Jacques Cousteau (JAC) NERR Meteorological Metadata
January 2005 – December, 2005
Latest Update: **October 16, 2023**

I. Data Set & Research Descriptors

1) Principal investigator & contact persons:

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2) Entry verification

a) Data Input Procedures:

The 15-minute, 1-hour average, and 24-hour meteorological data were downloaded from each instrument on the weather station to a Campbell Scientific CR10X datalogger. The CDMO Data Logger Program (NERR303.CSI, NERR _4.CSI and NERR_5_1.CSI) was loaded into the CR10X (10/2002, 11/05/03 and 11/15/05, respectively) to control the sensor and data collection schedule (see 2b of the Entry Verification section for the data collection schedule). The CR10X interfaces with the PC208W software supplied by Campbell Scientific and housed on a dedicated computer. This software uploads data via phone modem to a computer located at the RSC Marine Science and Environmental Field Station. The data was saved as a raw data file (i.e. nc101002, Nacote Creek October 10, 2002) and backed up to disk and a secondary hard drive.

Data was exported from PC208W in a comma-delimited format (.DAT) and opened in Microsoft Excel for pre-processing with an EQWin format macro (EQWinFormat.xls), created by the CDMO. The macro adds header, station code, date and time columns, and reformats data to the appropriate number of decimal places. The pre-processed data file is then ready to be copied into the EQWin weather.eqi file, where it was QA/QC checked and archived into the database. EQWin was used to generate queries, reports and graphs to identify data set outliers (data values falling outside the pre determined values for each parameter) and large changes in measured data. Statistical analyses and customized graphs and queries were also generated using EQWin. Data corrections, missing data and anomalous data were investigated and listed in their respective sections below.

1) There were data corrections made for 2005, see section 12.
2) There were no data anomalies identified in 2005.
3) There is missing data for 2005, see section 13.

SWMP technician Robert Scahill and RSC Marine Field Station manager Steven Evert collected; QA/QC checked and compiled 2005 weather data per CDMO procedures. Raw data files were collected weekly and backed up to disc and a secondary hard drive. Pre-processing macros were run and EQWin databases were created on a dedicated met station computer. All data was backed up to secondary hard drive, disc and remote servers.

b) Data Collection Schedule

i) Data is collected in the following formats.
(1) 15 minute averages are collected every 15 minutes.
(2) Hourly averages are collected every 60 minutes.
(3) Daily average, maximum with time, and minimum with time.

ii) 15 minute sample point parameters: Date, Time, Air Temperature (c), Relative Humidity (%), LiCor (par), Barometric Pressure (mb), Wind Speed (m/s), Wind Direction, Rainfall (mm)

iii) Hourly average parameters: Date, Time, Air Temperature (c), Relative Humidity (%), LiCor (par), Barometric Pressure (mb), Wind Speed (m/s), Wind Direction, Wind Direction Standard Deviation (using Yamartino's Algorithm)

iv) Daily Averages parameters: Date, Time, Air Temperature (c), Relative Humidity (%), LiCor (par), Barometric Pressure (mb), Wind Speed (m/s), Wind Direction

v) Daily Maximum parameters: Date, Time, Air Temperature (c), Time, Relative Humidity (%), Time, LiCor (par), Time, Barometric Pressure (mb), Time, Wind Speed (m/s), Time, Battery Voltage, Time

vi) Daily Minimum parameters: Date, Time, Air Temperature (c), Time, Relative Humidity (%), Time, LiCor (par), Time, Barometric Pressure (mb), Time, Wind Speed (m/s), Time, Battery Voltage, Time

c) Error/Anomalous Data Criteria

Air Temp:
- 15 min averages not greater than *max* for the day
- 15 min averages not less than the *min* for the day
- Sample not greater than 50 degrees Celsius (C)
- Sample not less than -40 degrees Celsius (C)

Relative Humidity:
- Sample not greater than 100 percent humidity (%)
- Sample not less than 0 percent humidity (%)
- 15 minute averages not greater than the *max* for the day
- 15 minute averages not less than the *min* for the day

Barometric Pressure:
- Sample not greater than 1060 millibars (mb)
- Sample not less than 900 millibars (mb)
- 15 minute averages not greater than *max* for the day
- 15 minute averages not less than *min* for the day

Wind Speed:
- Sample not greater than 30 meters per second (m/s)
- Sample not less than 0.5 meters per second (m/s) for 12 hours consecutively

Wind Direction:
- Sample not greater than 360 degrees
- Sample not less than 0 degrees

Precipitation:
- 15 minute total not greater than 5 millimeters (mm)

Solar Radiation (LiCor)
- 15 minute total not greater than 5000 millimoles per meter squared (mmol/m^2)
- 15 minute total not less than 0 millimoles per meter squared (mmol/m^2)

Time:
- 15-minute interval recorded

For all data:
- Duplicate interval data

3) Research objectives:

The principal objective is to record long-term meteorological data for the JC NERR in order to observe any environmental changes or trends over time. A major component of the

JCNERR SWMP program is the monitoring of estuarine water quality. The close coupling between meteorological conditions and estuarine water quality has necessitated the monitoring of atmospheric conditions in the system as well. The meteorological data collected at the Reserve site thus provide valuable information on the atmospheric influences on water quality in the JCNERR system.

4) Research methods:

The Campbell Scientific weather station samples every 5 seconds to produce15 minute, hourly and daily averages of those measurements of air temperature, relative humidity, barometric pressure, rainfall, wind speed and wind direction. The CR10X datalogger can store over two weeks of data before it overwrites the data. If the modem link failed and data could not be collected from the datalogger to the computer the data would be downloaded from the CR10X to a laptop computer following procedures in Part D. Section 4.5 of the CDMO Operations Manual. Monthly, sensors on the weather station are inspected for damage or debris. If any is found, it is repaired and/or cleaned. Sensors are removed and sent back to Campbell Scientific for calibration at a minimum of every two years, depending on sensor specifications.

5) Site location and character:

The Jacques Cousteau National Estuarine Research Reserve (JCNERR) at Mullica River/Great Bay is located on the northeast coast of the United States on the Atlantic Ocean. The estuary is near Tuckerton, New Jersey about 14 kilometers north of Atlantic City. The met station is located adjacent to Nacote Creek, a tributary of the Mullica River. The site is approximately 14.3 kilometers WSW of Little Egg Inlet, the primary saltwater influence of the JC NERR. The met station is located on property owned by the RSC Marine Science and Environmental Field Station in Port Republic, NJ, approximately 1.8 kilometers south of the Chestnut Neck marina on the Mullica River and 0.4 kilometers northeast of Rt. 9 in Port Republic, NJ.

GPS coordinates: N 39 degrees, 32 minutes, 06 seconds
W 74 degrees, 27 minutes, 49 seconds

The nearest long term water quality monitoring station is located at Chestnut Neck Marina, approximately 1.8 kilometers North of the met station. Water quality data (currently not included in the JC NERR SWMP program) for Nacote Creek is at a site adjacent to the met station.

The unit is mounted on a 13-meter tower adjacent to the Nacote Creek, approximately 20 m from the high tide line. The elevations above the marsh surface are as follows; Barometric pressure - 2.2 m, temperature and relative humidity - 2.9 m, PAR - 4.5 m, wind – 12.5 m, highest point on tower (lightning rod) - 14 m. The rain gauge is approximately 2.1 m above

the surface and 1.5 m north of the tower. The area is sparsely covered with clam shell debris and upland grasses.

Typical weather patterns for the New Jersey Coast include afternoon sea breezes (SW) and near still winds from midnight until shortly after sunrise during the summer months. Major weather events typically include 2-3 day duration periods of ENE winds and significant cold fronts from October through March. These cold fronts typically bring extended periods of increased NW winds commonly reaching 25-40 knots.

6) Data collection period:

The meteorological monitoring program was started in October 2002 at the JCNERR. The Reserve has a long-standing program in the collection of water quality data and other meteorological data, which is available at the Rutgers University Marine Field Station before October 2002 by contacting the Research Coordinator listed above. The data collection for 2005 began on 1/1/2005 and ended on 12/31/2005.

7) Distribution

According to the Ocean and Coastal Resource Management Data Dissemination Policy for the NERRS System-wide Monitoring Program,

> NOAA/ERD retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The PI retains the right to be fully credited for having collected and processed the data. Following academic courtesy standards, the PI and NERR site where the data were collected will be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. Manuscripts resulting from the NOAA/OCRM supported research that are produced for publication in open literature, including refereed scientific journals, will acknowledge that the research was conducted under an award from the Estuarine Reserves Division, Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration. The data set enclosed within this package/transmission is only as good as the quality assurance/quality control procedures outlined by the enclosed metadata reporting statement. The user bears all responsibility for its subsequent use/misuse in any further analyses or comparisons. The Federal government does not assume liability to the Recipient or third persons, nor will the Federal government reimburse or indemnify the Recipient for its liability due to any losses resulting in any way from the use of this data.

NERR weather data and metadata can be obtained from the Research Coordinator at the individual NERR site (please see Section 1, Principal investigators and contact persons), from the Data Manager at the Centralized Data Management Office (please see personnel directory under the general information link on the CDMO home page) and online at the CDMO home page http://cdmo.baruch.sc.edu/. Data are available in text tab-delimited format.

8) Associated researchers and projects:

The meteorological data collected in the SWMP program of JCNERR are important to assess migration patterns of key species found in the Mullica River-Great Bay Estuary, Little Egg Harbor, and other contiguous waters. Included here are the seasonal movements of striped bass (Morone saxatilis), bluefish (Pomatomus saltatrix) and summer flounder (Paralichthys dentatus). The meteorological data are also important for studies of the population dynamics of shellfish species, notably the hard clam (Mercenaria mercenaria) and blue crab (Callinectes sapidus). Furthermore, the data are valuable for evaluating environmental conditions that influence benthic communities, both those inhabiting soft sediments and living attached to hard surfaces (i.e., epibenthos). One of the most important areas of study for the coastal bay waters of Little Egg Harbor is dealing with submerged aquatic vegetation (Zostera marina and Ruppia maritima). A major concern is the health and vitality of the SAV, and how the beds in the bay are affected by natural factors (e.g., storms, unusual temperature conditions, reduced dissolved oxygen, etc.) and anthropogenic influences. All of the aforementioned studies are either underway or scheduled for future work.

II. Physical Structure Descriptors

9) Sensor specifications, operating range, accuracy, date of last calibration, date put into service

LiCor Quantum Sensor #2
Model # LI190SB
Stability: <±2% change over 1 yr
Operating Temperature: -40 to 65°C
Sensitivity: typically 5 µA per 1000µmoles s-1 m-2
Light spectrum wavelength: 400 to 700 nm
Date of last calibration: March 25, 2003
Put into service: November 5, 2003
S/N: Q32195

Wind Monitor #2
Model # 05103
Range: 0-60 m/s; 360° mechanical
Date of last calibration: March 19, 2003
Put into service: November 24, 2003
S/N: WM56138

Temperature and Relative Humidity #2
Model #: HMP45C
Operating Temperature: -40-+60°C
Temperature Measurement Range: -40-+60°C
Temperature Accuracy: ± 0.2 °C @ 20°C

Relative Humidity Measurement Range: 0-100% non-condensing
RH Accuracy: +/-2% RH (0-90%) and +/-3 %(90-100%)
Uncertainty of calibration: ± 1.2% RH
Date of Last calibration: April 11, 2003
Put into service: November 5, 2003
S/N: Y1540089

Barometric Sensor #2
Model # CS-105
Operating Range: Pressure - 600-1060 mb
Temperature: -40-+60C
Humidity: non-condensing
Accuracy: ±0.5 to 6.0 mb (+20-60C)
Stability: ± 0.1 mb per year
Date of Last calibration: April 2, 2003
Put into service: November 5, 2003
S/N: Y1430012

Tipping Bucket Rain Gauge #1
Model #: TE 525
Range: 0.1 mm
Accuracy: 1.0% at <2"/hr
Date of Last calibration: April, 2004

CR10X
Campbell Scientific CR10X Wiring Panel has 128K of flash memory (EEPROM), in which it stores the operating system and its program (that it uses to run the weather station). Additionally, there is 128K of SRAM, which it uses to run the program and store its measurements and for final data storage

A GOES transmitter was added on November 15, 2005. The satellite antenna is oriented to 192 degrees North magnetic and activates the transmitter at 39:50 after the hour for a 10 second period.

10) Coded variable indicator and variable code definitions:

NC = Nacote Creek
JAC = Mullica River/Jacques Cousteau NERR
Station code = jacncmet

11) Data anomalies:

Arrays:
During 2022 all pre-2007 weather data were revisited by the CDMO. Historically those datasets included 15 minute, hourly (60), and daily data arrays (144). As directed by the

NERRS Data Management Committee, the CDMO removed the hourly and daily data arrays leaving only the 15 minute data to make the entire NERRS SWMP weather dataset consistent in its reporting. All references to the 60 and 144 arrays were left in the metadata document as they may still provide valuable information, but users should be aware that they are largely no longer relevant. The updated datasets were uploaded to the database and made available through the various data applications at www.nerrsdata.org/get/landing.cfm throughout the fall of 2022.

There were no data anomalies recorded in 2005 based on EQWin queries from section 1.c.

NOTE: Precipitation data during periods of at or near 0 degrees Celsius may be suspect due to the potential freezing of the mechanical rain gauge.

Data corrections:

12) Deleted data:

Arrays:
During 2022 all pre-2007 weather data were revisited by the CDMO. Historically those datasets included 15 minute, hourly (60), and daily data arrays (144). As directed by the NERRS Data Management Committee, the CDMO removed the hourly and daily data arrays leaving only the 15 minute data to make the entire NERRS SWMP weather dataset consistent in its reporting. All references to the 60 and 144 arrays were left in the metadata document as they may still provide valuable information, but users should be aware that they are largely no longer relevant. The updated datasets were uploaded to the database and made available through the various data applications at www.nerrsdata.org/get/landing.cfm throughout the fall of 2022.

The following data was deleted due to a power down for the addition of the GOES transmitter

Array 15 on 11/15/05 @ 08:30
Array 60 on 11/15/05 @ 12:00
Array 144 on 11/15/05 @ 24:00

13) Missing Data:

Arrays:
During 2022 all pre-2007 weather data were revisited by the CDMO. Historically those datasets included 15 minute, hourly (60), and daily data arrays (144). As directed by the NERRS Data Management Committee, the CDMO removed the hourly and daily data arrays leaving only the 15 minute data to make the entire NERRS SWMP weather dataset consistent in its reporting. All references to the 60 and 144 arrays were left in the metadata document as

they may still provide valuable information, but users should be aware that they are largely no longer relevant. The updated datasets were uploaded to the database and made available through the various data applications at www.nerrsdata.org/get/landing.cfm throughout the fall of 2022.

Data are missing due to equipment or associated specific probes not being deployed, equipment failure, time of maintenance or calibration of equipment, or repair/replacement of a sampling station platform. For more details on deleted data, see the Deleted Data Section (12). If additional information on missing data is needed, contact the Research Coordinator at the reserve submitting the data.

The following data is missing due to a power down for the addition of the GOES transmitter

November 15, 2005
Data missing from 11/15/05 @ 08:30-11/15/05 @ 12:00

14) Other Remarks/notes

On 10/16/2023 this dataset was updated to include embedded QAQC flags for anomalous/suspect data. System-wide monitoring data beginning in 2007 were processed to allow for QAQC flags and codes to be embedded in the data files rather than detailed in the metadata alone (as in the anomalous/suspect, deleted, and missing data sections above). Prior to 2007, rejected data were deleted from the dataset so they are unavailable to be used at all, but suspect data were only noted in the metadata document. Suspect data flags <1> were embedded retroactively in order to allow suspect data to be easily identified and filtered from the dataset if desired for analysis and reporting purposes. No other flags or codes were embedded in the dataset and users should still refer to the detailed explanations above for more information.

Arrays:
During 2022 all pre-2007 weather data were revisited by the CDMO. Historically those datasets included 15 minute, hourly (60), and daily data arrays (144). As directed by the NERRS Data Management Committee, the CDMO removed the hourly and daily data arrays leaving only the 15 minute data to make the entire NERRS SWMP weather dataset consistent in its reporting. All references to the 60 and 144 arrays were left in the metadata document as they may still provide valuable information, but users should be aware that they are largely no longer relevant. The updated datasets were uploaded to the database and made available through the various data applications at www.nerrsdata.org/get/landing.cfm throughout the fall of 2022.

Precipitation:
During the initial years of NERRS SWMP weather data collection the CR10X programming was inconsistent in how precipitation values were recorded. For most reserves, zeros were not recorded when rainfall had not occurred between 2001-2003, instead no rainfall was represented by a blank cell. The CDMO verified which datasets were impacted by this issue

for the 2001-2006 datasets and inserted zeros when the metadata indicated that no precipitation occurred and data were not missing for other reasons. In some cases, zero values for precipitation data were evaluated and removed where the metadata confirmed that no rainfall should have been in the dataset. The pre-2007 data did not go through a thorough QAQC process again at that time (in addition to previous QAQC); however, if discrepancies were noticed between what was documented in the metadata and what was in the dataset, additional updates may have been made. The updated datasets were uploaded to the database and made available through the various data applications at www.nerrsdata.org/get/landing.cfm throughout early 2023.

No major storms affected the recording of data at the sampling site.