

US EPA ARCHIVE DOCUMENT

CATALOG DOCUMENTATION
NATIONAL COASTAL ASSESSMENT- NORTHEAST DATABASE
YEAR 2002 STATIONS
LIGHT ATTENUATION DATA: "ATTENCO"

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1. DATASET IDENTIFICATION

1.1 Title of Catalog document

National Coastal Assessment-Northeast Region Database
Year 2002 Stations
WATER QUALITY - LIGHT ATTENUATION DATA

1.2 Authors of the Catalog entry

John Kiddon, U.S. EPA NHEERL-AED
Harry Buffum, CSC Corp.

1.3 Catalog revision date

August 2007

1.4 Dataset name

ATTENCO

1.5 Task Group

National Coastal Assessment-Northeast

1.6 Dataset identification code

014

1.7 Version

001

1.8 Request for Acknowledgment

EMAP requests that all individuals who download EMAP data acknowledge the source of these data in any reports, papers, or presentations. If you publish these data, please include a statement similar to: "Some or all of the data described in this article were produced by the U. S. Environmental Protection Agency through its Environmental Monitoring and Assessment Program (EMAP)".

2. INVESTIGATOR INFORMATION (for full addresses see Section 13)

2.1 Principal Investigators (NCA Northeast Region)

Donald Cobb, U.S. EPA NHEERL-AED
Walter Galloway, U.S. EPA NHEERL-AED
Stephen Hale, U.S. EPA NHEERL-AED
John Kiddon, U.S. EPA NHEERL-AED
Norman Rubinstein, U.S. EPA NHEERL-AED
Charles Strobel, U.S. EPA NHEERL-AED
Henry Walker, U.S. EPA NHEERL-AED

2.2 Sample Collection Investigators

Donald Cobb, U.S. EPA NHEERL-AED

2.3 Sample Processing Investigators

John Kiddon, U.S. EPA NHEERL-AED

3. DATASET ABSTRACT

3.1 Abstract of the Dataset

This data file reports the attenuation coefficient (ATTENCO) calculated from in situ photosynthetically active radiation (PAR) and depth data collected at NCA Northeast estuaries during the Summer of 2002. The attenuation coefficient (k) is related to the PAR readings at surface (I_o) and depth (I_z) by the expression: $I_z/I_o = \exp(-kz)$, where z is depth. The file also reports the number of readings used to calculate the coefficient. Raw data used in the calculations are not included here but are available from the database manager (Section 10.3). One record is presented per sampling event.

3.2 Keywords for the Dataset

Attenuation coefficient, PAR, photosynthetically active radiation

4. OBJECTIVES AND INTRODUCTION

4.1 Program Objective

The National Coastal Assessment (NCA) is a national monitoring and assessment program with the primary goal of providing a consistent evaluation of the estuarine condition in U.S. estuaries. It is an initiative of the Environmental Monitoring and Assessment Program (EMAP), and is a partnership of several federal and state environmental agencies, including: EPA's Regions, Office of Research and Development, and Office of Water; state environmental protection agencies in the 24 marine coastal states and Puerto Rico; and the United States Geological Survey (USGS) and the National Oceanic and Atmospheric Agency (NOAA). The NCA program was initiated in 2000, and known as the Coastal 2000 Program.

Stations were randomly selected using EMAP's probabilistic sampling framework and were sampled once during a summer index period (June to October). A consistent suite of indicators was used to measure conditions in the water, sediment, and in benthic and fish communities. The measured data may be used by the states to meet their reporting requirements under the Clean Water Act, Section 305(b). The data will also be used to generate a series of national reports characterizing the condition of the Nation's estuaries.

4.2 Dataset Objective

The objective of the ATTENCO data file is to report values of attenuation coefficients calculated from in situ PAR measurements in the water column.

4.3 Dataset Background Discussion

Refer to Section 4.4 for a list of dataset parameters. Additional information about selected parameters are discussed in this section.

This file presents the light attenuation coefficient (ATTENCO), which is calculated from PAR and depth measurements. The attenuation coefficient (k) is related to the PAR readings at surface (I_o) and depth (I_z) by the expression: $I_z/I_o = \exp(-kz)$, where z is depth in meters. Section 6.2 describes the calculation procedure. Smaller positive values of ATTENCO indicate clearer water (deeper penetration of light through the water column).

PAR values were measured at regular intervals on both the downcast and upcast (see Section 5.1.2); however, only the downcast data were used to calculate ATTENCO. The parameter PAR_RECS reports the number of PAR measurements used in the calculation. Several QA flags are used to highlight which may diminish confidence in the calculated coefficient (see Section 4.4).

NCA planners provide two alternate locations for a station location in the event that the original location cannot be sampled. The parameter STA_ALT indicates whether the station location was the original site, first alternate, or second alternate—STA_ALT = "A", "B", or "C", respectively. Also refer to discussion in the STATIONS metadata file regarding use of this parameter during analysis of the data.

Massachusetts did not participate in the NCA program in 2002. Rhode Island conducted fish trawls only in 2002, and collected physical water parameters in conjunction with the trawls. Connecticut collected all parameters, but at an abbreviated group of in-shore stations (stations in the Long Island Sound intended for sampling in 2002 were sampled in 2003).

4.4 Summary of Dataset Parameters

* denotes parameters that should be used as key fields when merging data files

*STATION	Station name
*STAT_ALT	Alternate Site Coded (A, B, or C)
*EVNTDATE	Event date
ATTENCO	Calculated PAR Attenuation Coefficient
PAR_RECS	Number of PAR readings
QACODE	PAR-A Surface PAR readings were not recorded; alternate calculation procedure used (Section 6.2)
	PAR-B Fewer than four PAR readings recorded; diminished reliability of the estimate is possible
	PAR-C Calculated attenuation coefficients less than zero (not valid); reported as zero

5. DATA ACQUISITION AND PROCESSING METHODS

5.1 Data Acquisition

The sample collection methods used by USEPA trained field crews will be

described here. Any significant variations by NCA partners are noted in Section 5.1.12. Details regarding NCA partners are reported in the EVENTS data file.

5.1.1 Sampling Objective

Obtain in situ measurements of PAR in the water column of estuaries in the NCA region.

5.1.2 Sample Collection: Methods Summary

PAR was measured with a LICOR PAR sensor separately or attached to Hydrolab Datasonde or similar instrument. A deck sensor, if available, was located on the boat deck in an unshaded location. The PAR sensor was lowered on the sunny (or at least unshaded) side of the boat to a depth of about 0.5 meters, and PAR values were allowed to stabilize. PAR levels were recorded from both the in situ and surface sensors (if a deck sensor was present), along with the water depth of the PAR meter. Measurement intervals were as follows:

Shallow sites (< 2 m): at every 0.5 m interval;

Moderate depths (>2 to <10 m): at 0.5 m (near-surface) and every 1-m interval to near-bottom (0.5 m off-bottom);

Deep sites (>10 m): at 0.5 m (near-surface) and every 1-m interval to 10 m, then at 5-m intervals, thereafter, to near-bottom (0.5 m off-bottom).

Measurements were recorded at the same intervals on the upcast. If the meter hit the bottom, 2-3 minutes were allowed for the disturbed conditions to settle before taking subsequent readings. All surface and in situ data from downcasts and upcasts are available from the data manager (Section 10.3).

5.1.3 Beginning Sampling Dates

25 June 2002

5.1.4 Ending Sampling Dates

31 October 2002

5.1.5 Sampling Platform

Samples were collected from gasoline or diesel powered boats, 18 to 133 feet in length

5.1.6 Sampling Equipment

Quantum sensors measure photosynthetically active radiation (PAR) in the 400 to 700 nm waveband. The unit of measurement is micromoles per second per square meter ($\mu\text{mol s}^{-1}\text{m}^{-2}$). LICOR PAR sensor readings were recorded concurrently with hydrographic data from Hydrolab or similar instrument. PAR readings were recorded on datasheets and entered by hand into excel spreadsheets or recorded using a software program such as Procomm.

5.1.7 Manufacturer of Sampling Equipment

LICOR L1100 light meter, LI-COR, Inc.

5.1.8 Key Variables

Not applicable

5.1.9 Sample Collection: Calibration

No daily field calibration procedures are required for the LICOR light

meter. The meters were calibrated at the beginning of the season using a calibration kit provided by the manufacturer.

5.1.10 Sample Collection: Quality Control

There are several field QC measures to help ensure taking accurate measurements of light penetration. The "deck" sensor was situated in full sunlight (i.e., out of any shadows), likewise, the submerged sensor was deployed from the sunny side of the vessel and care was taken to avoid positioning the sensor in the shadow of the vessel. To minimize effects of a disturbed water column, only data collected on the downcast were used in calculating ATTENCO.

5.1.11 Sample Collection: References

Strobel, C.J. 2000. Coastal 2000-Northeast Component: Field Operations Manual U. S. Environmental Protection Agency, National Health and Environmental Effects Research Laboratory, Atlantic Ecology Division, Narragansett, RI. EPA

5.1.12 Sample Collection: Alternate Methods

Consult the STATIONS data file for cooperative agreement code (ST_COOP)
The different partners used the following equipment:

ST_COOP	Water Profile Equipment
CT	Sea-bird SBE-19
DE	Hydrolab Datasonde
ME	Hydrolab Datasonde
NH	YSI model 6600_M
NJ-C	Hydrolab Datasonde
NJ-DB	Hydrolab Datasonde
NY	YSI model 6600_M or YSI 85 or Seabird model 25
RI	Hydrolab Datasonde

5.2 Data Preparation and Sample Processing

No analytical processing was involved for the ATTENCO parameters.

5.2.1 Sample Processing Objective

Not applicable

5.2.2 Sample Processing: Methods Summary

Not applicable

5.2.3 Sample Processing: Calibration

Not applicable

5.2.4 Sample Processing: Quality Control

Not applicable

5.2.5 Sample Processing: References

Not applicable

5.2.6 Sample Processing: Alternate Methods

Not applicable

6. DATA ANALYSIS AND MANIPULATIONS

6.1 Name of New or Modified Value PAR Attenuation Coefficient

6.2 Data Manipulation Description

Attenuation coefficients were extracted from discrete PAR water profile data files by first sorting the PAR records from the same water profile by downcast and upcast, then selecting the downcast records for analysis. The attenuation coefficient (k) is related to the PAR readings at surface (I_o) and depth (I_z) by the expression: $I_z/I_o = \exp(-kz)$, where z is depth in meters. The attenuation coefficient k is calculated as the slope obtained via regression of $\{-\ln(I_z/I_o) \text{ vs } z\}$. The ratio (I_z/I_o) was calculated using simultaneous readings from respective PAR sensors (time intervals agreeing to within 1 second). PAR data collected deeper than the 1% light level was excluded to yield a more accurate attenuation coefficient.

In some cases, surface PAR values (I_o) were not measured. The attenuation coefficient was then taken to be the slope obtained via regression of $\{-\ln(I_z) \text{ vs } z\}$. Values of ATTENCO calculated in this manner are accompanied by a QACODE = PAR-A.

7. DATA DESCRIPTION

7.1 Description of Parameters

7.1.1 Components of the Dataset

PARAMETER	TYPE	LENGTH	LABEL
STATION	Char	9	Station Name
STAT_ALT	Char	1	Alternate Site Code (A, B, or C)
EVNTDATE	Num	8	Event Date
ATTENCO	Num	8	PAR Attenuation Coefficient
PAR_RECS	Num	8	Number of PAR readings
QACODE	Char	18	QA Qualifier

7.1.2 Precision of Reported Values

ATTENCO is reported to three significant digits.

7.1.3 Minimum Value in Dataset

ATTENCO 0.00

PAR_RECS 1

7.1.4 Maximum Value in Dataset

ATTENCO 5.5

PAR_RECS 40

7.2 Data Record Example

7.2.1 Column Names for Example Records

STATION	STAT_ALT	EVNTDATE	ATTENCO	PAR_RECS	QACODE
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7.2.2 Example Data Records

station	stat_al t	evntdate	attenco	par_recs	qacode
CT02- 0200	A 2	9/18/200	0.987	6	PAR-A
CT02- 0202	A 2	8/28/200	1.97	5	PAR-A
CT02- 0203	A 2	9/18/200	0.696	5	PAR-A

8. GEOGRAPHIC AND SPATIAL INFORMATION

8.1 Minimum Longitude (Westernmost)
-75.7737 decimal degrees

8.2 Maximum Longitude (Easternmost)
-67.0939 decimal degrees

8.3 Minimum Latitude (Southernmost)
38.4521 decimal degrees

8.4 Maximum Latitude (Northernmost)
44.9456 decimal degrees

8.5 Name of area or region

The National Coastal Assessment Northeast Region covers the northeastern US coastline from Maine to Delaware.

9. QUALITY CONTROL AND QUALITY ASSURANCE

9.1 Measurement Quality Objectives

The measurement quality objectives of the EMAP-Estuaries program specify accuracy and precision requirements of 10% in the water physical parameters. Reference: U.S. EPA. 2001. Environmental Monitoring and Assessment Program (EMAP): National Coastal Assessment Quality Assurance Project Plan 2001-2004. U.S. Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Research Laboratory, Gulf Ecology Division, Gulf Breeze, FL. EPA/620/R-01/002. 189 p.

9.2 Data Quality Assurance Procedures

The data were reviewed to assure consistency among partners regarding sampling procedures, reporting format, etc. All measurements were performed in the field

9.3 Actual Measurement Quality

No field replicates were measured for these parameters

10. DATA ACCESS

10.1 Data Access Procedures

Data can be downloaded from the web
<http://www.epa.gov/emap/nca/html/regions/index.html>

10.2 Data Access Restrictions

None

10.3 Data Access Contact Persons

John Kiddon, U.S. EPA NHEERL-AED, Narragansett, RI
 401-782-3034, 401-782-3030 (FAX), kiddon.john@epa.gov

Harry Buffum, Data Manager, CSC, Narragansett, RI
 401-782-3183, 401-782-3030 (FAX), buffum.harry@epa.gov

10.4 Dataset Format

ASCII (CSV) and SAS Export files

10.5 Information Concerning Anonymous FTP

Not available

10.6 Information Concerning WWW

No gopher access, see Section 10.1 for WWW access

10.7 EMAP CD-ROM Containing the Dataset

Data not available on CD-ROM

11. REFERENCES

Strobel, C.J. 2000. Environmental Monitoring and Assessment Program: Coastal 2000 - Northeast component: field operations manual. Narragansett (RI): U.S. Environmental Protection Agency, National Health and Environmental Effects Research Laboratory, Atlantic Ecology Division. EPA/620/R-00/002. 68 p.

U.S. EPA. 2001. National Coastal Assessment: Field Operations Manual. U.S. Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Research Laboratory, Gulf Ecology Division, Gulf Breeze, FL. EPA/620/R-01/003. 72 p.

U.S. EPA. 2001. Environmental Monitoring and Assessment Program (EMAP): National Coastal Assessment Quality Assurance Project Plan 2001-2004. U.S. Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Research Laboratory, Gulf Ecology Division, Gulf Breeze, FL. EPA/620/R-01/002. 189 p.

12. TABLE OF ACRONYMS

AED	Atlantic Ecology Division
CSC	Computer Sciences Corporation
EMAP	Environmental Monitoring and Assessment Program
EPA	Environmental Protection Agency
NCA	National Coastal Assessment
NHEERL	National Health and Environmental Effects Research Laboratory
PAR	Photosynthetically Active Radiation
QA/QC	Quality Assurance/Quality Control
umol	micro mole

13. PERSONNEL INFORMATION

Chuck Audette, Database Analyst
Computer Sciences Corporation
27 Tarzwell Drive, Narragansett, RI 02882-1197
401-782-3092, 401-782-3030 (FAX), audette.chuck@epa.gov

Harry Buffum, Database Manager
Computer Sciences Corporation
27 Tarzwell Drive, Narragansett, RI 02882-1197
401-782-3183, 401-782-3030 (FAX), buffum.harry@epa.gov

Don Cobb, NCA Project Officer
U.S. Environmental Protection Agency, NHEERL-AED
27 Tarzwell Drive, Narragansett, RI 02882-1197
401-782-9616, 401-782-3030 (FAX), cobb.donald@epa.gov

Walter Galloway, NCA Project Officer
U.S. Environmental Protection Agency, NHEERL-AED
27 Tarzwell Drive, Narragansett, RI 02882-1197
401-782-3096, 401-782-3030 (FAX), galloway.walt@epa.gov

Steve Hale, EMAP Information Manager
U.S. Environmental Protection Agency, NHEERL-AED
27 Tarzwell Drive, Narragansett, RI 02882-1197
401-782-3048, 401-782-3030 (FAX), hale.stephen@epa.gov

Melissa Hughes, Data Librarian
Computer Sciences Corporation
27 Tarzwell Drive, Narragansett, RI 02882-1197
401-782-3184, 401-782-3030 (FAX), hughes.melissa@epa.gov

John Kiddon, NCA Analyst and Northeast QA Manager
U.S. Environmental Protection Agency, NHEERL-AED
27 Tarzwell Drive, Narragansett, RI 02882-1197
401-782-3044, 401-782-3030 (FAX), kiddon.john@epa.gov

John Macauley, NCA QA Officer
U.S. Environmental Protection Agency, NHEERL-GED
1 Sabine Island Dr., Gulf Breeze, FL 32561
850-934-9353, macauley.john@epa.gov

Norman Rubinstein, NCA Project Officer
U.S. Environmental Protection Agency, NHEERL-AED
27 Tarzwell Drive, Narragansett, RI 02882-1197
401-782-3045, 401-782-3030 (FAX), rubinstein.norman@epa.gov

Charlie Strobel, AED Analyst and Project Officer
U.S. Environmental Protection Agency, NHEERL-AED
27 Tarzwell Drive, Narragansett, RI 02882-1197
401-782-3180, 401-782-3030 (FAX), strobel.charles@epa.gov

Kevin Summers, Acting National NCA Program Director

U.S. Environmental Protection Agency, NHEERL-GED
1 Sabine Island Dr., Gulf Breeze, FL 32561
850-934-9244, summers.kevin@epa.gov

Hal Walker, Northeast NCA Program Director and Analyst
U.S. Environmental Protection Agency, NHEERL-AED
27 Tarzwell Drive, Narragansett, RI 02882-1197
401-782-3007, 401-782-3030 (FAX), walker.henry@epa.gov