	2.8	2.1
9/28/2008	17	2.4	16.2	0.1	7.6	2.0	0.8	0.6
9/29/2008	6	9.2	32.8	4.1	14.2	7.6	2.9	2.2
9/30/2008	9	9.4	32.0	3.2	14.3	7.8	3.0	2.2
10/1/2008	15	7.6	28.3	1.6	14.7	6.3	2.4	1.8
10/2/2008	6	4.0	22.1	2.0	5.9	3.3	1.3	0.9
10/3/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/4/2008	5	2.0	15.9	-0.5	6.5	1.6	0.6	0.5
10/5/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/6/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/7/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/8/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Date	Valid	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
10/9/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/10/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/11/2008	12	1.9	14.5	0.2	4.7	1.5	0.6	0.4
10/12/2008	17	4.4	21.7	0.3	12.7	3.6	1.4	1.0
10/13/2008	33	7.3	27.2	-3.7	23.9	6.0	2.3	1.7
10/14/2008	21	5.0	22.9	0.1	17.3	4.1	1.6	1.2
10/15/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/16/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/17/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/18/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/19/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/20/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/21/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/22/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/23/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/24/2008	11	10.3	32.8	1.7	32.3	8.5	3.3	2.4
10/25/2008	8	20.4	44.8	6.8	42.6	16.8	6.4	4.8
10/26/2008	12	18.6	42.1	12.2	34.5	15.2	5.9	4.3
10/27/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/28/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/29/2008	6	10.2	34.2	2.9	19.6	8.4	3.2	2.4
10/30/2008	20	6.8	26.6	2.9	14.3	5.6	2.1	1.6
10/31/2008	17	8.1	29.0	1.7	20.6	6.7	2.6	1.9
11/1/2008	23	0.1	3.9	-7.8	7.9	0.1	0.0	0.0
11/2/2008	11	2.4	16.4	1.0	5.8	1.9	0.7	0.6
11/3/2008	20	4.7	22.3	1.7	16.9	3.8	1.5	1.1
11/4/2008	16	4.6	22.3	0.2	12.9	3.8	1.5	1.1
11/5/2008	17	6.4	26.0	-0.7	19.9	5.3	2.0	1.5
11/6/2008	33	8.5	29.1	-19.0	28.2	7.0	2.7	2.0
11/7/2008	26	8.2	28.9	2.2	30.3	6.8	2.6	1.9
11/8/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11/9/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11/10/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11/11/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11/12/2008	14	13.5	36.9	1.5	58.2	11.1	4.3	3.2
11/13/2008	14	11.3	34.3	2.1	25.3	9.3	3.6	2.6
11/14/2008	5	6.9	29.2	1.8	13.6	5.7	2.2	1.6
11/15/2008	32	11.0	32.7	2.9	32.3	9.0	3.5	2.6
11/16/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11/17/2008	6	1.0	11.3	0.2	1.8	0.8	0.3	0.2
11/18/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11/19/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11/20/2008	4	15.8	44.2	12.8	19.2	13.0	5.0	3.7
11/21/2008	16	3.4	19.2	0.4	12.5	2.8	1.1	0.8
11/22/2008	5	2.3	17.1	1.0	3.9	1.9	0.7	0.5

Date	Valid	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
11/23/2008	1	0.1	0.0	0.1	0.1	0.1	0.0	0.0
11/24/2008	13	3.3	19.3	0.1	14.8	2.7	1.0	0.8
11/25/2008	5	3.9	22.3	3.1	4.7	3.2	1.2	0.9
11/26/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11/27/2008	1	0.1	0.0	0.1	0.1	0.1	0.0	0.0
11/28/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11/29/2008	7	1.3	12.4	0.0	2.9	1.0	0.4	0.3
11/30/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/1/2008	1	9.7	0.0	9.7	9.7	8.0	3.1	2.3
12/2/2008	1	8.3	0.0	8.3	8.3	6.8	2.6	2.0
12/3/2008	9	7.5	28.8	4.6	12.2	6.1	2.4	1.7
12/4/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/5/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/6/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/7/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/8/2008	1	0.8	0.0	0.8	0.8	0.6	0.2	0.2
12/9/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/10/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/11/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/12/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/13/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/14/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/15/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/16/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/17/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/18/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/19/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/20/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/21/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/22/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/23/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/24/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/25/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/26/2008	1	0.1	0.0	0.1	0.1	0.1	0.0	0.0
12/27/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/28/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/29/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/30/2008	2	2.4	22.5	2.1	2.8	2.0	0.8	0.6
12/31/2008	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/1/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/2/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/3/2009	1	-0.2	0.0	-0.2	-0.2	-0.1	-0.1	0.0
1/4/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/5/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/6/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Date	Valid	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
1/7/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/8/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/9/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/10/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/11/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/12/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/13/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/14/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/15/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/16/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/17/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/18/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/19/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/20/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/21/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/22/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/23/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/24/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/25/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/26/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/27/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/28/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/29/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/30/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/31/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/1/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/2/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/3/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/4/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/5/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/6/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/7/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/8/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/9/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/10/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/11/2009	4	0.3	6.7	-0.1	0.6	0.3	0.1	0.1
2/12/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/13/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/14/2009	13	0.6	8.6	0.3	1.1	0.5	0.2	0.2
2/15/2009	16	0.2	4.5	-0.2	0.9	0.1	0.1	0.0
2/16/2009	14	0.5	7.2	-0.1	1.7	0.4	0.1	0.1
2/17/2009	1	1.1	0.0	1.1	1.1	0.9	0.4	0.3
2/18/2009	5	2.0	16.3	1.0	3.5	1.7	0.6	0.5
2/19/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/20/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Date	Valid	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
2/21/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/22/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/23/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/24/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/25/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3/11/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3/12/2009	1	3.1	0.0	3.1	3.1	2.5	1.0	0.7
3/13/2009	1	0.1	0.0	0.1	0.1	0.1	0.0	0.0
3/14/2009	1	1.0	0.0	1.0	1.0	0.8	0.3	0.2
3/15/2009	2	1.6	18.4	0.3	2.9	1.3	0.5	0.4
3/16/2009	1	0.1	0.0	0.1	0.1	0.1	0.0	0.0
3/17/2009	12	7.8	28.9	-1.0	30.0	6.4	2.5	1.8
3/18/2009	25	3.4	19.0	-0.8	9.4	2.8	1.1	0.8
3/19/2009	24	1.0	10.3	0.0	4.4	0.8	0.3	0.2
3/20/2009	10	3.1	18.8	0.5	9.4	2.5	1.0	0.7
3/21/2009	11	1.3	12.3	0.1	3.2	1.1	0.4	0.3
3/22/2009	17	0.4	7.0	0.1	1.3	0.4	0.1	0.1
3/23/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3/24/2009	14	14.6	38.1	7.3	24.1	12.0	4.6	3.4
3/25/2009	17	19.5	42.1	0.3	40.0	16.0	6.2	4.6
3/26/2009	13	1.3	12.2	0.4	2.9	1.1	0.4	0.3
3/27/2009	9	1.1	11.5	-0.1	4.8	0.9	0.3	0.3
3/28/2009	2	6.7	36.9	6.6	6.8	5.5	2.1	1.6
3/29/2009	1	5.2	0.0	5.2	5.2	4.3	1.6	1.2
3/30/2009	4	0.8	10.8	0.0	1.6	0.7	0.3	0.2
3/31/2009	10	26.2	48.9	5.8	71.8	21.5	8.3	6.1
4/1/2009	8	13.3	37.6	4.5	45.3	10.9	4.2	3.1
4/2/2009	14	2.7	17.4	0.6	5.7	2.2	0.9	0.6
4/3/2009	3	7.0	32.3	3.8	11.9	5.8	2.2	1.6
4/4/2009	5	2.2	16.8	1.2	3.6	1.8	0.7	0.5
4/5/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/6/2009	3	6.2	30.8	4.7	7.8	5.1	1.9	1.4
4/7/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/8/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/9/2009	3	4.4	26.4	0.9	7.1	3.6	1.4	1.0
4/10/2009	1	10.6	0.0	10.6	10.6	8.7	3.3	2.5
4/11/2009	31	9.9	31.2	1.7	22.8	8.1	3.1	2.3
4/12/2009	6	7.5	29.9	-9.0	15.0	6.2	2.4	1.8
4/13/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/14/2009	4	10.0	36.1	8.0	11.5	8.2	3.1	2.3
4/15/2009	30	12.1	34.3	4.6	24.3	10.0	3.8	2.8
4/16/2009	1	2.6	0.0	2.6	2.6	2.1	0.8	0.6
4/17/2009	14	1.0	10.6	-0.1	2.3	0.8	0.3	0.2
4/18/2009	9	1.8	14.4	0.5	5.8	1.5	0.6	0.4
4/19/2009	4	0.9	11.4	-0.1	2.3	0.8	0.3	0.2

Date	Valid	Emission average ($\mu g m^{-2} s^{-1}$)	Emission SD ($\mu g m^{-2} s^{-1}$)	Emission minimum ($\mu g m^{-2} s^{-1}$)	Emission maximum ($\mu g m^{-2} s^{-1}$)	Emission average ($kg d^{-1}$)	Emission average ($gd^{-1} hd^{-1}$)	Emission average ($gd^{-1} AU^{-1}$)
4/20/2009	1	4.4	0.0	4.4	4.4	3.6	1.4	1.0
4/21/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/22/2009	1	10.4	0.0	10.4	10.4	8.5	3.3	2.4
4/23/2009	26	9.2	30.4	4.2	22.0	7.5	2.9	2.1
4/24/2009	25	17.3	39.8	3.9	46.2	14.2	5.5	4.1
4/25/2009	12	15.8	39.4	11.1	22.8	12.9	5.0	3.7
4/26/2009	37	15.2	37.6	3.4	55.5	12.5	4.8	3.6
4/27/2009	28	16.3	39.5	3.2	36.7	13.4	5.2	3.8
4/28/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/29/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/30/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/1/2009	10	10.6	33.4	2.6	34.2	8.7	3.3	2.5
5/2/2009	8	5.8	25.7	2.0	10.1	4.8	1.8	1.4
5/3/2009	11	1.3	12.3	0.1	7.8	1.1	0.4	0.3
5/4/2009	2	6.8	37.2	5.8	7.9	5.6	2.2	1.6
5/5/2009	8	5.5	25.0	2.1	14.7	4.5	1.7	1.3
5/6/2009	16	7.6	28.1	2.6	17.0	6.2	2.4	1.8
5/7/2009	9	7.3	28.5	3.0	9.8	6.0	2.3	1.7
5/8/2009	12	8.1	29.3	0.4	34.6	6.7	2.6	1.9
5/9/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/10/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/11/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/12/2009	17	4.2	21.3	0.4	9.2	3.4	1.3	1.0
5/13/2009	27	28.8	48.0	3.9	88.5	23.6	9.1	6.7
5/14/2009	12	40.0	58.5	15.0	79.5	32.9	12.6	9.4
5/15/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/16/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/17/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/18/2009	13	4.7	22.6	1.0	8.2	3.8	1.5	1.1
5/19/2009	21	3.9	20.3	2.7	7.6	3.2	1.2	0.9
5/20/2009	32	-8.4	0.0	-417.5	11.2	-6.9	-2.6	-2.0
5/21/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/22/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/23/2009	2	4.3	29.6	3.2	5.4	3.5	1.4	1.0
5/24/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/25/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/26/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/27/2009	2	2.2	21.5	2.1	2.3	1.8	0.7	0.5
5/28/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/29/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5/30/2009	6	1.9	15.6	0.6	3.9	1.6	0.6	0.5
5/31/2009	2	1.6	18.5	1.3	1.9	1.3	0.5	0.4
6/1/2009	26	5.9	24.8	1.0	17.5	4.9	1.9	1.4
6/2/2009	1	9.2	0.0	9.2	9.2	7.6	2.9	2.2
6/3/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Date	Valid	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
6/4/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/5/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/6/2009	9	8.6	30.5	3.8	13.6	7.0	2.7	2.0
6/7/2009	26	4.9	22.5	-1.1	9.4	4.0	1.5	1.1
6/8/2009	17	4.7	22.6	-2.9	11.7	3.9	1.5	1.1
6/9/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/10/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/11/2009	8	5.8	25.8	3.2	12.1	4.8	1.8	1.4
6/12/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/13/2009	1	2.6	0.0	2.6	2.6	2.1	0.8	0.6
6/14/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/15/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/16/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/17/2009	6	6.8	28.5	0.4	9.5	5.6	2.2	1.6
6/18/2009	7	4.5	23.1	2.6	7.3	3.7	1.4	1.1
6/19/2009	2	22.5	63.9	18.7	26.3	18.5	7.1	5.3
6/20/2009	1	16.3	0.0	16.3	16.3	13.3	5.1	3.8
6/21/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/22/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/23/2009	4	1.9	16.1	1.4	2.2	1.5	0.6	0.4
6/24/2009	12	4.1	21.5	1.1	9.6	3.4	1.3	1.0
6/25/2009	3	2.8	21.0	1.1	4.8	2.3	0.9	0.7
6/26/2009	23	4.5	21.9	1.0	9.9	3.7	1.4	1.1
6/27/2009	10	2.9	18.2	-1.0	7.5	2.4	0.9	0.7
6/28/2009	8	5.8	25.8	1.9	8.4	4.8	1.8	1.4
6/29/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/30/2009	13	3.9	20.6	0.8	5.8	3.2	1.2	0.9
7/1/2009	13	2.1	15.4	0.2	3.1	1.7	0.7	0.5
7/2/2009	16	3.2	18.6	1.2	6.6	2.6	1.0	0.7
7/3/2009	15	2.2	15.5	0.9	5.1	1.8	0.7	0.5
7/4/2009	16	2.7	17.2	0.1	6.9	2.2	0.8	0.6
7/5/2009	7	0.6	8.3	-0.4	0.9	0.5	0.2	0.1
7/6/2009	7	1.2	12.0	0.6	2.7	1.0	0.4	0.3
7/7/2009	8	1.9	15.1	0.1	3.1	1.6	0.6	0.4
7/8/2009	9	2.8	18.3	-0.4	9.0	2.3	0.9	0.7
7/9/2009	16	3.4	19.1	0.5	7.2	2.8	1.1	0.8
7/10/2009	9	1.5	13.4	-0.2	2.7	1.3	0.5	0.4
7/11/2009	3	1.7	16.2	0.4	2.9	1.4	0.5	0.4
7/12/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/13/2009	12	3.1	18.7	0.5	8.2	2.5	1.0	0.7
7/14/2009	13	2.7	17.2	0.5	6.0	2.2	0.8	0.6
7/15/2009	14	3.8	20.3	0.1	14.7	3.1	1.2	0.9
7/16/2009	3	2.3	19.0	1.4	2.9	1.9	0.7	0.5
7/17/2009	6	7.3	29.8	3.4	11.5	6.0	2.3	1.7
7/18/2009	7	3.4	20.2	0.3	6.3	2.8	1.1	0.8

Date	Valid	Emission average ($\mu g m^{-2} s^{-1}$)	Emission SD ($\mu g m^{-2} s^{-1}$)	Emission minimum ($\mu g m^{-2} s^{-1}$)	Emission maximum ($\mu g m^{-2} s^{-1}$)	Emission average ($kg d^{-1}$)	Emission average ($g d^{-1} h d^{-1}$)	Emission average ($g d^{-1} AU^{-1}$)
7/19/2009	10	3.8	20.9	1.1	7.5	3.2	1.2	0.9
7/20/2009	5	1.3	13.3	0.0	2.4	1.1	0.4	0.3
7/21/2009	14	2.7	17.4	0.5	5.1	2.2	0.9	0.6
7/22/2009	6	4.1	22.4	0.8	8.2	3.4	1.3	1.0
7/23/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/24/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/25/2009	10	8.6	31.0	3.2	18.2	7.1	2.7	2.0
7/26/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/27/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7/28/2009	2	34.7	91.6	10.4	59.1	28.5	11.0	8.1
7/29/2009	1	5.0	0.0	5.0	5.0	4.1	1.6	1.2
7/30/2009	8	2.3	16.5	0.2	4.6	1.9	0.7	0.5
7/31/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/1/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/2/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/3/2009	12	14.4	37.9	6.8	20.0	11.8	4.5	3.4
8/4/2009	22	7.8	28.2	1.9	15.8	6.4	2.5	1.8
8/5/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/6/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/7/2009	10	2.6	17.3	1.1	5.2	2.1	0.8	0.6
8/8/2009	22	4.2	21.1	0.3	10.1	3.4	1.3	1.0
8/9/2009	5	5.4	26.1	3.8	6.8	4.4	1.7	1.3
8/10/2009	5	2.1	16.3	1.6	3.1	1.7	0.7	0.5
8/11/2009	10	5.8	25.3	2.7	16.3	4.7	1.8	1.3
8/12/2009	25	2.5	16.4	0.3	5.9	2.0	0.8	0.6
8/13/2009	14	2.4	16.4	0.0	4.7	2.0	0.8	0.6
8/14/2009	8	3.8	21.1	0.2	15.9	3.1	1.2	0.9
8/15/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/16/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8/17/2009	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A

6.12.4 Daily H_2S emission using bLS emissions model

Column headings for the following table are:

Date: Month/Day/Year
Valid: Number of ½ hour periods with valid emissions data
Direction limited: Number of ½ hour periods invalidated because wind was from an excluded wind direction
Angle limited: Number of ½ hour periods invalidated because angle of attack to the downwind side was greater than 60 degrees
Turbulence limited: Number of ½ hour periods that the bLS model was not run because either $u_* < 0.15$ ms^{-1} or $|L| < 2$ m
Background (ppb): bLS model calculated daily average background concentration (ppb); average is over the ½ hour periods included in the valid column
Emission average (μgm^{-2}s^{-1}): Daily average emission calculated from the valid ½ hour periods
Emissions SD (μgm^{-2}s^{-1}): Daily emission standard deviation of the valid ½ hour periods
Emission minimum (μgm^{-2}s^{-1}): Daily minimum emission of the valid ½ hour periods
Emission maximum (μgm^{-2}s^{-1}): Daily maximum emission of the valid ½ hour periods
Emission average (kgd^{-1}): Daily average emission calculated from the valid ½ hour periods; totaled over the source area
Emission average (gd^{-1}hd^{-1}): Daily average emission calculated from the valid ½ hour periods; totaled over the source area on a per head basis
Emission average (gd^{-1}AU^{-1}): Daily average emission calculated from the valid ½ hour periods; totaled over the source area on a per animal unit basis

Date	Valid	Direction limited	Angle limited	Turbulence limited	Background (ppb)	Emission average (μgm^{-2}s^{-1})	Emission SD (μgm^{-2}s^{-1})	Emission minimum (μgm^{-2}s^{-1})	Emission maximum (μgm^{-2}s^{-1})	Emission average (kgd^{-1})	Emission average (gd^{-1}hd^{-1})	Emission average (gd^{-1}AU^{-1})
9/12/2008	36	0	0	4	-1.0	17.7	18.9	3.4	112.4	14.3	5.5	4.1
9/13/2008	34	0	5	8	0.0	21.9	14.9	0.2	61.0	17.6	6.8	5.0
9/14/2008	29	0	8	11	-1.4	24.7	37.4	3.2	184.7	19.9	7.6	5.7
9/15/2008	24	0	16	0	-0.1	5.7	3.3	0.9	12.6	4.6	1.8	1.3
9/16/2008	13	0	11	22	4.1	4.7	3.6	0.0	10.1	3.8	1.5	1.1
9/17/2008	8	0	8	26	-1.2	9.3	5.2	3.8	15.9	7.5	2.9	2.1
9/18/2008	0	0	6	30	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/19/2008	9	0	13	25	-0.6	1.1	1.1	0.0	2.8	0.9	0.4	0.3
9/20/2008	8	0	2	35	0.8	0.6	0.3	0.0	1.0	0.5	0.2	0.1
9/21/2008	5	0	10	26	6.2	2.2	3.1	-0.5	7.5	1.7	0.7	0.5
9/22/2008	0	0	24	17	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9/23/2008	3	0	19	19	-1.4	8.2	0.9	7.3	9.2	6.6	2.5	1.9
9/24/2008	3	0	4	25	14.0	1.8	1.9	-0.2	3.5	1.5	0.6	0.4
9/25/2008	7	0	7	24	1.2	3.9	3.3	0.6	10.2	3.1	1.2	0.9
9/26/2008	12	0	9	20	9.0	13.9	11.4	-2.1	38.8	11.2	4.3	3.2
9/27/2008	26	0	2	13	5.8	10.1	10.0	-0.5	37.2	8.2	3.1	2.3
9/28/2008	17	0	3	21	4.6	2.1	2.0	0.1	7.3	1.7	0.6	0.5
9/29/2008	18	0	8	11	3.9	6.9	5.5	0.3	19.2	5.6	2.1	1.6
9/30/2008	12	0	16	13	0.0	8.4	4.7	0.0	15.5	6.8	2.6	1.9

Date	Valid	Direction limited	Angle limited	Turbulence limited	Background (ppb)	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
10/1/2008	18	0	6	12	0.2	7.9	6.8	0.2	21.3	6.4	2.5	1.8
10/2/2008	9	0	15	15	4.7	5.2	5.3	-1.2	15.7	4.2	1.6	1.2
10/3/2008	16	0	8	13	4.0	2.9	3.3	-1.4	11.2	2.3	0.9	0.7
10/4/2008	20	0	2	19	9.2	1.4	3.8	-3.8	12.4	1.1	0.4	0.3
10/5/2008	6	0	11	23	6.8	3.5	5.3	-3.5	9.9	2.8	1.1	0.8
10/6/2008	0	0	33	7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/7/2008	6	0	33	0	-0.5	17.3	14.7	3.1	37.5	13.9	5.3	4.0
10/8/2008	24	0	0	0	-0.7	19.0	15.0	1.2	68.2	15.3	5.9	4.4
10/9/2008	7	0	0	1	1.7	3.1	1.4	1.6	5.7	2.5	1.0	0.7
10/10/2008	3	0	6	27	0.0	4.2	1.3	3.0	5.7	3.4	1.3	1.0
10/11/2008	12	0	8	21	-0.2	2.5	2.9	0.1	10.5	2.0	0.8	0.6
10/12/2008	15	0	2	23	1.4	3.8	3.1	0.1	8.9	3.0	1.2	0.9
10/13/2008	22	0	0	16	0.7	12.6	8.8	1.1	37.4	10.1	3.9	2.9
10/14/2008	33	0	0	5	0.1	10.6	8.7	-0.1	40.8	8.6	3.3	2.4
10/15/2008	11	0	7	21	0.7	9.7	9.6	-0.5	32.2	7.8	3.0	2.2
10/16/2008	33	0	4	2	1.6	13.3	12.6	-9.3	51.4	10.7	4.1	3.0
10/17/2008	15	0	12	14	5.8	7.3	5.5	0.0	15.8	5.9	2.3	1.7
10/18/2008	19	0	3	16	5.1	5.9	3.9	-2.2	15.5	4.7	1.8	1.3
10/19/2008	18	0	0	22	0.3	10.1	5.5	0.2	22.7	8.1	3.1	2.3
10/20/2008	20	0	2	18	-0.4	18.1	9.3	4.7	33.3	14.6	5.6	4.2
10/21/2008	26	0	0	15	3.6	18.4	11.0	5.2	51.8	14.8	5.7	4.2
10/22/2008	3	0	21	18	7.4	7.9	0.5	7.5	8.5	6.3	2.4	1.8
10/23/2008	0	0	36	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/24/2008	21	0	13	4	-0.8	14.5	16.7	3.3	79.0	11.6	4.5	3.3
10/25/2008	37	0	1	0	-1.2	22.5	10.8	6.3	50.7	18.1	7.0	5.2
10/26/2008	25	0	15	0	-1.3	26.7	11.0	8.8	63.3	21.4	8.2	6.1
10/27/2008	0	0	23	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/28/2008	0	0	3	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10/29/2008	8	0	23	3	-1.3	12.3	6.4	4.8	22.4	9.9	3.8	2.8
10/30/2008	16	0	1	21	-0.4	8.7	5.2	2.2	17.9	7.0	2.7	2.0
10/31/2008	33	0	1	6	-0.3	6.7	6.5	1.0	27.7	5.4	2.1	1.5
11/1/2008	14	0	1	24	1.3	2.6	2.8	-0.1	8.5	2.1	0.8	0.6
11/2/2008	12	0	23	4	-0.7	3.2	1.8	1.4	8.3	2.5	1.0	0.7
11/3/2008	31	0	0	9	-0.7	6.6	4.9	1.4	18.2	5.3	2.0	1.5
11/4/2008	15	0	0	27	-0.9	7.9	4.9	2.6	16.6	6.3	2.4	1.8
11/5/2008	16	0	0	25	3.8	9.3	7.0	-0.2	21.3	7.5	2.9	2.1
11/6/2008	33	0	2	3	1.3	8.7	8.3	-1.0	25.4	7.0	2.7	2.0
11/7/2008	27	0	7	6	-1.0	10.4	7.6	3.1	33.2	8.4	3.2	2.4
11/8/2008	14	0	26	0	-1.7	14.5	4.6	8.5	23.5	11.7	4.5	3.3
11/9/2008	0	0	39	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11/10/2008	0	0	33	5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11/11/2008	11	0	9	19	-1.1	1.9	1.3	0.1	4.5	1.6	0.6	0.4
11/12/2008	19	0	21	0	-1.4	9.3	10.9	0.8	37.5	7.4	2.9	2.1
11/13/2008	31	0	6	0	-1.6	9.3	5.3	1.4	21.1	7.5	2.9	2.1
11/14/2008	41	0	0	0	-1.4	15.2	13.0	1.6	65.6	12.2	4.7	3.5

Date	Valid	Direction limited	Angle limited	Turbulence limited	Background (ppb)	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
11/15/2008	41	0	0	0	0.4	8.4	4.6	1.5	25.5	6.8	2.6	1.9
11/16/2008	1	0	37	0	-1.2	4.4	N/A	4.4	4.4	3.5	1.3	1.0
11/17/2008	5	0	15	10	-1.2	2.0	1.8	0.8	5.1	1.6	0.6	0.5
11/18/2008	6	0	5	4	-1.5	0.7	0.4	0.1	1.2	0.6	0.2	0.2
11/19/2008	14	0	0	12	-1.4	4.5	3.1	0.6	9.6	3.7	1.4	1.0
11/20/2008	10	0	0	0	-1.1	7.5	1.7	5.4	10.0	6.0	2.3	1.7
11/21/2008	23	0	13	4	-1.1	3.0	1.8	0.7	7.3	2.4	0.9	0.7
11/22/2008	17	0	0	23	-1.4	1.2	0.8	0.2	2.6	1.0	0.4	0.3
11/23/2008	17	0	0	22	-1.3	2.5	2.9	0.0	9.6	2.0	0.8	0.6
11/24/2008	18	0	15	7	-1.2	1.8	1.5	0.2	5.8	1.5	0.6	0.4
11/25/2008	7	0	32	1	-1.0	4.0	2.0	1.3	7.1	3.2	1.2	0.9
11/26/2008	3	0	11	27	-1.3	0.0	0.9	-0.5	1.1	0.0	0.0	0.0
11/27/2008	6	0	7	26	-0.4	2.7	3.1	0.3	8.4	2.2	0.8	0.6
11/28/2008	0	0	34	5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11/29/2008	9	0	2	29	-1.3	1.2	0.8	0.1	2.2	1.0	0.4	0.3
11/30/2008	2	0	25	12	-1.0	1.2	0.4	0.9	1.5	1.0	0.4	0.3
12/1/2008	16	0	23	0	-1.3	6.2	1.8	3.3	10.5	5.0	1.9	1.4
12/2/2008	18	0	22	0	-1.5	7.1	3.0	1.6	13.6	5.7	2.2	1.6
12/3/2008	40	0	1	0	-1.4	6.0	2.2	2.1	9.8	4.8	1.9	1.4
12/4/2008	1	0	36	0	-1.4	4.8	N/A	4.8	4.8	3.8	1.5	1.1
12/5/2008	3	0	37	0	-1.7	0.0	0.8	-0.8	0.5	0.0	0.0	0.0
12/6/2008	30	0	7	0	-1.5	0.3	0.7	-0.7	2.8	0.2	0.1	0.1
12/7/2008	6	0	29	4	-1.5	0.0	0.5	-0.9	0.6	0.0	0.0	0.0
12/8/2008	26	0	2	0	-1.6	0.2	0.3	-0.3	1.2	0.2	0.1	0.1
12/12/2008	5	0	33	2	-1.0	0.0	0.2	-0.1	0.4	0.0	0.0	0.0
12/13/2008	33	0	1	6	-1.5	0.0	0.3	-0.7	0.6	0.0	0.0	0.0
12/14/2008	40	0	0	0	-1.6	0.2	0.4	-0.6	0.9	0.2	0.1	0.0
12/15/2008	12	0	10	0	-1.3	1.1	0.7	-0.6	2.0	0.8	0.3	0.2
12/16/2008	6	0	27	7	-1.1	-0.2	1.0	-1.7	1.1	-0.1	-0.1	0.0
12/17/2008	1	0	7	0	-1.9	0.8	N/A	0.8	0.8	0.7	0.3	0.2
12/18/2008	3	0	6	32	-1.7	0.0	0.1	-0.1	0.1	0.0	0.0	0.0
12/19/2008	5	0	10	4	-1.1	-0.1	0.3	-0.4	0.2	-0.1	0.0	0.0
12/20/2008	11	0	29	1	-1.1	0.0	0.3	-0.6	0.4	0.0	0.0	0.0
12/21/2008	0	0	22	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/22/2008	0	0	38	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/23/2008	28	0	0	6	4.5	-0.8	2.5	-10.3	1.2	-0.6	-0.2	-0.2
12/24/2008	16	0	11	0	-1.4	0.0	0.2	-0.3	0.7	0.0	0.0	0.0
12/25/2008	8	0	23	9	-1.9	0.1	0.1	0.0	0.4	0.1	0.0	0.0
12/26/2008	31	0	8	1	-1.5	0.0	0.3	-0.6	0.5	0.0	0.0	0.0
12/27/2008	38	0	3	0	-1.5	0.0	0.2	-0.3	0.7	0.0	0.0	0.0
12/28/2008	10	0	28	2	-1.9	0.5	0.8	0.0	2.7	0.4	0.2	0.1
12/29/2008	14	0	0	11	-1.8	0.1	0.3	-0.5	0.5	0.0	0.0	0.0
12/30/2008	3	0	0	1	-1.3	2.2	1.4	0.7	3.6	1.8	0.7	0.5
12/31/2008	24	0	12	1	-1.4	6.3	6.5	-0.2	18.8	5.1	2.0	1.4
1/1/2009	29	0	0	11	-1.5	0.0	0.3	-0.8	0.4	0.0	0.0	0.0

Date	Valid	Direction limited	Angle limited	Turbulence limited	Background (ppb)	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
1/2/2009	15	0	24	2	-1.7	0.1	0.6	-1.1	1.6	0.1	0.0	0.0
1/3/2009	1	0	26	13	-1.3	0.0	N/A	0.0	0.0	0.0	0.0	0.0
1/4/2009	5	0	33	1	-1.1	-0.1	0.2	-0.3	0.1	0.0	0.0	0.0
1/5/2009	6	0	17	8	-1.6	0.0	0.3	-0.3	0.3	0.0	0.0	0.0
1/6/2009	1	0	12	17	-1.1	0.3	N/A	0.3	0.3	0.3	0.1	0.1
1/7/2009	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/8/2009	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/9/2009	5	0	7	0	-1.3	0.5	0.7	-0.4	1.4	0.4	0.2	0.1
1/10/2009	13	0	26	0	-0.8	-0.1	0.4	-1.0	0.4	-0.1	0.0	0.0
1/11/2009	9	0	20	10	-1.6	0.0	0.2	-0.3	0.5	0.0	0.0	0.0
1/12/2009	14	0	12	13	-1.3	0.0	0.2	-0.4	0.3	0.0	0.0	0.0
1/13/2009	16	0	25	1	-1.9	0.1	0.3	-0.4	0.7	0.1	0.0	0.0
1/14/2009	14	0	15	13	-1.0	-0.1	0.5	-0.8	0.9	-0.1	0.0	0.0
1/15/2009	0	0	32	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/16/2009	7	0	13	20	-1.6	0.2	0.3	-0.2	0.7	0.1	0.0	0.0
1/17/2009	29	0	2	8	-1.7	0.0	0.4	-1.0	1.0	0.0	0.0	0.0
1/18/2009	0	0	11	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/19/2009	0	0	14	24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/20/2009	12	0	7	21	-1.8	0.1	0.2	-0.2	0.4	0.0	0.0	0.0
1/21/2009	10	0	8	7	-0.9	0.0	0.4	-1.0	0.4	0.0	0.0	0.0
1/22/2009	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/23/2009	4	0	1	0	-1.9	0.0	0.2	-0.2	0.2	0.0	0.0	0.0
1/24/2009	10	0	24	3	-2.1	0.2	0.3	-0.2	0.8	0.1	0.1	0.0
1/25/2009	0	0	27	14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/26/2009	2	0	0	40	-1.1	0.0	0.2	-0.1	0.2	0.0	0.0	0.0
1/27/2009	8	0	8	27	-1.8	-0.1	0.6	-1.1	0.6	-0.1	0.0	0.0
1/28/2009	15	0	19	7	-1.5	0.0	0.2	-0.4	0.3	0.0	0.0	0.0
1/29/2009	30	0	4	4	-1.4	-0.1	0.7	-2.2	1.5	-0.1	0.0	0.0
1/30/2009	0	0	18	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/31/2009	19	0	1	22	-1.7	0.1	0.4	-0.6	0.8	0.0	0.0	0.0
2/1/2009	11	0	20	8	-2.3	0.5	0.6	-0.3	1.5	0.4	0.2	0.1
2/2/2009	1	0	18	20	-1.4	-0.3	N/A	-0.3	-0.3	-0.2	-0.1	-0.1
2/3/2009	16	0	14	12	-1.4	0.0	0.2	-0.7	0.3	0.0	0.0	0.0
2/4/2009	7	0	15	15	-1.2	0.0	0.1	-0.2	0.1	0.0	0.0	0.0
2/5/2009	14	0	0	24	-1.7	0.0	0.3	-0.5	0.4	0.0	0.0	0.0
2/6/2009	22	0	0	17	-1.6	0.0	0.2	-0.4	0.3	0.0	0.0	0.0
2/7/2009	40	0	0	0	-1.8	0.2	0.5	-1.1	1.1	0.2	0.1	0.1
2/8/2009	14	0	12	17	-1.6	-0.1	0.3	-0.9	0.3	-0.1	0.0	0.0
2/9/2009	10	0	7	15	-1.3	0.0	0.3	-0.3	0.5	0.0	0.0	0.0
2/10/2009	41	0	0	0	-1.4	0.2	0.6	-1.0	1.8	0.2	0.1	0.1
2/11/2009	35	0	3	0	-1.3	1.9	4.4	-0.1	17.7	1.5	0.6	0.4
2/12/2009	0	0	40	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/13/2009	0	0	14	9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/14/2009	32	0	0	4	-1.2	0.9	0.5	0.3	2.8	0.7	0.3	0.2
2/15/2009	22	0	0	18	-1.0	0.2	0.3	-0.2	0.8	0.2	0.1	0.0

Date	Valid	Direction limited	Angle limited	Turbulence limited	Background (ppb)	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
2/16/2009	16	0	8	17	-1.3	0.5	0.5	-0.1	1.5	0.4	0.2	0.1
2/17/2009	29	0	0	12	-1.6	1.1	1.7	-0.5	5.9	0.9	0.3	0.3
2/18/2009	29	0	10	0	-1.1	2.2	1.0	0.7	5.2	1.7	0.7	0.5
2/19/2009	0	0	25	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/20/2009	0	0	32	7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/21/2009	12	0	17	10	-1.6	0.1	0.6	-0.7	1.0	0.1	0.0	0.0
2/22/2009	0	0	42	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2/23/2009	2	0	15	31	-1.7	0.1	0.0	0.1	0.1	0.1	0.0	0.0
2/24/2009	21	0	1	26	-1.6	0.4	0.5	-0.3	1.4	0.3	0.1	0.1
2/25/2009	20	0	0	1	-1.7	0.2	0.2	-0.1	0.7	0.2	0.1	0.1
3/12/2009	32	0	14	1	-1.4	2.0	1.2	0.1	5.6	1.6	0.6	0.5
3/13/2009	21	0	9	17	-1.3	1.9	1.3	-0.1	4.4	1.5	0.6	0.4
3/14/2009	0	0	8	40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3/15/2009	1	0	14	33	-3.0	4.5	N/A	4.5	4.5	3.6	1.4	1.0
3/16/2009	5	0	18	22	-0.3	0.0	0.3	-0.5	0.2	0.0	0.0	0.0
3/17/2009	21	0	0	25	-0.5	7.5	5.4	0.1	16.7	6.0	2.3	1.7
3/18/2009	26	0	7	15	-0.7	4.3	2.9	0.0	11.9	3.5	1.3	1.0
3/19/2009	31	0	0	16	-1.3	3.2	2.5	0.3	8.8	2.5	1.0	0.7
3/20/2009	15	0	17	15	-1.2	3.8	3.0	0.0	9.5	3.1	1.2	0.9
3/21/2009	18	0	12	17	-1.7	1.8	1.3	0.0	4.2	1.4	0.5	0.4
3/22/2009	17	0	3	28	-1.4	0.8	0.4	0.1	1.7	0.7	0.3	0.2
3/23/2009	0	0	42	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3/24/2009	20	0	25	0	-1.1	11.0	4.0	6.8	22.5	8.8	3.4	2.5
3/25/2009	32	0	11	4	-0.9	15.0	16.5	0.6	94.0	12.0	4.6	3.4
3/26/2009	11	0	18	15	-0.6	1.3	0.7	0.5	2.5	1.0	0.4	0.3
3/27/2009	16	0	2	29	-0.2	1.7	3.0	0.0	10.8	1.4	0.5	0.4
3/28/2009	27	0	20	0	-0.6	10.1	3.0	5.2	15.3	8.1	3.1	2.3
3/29/2009	20	0	25	0	-1.4	12.6	5.4	2.6	24.7	10.1	3.9	2.9
3/30/2009	8	0	25	12	-1.0	1.2	1.2	0.1	3.9	1.0	0.4	0.3
3/31/2009	21	0	26	1	-0.6	18.0	11.0	7.3	54.6	14.5	5.6	4.1
4/1/2009	19	0	24	3	-0.8	13.4	9.8	2.9	45.7	10.8	4.2	3.1
4/2/2009	9	0	18	17	-1.0	4.1	3.2	1.4	11.0	3.3	1.3	0.9
4/3/2009	43	0	4	0	-0.6	19.8	15.2	6.2	98.9	15.9	6.1	4.5
4/4/2009	21	0	2	23	-1.1	2.9	1.2	1.4	6.7	2.3	0.9	0.7
4/5/2009	3	0	31	13	-0.9	5.2	1.3	4.3	6.7	4.2	1.6	1.2
4/6/2009	38	0	1	0	-1.1	22.2	13.5	6.5	81.8	17.8	6.9	5.1
4/7/2009	22	0	15	0	-1.1	8.1	3.2	3.2	16.5	6.5	2.5	1.8
4/8/2009	0	0	33	5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/9/2009	1	0	15	32	-0.7	0.3	N/A	0.3	0.3	0.3	0.1	0.1
4/10/2009	31	0	12	5	-0.9	32.0	26.8	7.2	105.5	25.7	9.9	7.3
4/11/2009	42	0	0	2	-0.9	15.0	5.7	1.9	23.0	12.0	4.6	3.4
4/12/2009	13	0	20	14	-0.5	14.1	3.5	7.2	18.0	11.3	4.3	3.2
4/13/2009	0	0	44	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/14/2009	24	0	13	10	-0.4	15.9	8.4	8.2	40.0	12.8	4.9	3.6
4/15/2009	45	0	1	1	-0.4	15.0	4.9	5.4	28.0	12.0	4.6	3.4

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4/16/2009	0	0	17	29	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/17/2009	15	0	2	30	-0.7	2.0	1.6	-0.1	4.5	1.6	0.6	0.5
4/18/2009	9	0	1	37	-0.1	3.5	3.3	0.5	8.4	2.8	1.1	0.8
4/19/2009	0	0	22	26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/20/2009	12	0	29	4	-1.0	12.7	10.9	3.2	39.4	10.2	3.9	2.9
4/21/2009	8	0	39	0	-1.3	34.8	35.3	10.6	121.0	28.0	10.8	8.0
4/22/2009	8	0	31	7	-0.5	21.3	9.0	12.1	37.7	17.2	6.6	4.9
4/23/2009	23	0	2	23	-0.1	16.1	6.8	6.4	26.5	13.0	5.0	3.7
4/24/2009	46	0	0	0	0.0	26.2	14.3	6.9	57.6	21.0	8.1	6.0
4/25/2009	48	0	0	0	0.1	41.5	20.9	15.9	97.2	33.3	12.8	9.5
4/26/2009	41	0	0	5	0.1	28.2	24.9	3.4	84.6	22.6	8.7	6.5
4/27/2009	41	0	6	1	0.3	34.6	22.7	3.0	95.9	27.8	10.7	7.9
4/28/2009	27	0	18	3	-0.1	12.2	7.4	2.7	27.8	9.8	3.8	2.8
4/29/2009	0	0	46	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4/30/2009	9	0	26	2	-0.2	99.7	107.2	30.6	355.6	80.1	30.8	22.8
5/1/2009	22	0	19	7	-0.1	12.5	11.2	3.8	55.8	10.1	3.9	2.9
5/2/2009	6	0	22	20	0.7	4.8	2.0	2.2	6.7	3.8	1.5	1.1
5/3/2009	10	0	5	33	-1.6	1.4	0.9	0.4	3.0	1.1	0.4	0.3
5/4/2009	7	0	11	30	-1.1	4.4	5.4	0.0	14.7	3.5	1.4	1.0
5/5/2009	7	0	12	19	0.4	4.8	2.6	1.4	9.7	3.8	1.5	1.1
5/6/2009	19	0	8	21	0.0	9.4	6.6	2.4	24.9	7.6	2.9	2.2
5/7/2009	23	0	13	12	0.0	27.0	53.2	5.3	268.7	21.7	8.3	6.2
5/8/2009	15	0	5	28	0.1	16.2	19.9	0.6	60.9	13.0	5.0	3.7
5/9/2009	18	0	17	11	0.4	20.1	10.4	5.1	40.0	16.2	6.2	4.6
5/10/2009	17	0	8	22	0.6	10.2	10.2	2.8	38.3	8.2	3.2	2.3
5/11/2009	32	0	0	15	0.9	12.4	6.8	4.1	26.0	10.0	3.8	2.8
5/12/2009	23	0	4	21	1.6	6.9	6.4	0.4	24.0	5.5	2.1	1.6
5/13/2009	36	0	2	8	3.4	53.3	47.1	2.5	219.8	42.9	16.5	12.2
5/14/2009	18	0	28	0	1.1	73.4	65.5	9.6	279.9	59.0	22.7	16.8
5/15/2009	8	0	11	27	0.6	10.6	7.1	3.7	24.7	8.5	3.3	2.4
5/16/2009	25	0	15	3	-4.9	72.1	185.0	3.2	775.4	58.0	22.3	16.5
5/17/2009	27	0	0	18	0.8	11.8	6.3	3.2	24.8	9.5	3.7	2.7
5/18/2009	19	0	3	19	0.3	8.6	4.8	1.1	17.7	6.9	2.7	2.0
5/19/2009	38	0	0	8	-0.1	17.9	14.5	2.5	48.9	14.4	5.5	4.1
5/20/2009	34	0	0	11	1.0	10.5	7.2	2.1	28.4	8.4	3.2	2.4
5/21/2009	30	0	1	17	-0.2	11.1	8.7	2.1	38.0	8.9	3.4	2.5
5/22/2009	7	0	6	31	2.5	0.5	0.6	0.1	1.7	0.4	0.2	0.1
5/23/2009	14	0	20	12	0.4	2.8	2.4	-0.1	8.3	2.3	0.9	0.6
5/24/2009	16	0	11	21	1.7	12.4	11.7	0.0	35.0	10.0	3.8	2.8
5/25/2009	5	0	10	8	1.9	17.7	3.1	13.3	20.7	14.2	5.5	4.1
5/26/2009	6	0	2	0	0.3	7.0	7.0	1.6	19.9	5.7	2.2	1.6
5/27/2009	35	0	6	5	1.2	8.2	7.6	-0.1	28.8	6.6	2.5	1.9
5/28/2009	21	0	10	9	-0.5	7.9	5.7	0.8	19.2	6.3	2.4	1.8
5/29/2009	15	0	15	16	0.3	13.7	11.0	1.0	36.2	11.0	4.2	3.1
5/30/2009	19	0	1	28	-0.9	8.9	6.5	0.3	25.7	7.2	2.8	2.0

Date	Valid	Direction limited	Angle limited	Turbulence limited	Background (ppb)	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
5/31/2009	24	0	8	13	0.6	9.9	12.7	-3.6	56.0	7.9	3.1	2.3
6/1/2009	40	0	2	6	-0.7	14.5	14.8	-1.0	69.0	11.6	4.5	3.3
6/2/2009	6	0	1	20	-0.4	39.5	37.9	4.5	95.1	31.7	12.2	9.0
6/3/2009	0	0	16	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/4/2009	10	0	15	22	0.0	21.7	14.3	3.7	53.8	17.4	6.7	5.0
6/5/2009	17	0	4	23	-0.5	6.2	6.5	-0.6	24.3	5.0	1.9	1.4
6/6/2009	27	0	5	15	0.0	17.0	10.5	3.3	43.8	13.7	5.3	3.9
6/7/2009	40	0	1	5	5.5	9.6	8.2	-0.9	42.5	7.8	3.0	2.2
6/8/2009	34	0	1	10	7.5	13.4	9.7	-2.2	37.0	10.7	4.1	3.1
6/9/2009	26	0	1	11	1.2	10.5	10.0	-1.1	36.2	8.5	3.3	2.4
6/10/2009	11	0	23	12	1.5	8.0	5.3	1.4	16.8	6.4	2.5	1.8
6/11/2009	27	0	16	5	0.3	15.8	16.7	2.0	81.9	12.7	4.9	3.6
6/12/2009	34	0	8	2	0.5	13.8	6.9	0.4	27.5	11.1	4.3	3.2
6/13/2009	9	0	14	22	1.3	3.6	3.7	0.1	12.4	2.9	1.1	0.8
6/14/2009	19	0	16	13	-0.6	8.4	7.4	-3.9	24.4	6.7	2.6	1.9
6/15/2009	6	0	7	24	1.9	6.6	1.8	4.2	8.6	5.3	2.0	1.5
6/16/2009	1	0	19	8	-0.2	3.5	N/A	3.5	3.5	2.8	1.1	0.8
6/17/2009	12	0	20	12	-0.4	8.1	5.4	0.0	17.4	6.5	2.5	1.9
6/18/2009	18	0	9	17	1.5	6.9	6.5	0.9	20.5	5.6	2.1	1.6
6/19/2009	35	0	7	6	1.5	12.4	8.4	0.7	34.1	10.0	3.8	2.8
6/20/2009	13	0	19	0	0.4	22.6	23.2	7.0	95.0	18.2	7.0	5.2
6/21/2009	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6/22/2009	15	0	2	3	0.6	2.5	1.9	0.1	6.5	2.0	0.8	0.6
6/23/2009	8	0	6	20	9.6	1.6	1.6	-1.6	3.4	1.3	0.5	0.4
6/24/2009	12	0	3	21	-0.5	8.0	6.0	3.2	20.7	6.5	2.5	1.8
6/25/2009	2	0	17	20	0.9	6.3	2.4	4.6	8.0	5.1	1.9	1.4
6/26/2009	21	0	2	17	1.4	5.8	2.8	2.0	10.7	4.7	1.8	1.3
6/27/2009	14	0	4	18	2.2	2.6	3.9	-2.4	9.7	2.1	0.8	0.6
6/28/2009	17	0	12	8	-0.1	4.7	5.1	0.8	21.1	3.8	1.5	1.1
6/29/2009	15	0	25	1	-1.4	2.5	1.2	0.5	4.8	2.0	0.8	0.6
6/30/2009	14	0	5	12	-1.0	3.8	2.1	0.0	7.5	3.1	1.2	0.9
7/1/2009	13	0	13	15	-0.8	1.9	1.2	0.1	4.8	1.5	0.6	0.4
7/2/2009	20	0	5	6	-0.9	2.3	1.8	0.1	6.3	1.8	0.7	0.5
7/3/2009	13	0	8	17	-0.4	2.2	1.4	0.3	4.6	1.8	0.7	0.5
7/4/2009	22	0	3	14	-0.2	2.5	2.1	0.3	8.8	2.0	0.8	0.6
7/5/2009	11	0	9	18	2.9	0.7	0.6	-0.2	1.5	0.5	0.2	0.2
7/6/2009	18	0	0	21	-0.3	1.5	1.1	0.1	3.6	1.2	0.5	0.3
7/7/2009	20	0	0	20	0.2	2.0	1.9	0.1	6.6	1.6	0.6	0.5
7/8/2009	13	0	3	20	1.0	2.6	2.6	-0.4	9.8	2.1	0.8	0.6
7/9/2009	20	0	3	15	0.7	3.1	1.8	0.7	7.6	2.5	0.9	0.7
7/10/2009	8	0	1	18	1.7	2.7	2.5	-0.2	7.2	2.2	0.8	0.6
7/11/2009	13	0	14	15	-1.1	4.9	5.9	0.3	21.6	3.9	1.5	1.1
7/12/2009	22	0	1	20	0.1	3.3	2.5	0.5	8.5	2.6	1.0	0.8
7/13/2009	15	0	7	20	-0.3	3.1	2.9	0.1	9.4	2.5	1.0	0.7
7/14/2009	12	0	14	19	0.9	1.9	1.0	0.3	3.4	1.5	0.6	0.4

Date	Valid	Direction limited	Angle limited	Turbulence limited	Background (ppb)	Emission average ($\mu gm^{-2}s^{-1}$)	Emission SD ($\mu gm^{-2}s^{-1}$)	Emission minimum ($\mu gm^{-2}s^{-1}$)	Emission maximum ($\mu gm^{-2}s^{-1}$)	Emission average (kgd^{-1})	Emission average ($gd^{-1}hd^{-1}$)	Emission average ($gd^{-1}AU^{-1}$)
7/15/2009	20	0	15	6	-0.6	1.7	2.0	0.0	6.4	1.3	0.5	0.4
7/16/2009	2	0	23	16	-1.7	4.3	1.9	3.0	5.6	3.5	1.3	1.0
7/17/2009	8	0	13	0	0.3	5.6	1.3	4.1	7.9	4.5	1.7	1.3
7/18/2009	8	0	32	7	-0.4	2.3	1.5	0.7	4.4	1.9	0.7	0.5
7/19/2009	11	0	6	26	-1.0	3.1	4.0	0.1	14.0	2.5	0.9	0.7
7/20/2009	13	0	6	24	-0.3	1.1	1.4	0.0	4.2	0.9	0.3	0.3
7/21/2009	13	0	10	22	0.1	2.9	1.5	0.6	7.2	2.3	0.9	0.7
7/22/2009	8	0	7	24	2.1	3.1	3.5	0.0	9.1	2.5	1.0	0.7
7/23/2009	14	0	8	14	0.0	4.6	3.1	1.1	11.1	3.7	1.4	1.0
7/24/2009	21	0	2	25	0.8	8.3	5.9	0.8	19.7	6.7	2.6	1.9
7/25/2009	25	0	16	3	0.6	14.2	25.2	1.3	125.9	11.4	4.4	3.2
7/26/2009	12	0	30	2	-0.4	3.9	2.9	0.2	9.7	3.1	1.2	0.9
7/27/2009	7	0	2	25	-1.4	2.4	1.7	1.3	6.1	2.0	0.8	0.6
7/28/2009	11	0	2	1	3.1	13.7	18.5	2.8	67.5	11.0	4.2	3.1
7/29/2009	24	0	2	20	2.2	3.7	2.2	0.6	8.4	3.0	1.1	0.8
7/30/2009	10	0	6	27	1.0	2.6	2.0	0.4	5.8	2.1	0.8	0.6
7/31/2009	11	0	16	19	0.9	2.0	0.8	0.8	3.7	1.6	0.6	0.5
8/1/2009	21	0	2	25	-0.2	14.1	7.8	3.0	33.2	11.3	4.4	3.2
8/2/2009	15	0	22	9	0.3	2.7	1.9	0.8	8.5	2.2	0.8	0.6
8/3/2009	35	0	0	13	0.1	18.6	10.2	2.3	36.4	14.9	5.7	4.2
8/4/2009	22	0	7	13	2.6	9.5	7.2	-1.2	23.8	7.6	2.9	2.2
8/5/2009	18	0	5	14	3.6	3.7	3.2	-0.8	11.1	3.0	1.1	0.8
8/6/2009	19	0	1	23	0.2	1.9	1.8	0.0	6.0	1.5	0.6	0.4
8/7/2009	11	0	9	28	-0.4	1.9	1.4	0.6	4.2	1.5	0.6	0.4
8/8/2009	37	0	4	5	-0.5	9.7	9.4	0.1	34.6	7.8	3.0	2.2
8/9/2009	46	0	2	0	0.0	11.1	4.3	3.9	22.3	8.9	3.4	2.5
8/10/2009	18	0	19	9	-0.6	13.1	14.7	1.5	57.4	10.5	4.0	3.0
8/11/2009	10	0	17	18	1.5	5.7	3.8	1.8	13.5	4.6	1.8	1.3
8/12/2009	38	0	0	8	0.4	1.6	1.3	0.0	6.8	1.3	0.5	0.4
8/13/2009	17	0	8	21	0.2	2.4	2.9	0.0	12.3	1.9	0.7	0.5
8/14/2009	20	0	1	26	-0.9	2.3	2.2	0.2	6.7	1.8	0.7	0.5
8/15/2009	23	0	0	24	-0.5	6.1	4.2	0.9	18.3	4.9	1.9	1.4
8/16/2009	27	0	0	21	0.2	11.7	7.2	0.3	27.8	9.4	3.6	2.7
8/17/2009	16	0	8	5	6.9	4.7	4.2	-2.9	13.3	3.8	1.5	1.1