Jacques Cousteau (JAC) **NERR Meteorological Metadata**
January 1, 2010 – December 31, 2010
Latest Update: November 12, 2014

I. Data Set and Research Descriptors

1) Principal investigator and contact persons

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2) Entry verification

a) Data Input Procedures

Data are uploaded from the CR1000 data logger to a Personal Computer (IBM compatible). Files are exported from LoggerNet in a comma-delimited format and uploaded to the CDMO where they undergo automated primary QAQC and become part of the CDMO's online provisional database. During primary QAQC, data are flagged if they are missing, out of sensor range. The edited file is then returned to the Reserve where it is opened in Microsoft Excel and processed using the CDMO's NERRQAQC Excel macro. The macro inserts station codes, creates metadata worksheets for flagged data and summary statistics, and graphs the data for review. It allows the user to apply QAQC flags and codes to the data, append files, and export the resulting data file to the CDMO for tertiary QAQC and assimilation into the CDMO's authoritative online database. For more information on QAQC flags and QAQC codes, see Sections 11 and 12.
SWMP technician Gina Petruzzelli and RSC Marine Field Station manager Steven Evert collected; QA/QC checked and compiled 2010 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 on a dedicated met station computer. All data was backed up to secondary hard drive, disc and remote servers.

3) Research objectives

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

4) Research methods

The Campbell Scientific weather station samples every 5 seconds to produce 15 minute averages of those measurements of air temperature, relative humidity, barometric pressure, wind speed and wind direction. Total precipitation and photosynthetically active radiation data are totalized over the 15 minute sampling interval. The CR1000 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 CR1000 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 either annually or every two years,, depending on sensor specifications.

Recommended calibration frequency for the MET station sensors:
- Temperature/Humidity- annual recalibration
- Rain Gauge- annual recalibration
- Wind Speed/Direction- annual or bi-annual inspection (depending on the sensor)
- Barometric Pressure- bi-annual recalibration
- PAR- bi-annual recalibration
- CR1000-every 5 years (required beginning 2014, one year initial grace period)

Campbell Scientific data telemetry equipment was installed at the Nacote Creek Meteorological station on 11/15/05 and transmits data to the NOAA GOES satellite, NESDIS ID #3B00D112. (Where 3B00D112 is the GOES ID for that particular station.) The transmissions are scheduled hourly and contain four (4) data sets reflecting fifteen minute data sampling intervals. Upon receipt by the CDMO, the data undergoes the same automated primary QAQC process detailed in Section 2 above. The “real-time” telemetry data become part of the provisional dataset until undergoing secondary and tertiary

QAQC and assimilation in the CDMO's authoritative online database. Provisional and authoritative data are available at http://cdmo.baruch.sc.edu.

Data Collection Schedule:

The 15 minute Data are collected in the following formats for the CR1000:

Averages from 5-second data:
Air Temperature (°C), Relative Humidity (%), Barometric Pressure (mb), Wind Speed (m/s), Wind Direction (degrees), Wind Direction Standard Deviation (degrees), Battery Voltage (volts)

Maximum, Minimum, and their times from 5-second data (these data are not available in the dataset, but are available from JAC NERR)**:**
Air Temperature (°C)

Maximum and times from 5-second data:
Wind Speed, (m/s)

Totals:
Precipitation (mm), PAR (millimoles/m^2), and Cumulative Precipitation (mm)

5) Site location and character

The Jacques Cousteau National Estuarine Research Reserve (JAC NERR) 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 JAC 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, 4.83 seconds
W 74 degrees, 27 minutes, 48.74 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 JAC 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 2010 data collection interval spanned from January 1, 2010 at 00:00 to December 31, 2010 at 23:45.

7) Distribution.

NOAA retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The NERRS retains the right to be fully credited for having collected and process the data. Following academic courtesy standards, the NERR site where the data were collected should be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. The data set enclosed within this package/transmission is only as good as the quality assurance and 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.

Requested citation format:
National Estuarine Research Reserve System (NERRS). 2012. System-wide Monitoring Program. Data accessed from the NOAA NERRS Centralized Data Management Office website: http://cdmo.baruch.sc.edu/; *accessed* 12 October 2012.

NERR meteorological data and metadata can be obtained from the Research Coordinator at the individual NERR site (please see 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 comma delimited format.

8) Associated researchers and projects

The meteorological data collected in the SWMP program of JAC NERR 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. In addition to meteorological monitoring, JAC NERR also monitors water quality and nutrient data as part of SWMP. These data are available online at http://cdmo.baruch.sc.edu/.

II. Physical Structure Descriptors

9) Sensor specifications.

Parameter: LI-COR Quantum Sensor #1
Units: mmoles m-2 (total flux)
Sensor type: High stability silicon photovoltaic detector (blue enhanced)
Model #: LI190SB
Light spectrum waveband: 400 to 700 nm
Temperature dependence: 0.15% per °C maximum
Stability: <±2% change over 1 yr
Operating Temperature: -40°C to 65°C; Humidity: 0 to 100%
Sensitivity: typically 5 µA per 1000 µmoles s-1 m-2
Date of last calibration: April 30, 2009
Multiplier: 1.29
Put into service: August 4, 2009
S/N: Q30323

Parameter: Wind speed Sensor #1
Units: meter per second (m/s)
Sensor type: 18 cm diameter 4-blade helicoids propeller molded of polypropylene
Model #: R.M. Young 05103 Wind Monitor

Range: 0-60 m/s (134 mph); gust survival 100 m/s (220 mph)
Accuracy: +/- 0.3 m/s
Date of last calibration: April 30, 2009
Put into service: August 4, 2009
S/N: WM56138

Parameter: Wind direction Sensor #1
Units: degrees
Sensor type: balanced vane, 38 cm turning radius
Model #: R.M. Young 05103 Wind Monitor
Range: 360° mechanical, 355° electrical (5° open)
Accuracy: +/- 3 degrees
Date of last calibration: April 30, 2009
Put into service: August 4, 2009
S/N: WM48915

Parameter: Temperature Sensor #1
Units: Celsius
Sensor type: Platinum resistance temperature detector (PRT)
Model #: HMP45C Temperature and Relative Humidity Probe
Operating Temperature: -40°C to +60°C
Range: -40°C to +60°C
Accuracy: ± 0.2 °C @ 20°C
Date of Last calibration: April 30, 2009
Put into service: August 4, 2009
S/N: X1130013

Parameter: Relative Humidity Sensor #1
Units: Percent
Sensor type: Vaisala HUMICAP© 180 capacitive relative humidity sensor
Model #: HMP45C Temperature and Relative Humidity Probe
Range: 0-100% non-condensing
Accuracy at 20°C: +/- 2% RH (0-90%) and +/- 3% (90-100%)
Temperature dependence of RH measurement: +/- 0.05% RH/°C
Date of Last calibration: April 30, 2009
Put into service: August 4, 2009
S/N: W2540007

Parameter: Barometric Sensor #1
Units: millibars (mb)
Sensor type: Vaisala Barocap © silicon capacitive pressure sensor
Model #: CS-105
Operating Range: Pressure: 600 to 1060 mb; Temperature: -40°C to +60°C; Humidity: non-condensing
Accuracy: ± 0.5 mb @ 20°C; +/- 2 mb @ 0°C to 40°C; +/- 4 mb @ -20°C to 45°C; +/- 6 mb @ -40°C to 60°C

Stability: ± 0.1 mb per year
Date of Last calibration: May 06, 2009
Put into service: August 4, 2009
S/N: W2540007

Parameter: Precipitation Sensor #1
Units: millimeters (mm)
Sensor type: Tipping Bucket Rain Gauge
Model #: TE525
Rainfall per tip: 0.01 inch
Operating range: Temperature: 0° to 50°C; Humidity: 0 to 100%
Accuracy: +/- 1.0% up to 1 in./hr; +0, -3% from 1 to 2 in./hr; +0, -5% from 2 to 3 in./hr
Date of Last calibration: September 6, 2007

CR1000
The CR1000 has two MB Flash EEPROM that is used to store the Operating System. Another 128 K Flash is used to store configuration settings. A minimum of 2 MB SRAM is (4 MB optional) is available for program storage (16K), operating system use, and data storage. Additional storage is available by using a compact flash card in the optional CRM100 Compact Flash Module. The CR1000 was added on November 10, 2006.

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. The telemetry is "Provisional" data and not the "Authentic" Dataset used for long term monitoring and study. This data can be viewed by going to http://cdmo.baruch.sc.edu.

10) Coded variable definitions

Sampling station:	Sampling site code:	Station code:
Nacote Creek	NC	jacncmet

11) QAQC flag definitions

QAQC flags provide documentation of the data and are applied to individual data points by insertion into the parameter's associated flag column (header preceded by an F_). During primary automated QAQC (performed by the CDMO), -5, -4, and -2 flags are applied automatically to indicate data that is above or below sensor range, or missing. All remaining data are then flagged 0, as passing initial QAQC checks.

During secondary and tertiary QAQC 1, -3, and 5 flags may be used to note data as suspect, rejected due to QAQC, or corrected.

-5 Outside High Sensor Range
-4 Outside Low Sensor Range
-3 Data Rejected due to QAQC
-2 Missing Data
-1 Optional SWMP supported parameter
0 Passed Initial QAQC Checks
1 Suspect Data
2 *Open - reserved for later flag*
3 *Open - reserved for later flag*
4 Historical Data: Pre-Auto QAQC
5 Corrected Data

12) QAQC code definitions

QAQC codes are used in conjunction with QAQC flags to provide further documentation of the data and are also applied by insertion into the associated flag column. There are three (3) different code categories, general, sensor, and comment. General errors document general problems with the CR1000, sensor errors are sensor specific, and comment codes are used to further document conditions or a problem with the data. Only one general or sensor error and one comment code can be applied to a particular data point, but some comment codes (marked with an * below) can be applied to the entire record in the F_Record column.

General Errors

GIM	Instrument Malfunction
GIT	Instrument Recording Error, Recovered Telemetry Data
GMC	No Instrument Deployed due to Maintenance/Calibration
GMT	Instrument Maintenance
GPD	Power Down
GPF	Power Failure / Low Battery
GPR	Program Reload
GQR	Data Rejected Due to QA/QC Checks
GSM	See Metadata

Sensor Errors

SDG	Suspect Due to Sensor Diagnostics
SIC	Incorrect Calibration Constant, Multiplier or Offset
SIW	Incorrect Wiring
SMT	Sensor Maintenance

SNV	Negative Value
SOC	Out of Calibration
SQR	Data Rejected due to QAQC Checks
SSN	Not a Number / Unknown Value
SSM	Sensor Malfunction
SSR	Sensor Removed

Comments

CAF	Acceptable Calibration/Accuracy Error of Sensor
CDF	Data Appear to Fit Conditions
CML	Snow Melt from Previous Snowfall Event
CRE*	Significant Rain Event
CSM*	See Metadata
CCU	Cause Unknown
CVT*	Possible Vandalism/Tampering
CWE*	Significant Weather Event

13) Other remarks/notes

Data are missing due to equipment or associated specific sensors not being deployed, equipment failure, time of maintenance or calibration of equipment, or repair/replacement of a sampling station platform. Any NANs in the dataset stand for "not a number" and are the result of low power, disconnected wires, or out of range readings. If additional information on missing data is needed, contact the Research Coordinator at the reserve submitting the data.

Small negative PAR values are within range of the sensor and are due to normal errors in the sensor and the CR1000 Datalogger. The Maximum signal noise error for the Licor sensor is +/- 2.214 mmoles/m2 over a 15 minute interval.

Relative Humidity data greater than 100 are within range of the sensor accuracy of +/- 3%.

Data recorded for all parameters (with the exception of cumulative precipitation) at the midnight timestamp (00:00) are the 15 minute averages and totals for the 23:45-23:59 time period of the previous day. Cumulative precipitation data at the midnight timestamp (00:00) are the sum of raw (unrounded) precipitation data from 00:00 to 23:59 of the previous day. Summing each individual 15-minute total precipitation value from the same period will result in small differences from cumulative precipitation due to rounding. It is especially important to note how data at the midnight timestamp are recorded when using January 1st and December 31st data.

January 1, 2010 00:00 to January 5, 2010 14:15 missing data due to an incorrect program (data missing since December 23, 2009 10:15). A new program was uploaded at 14:15. Data at 14:30 were rejected due to not being a full 15 minutes of 5-second data.

PAR data from1/5/2010-12/31/2010 are flagged and coded as <0> CSM for sensor drift, unless otherwise flagged as rejected, missing, or suspect. There were noticeable changes in PAR values following the swap to a freshly calibrated sensor (assumed to be accurate) on 08/16/2012. We do not have the calibration certificate for the sensor that was removed in 2012 (Q30323), however, based on the jump in PAR values, we believe the sensor drifted over time. Acceptable drift is +/- 2% for this sensor. All PAR data 1 year prior the sensor swap, from 8/16/2011 to 8/16/2012 are or will be flagged and coded as <1> SSD CSM. PAR data for the remainder of this deployment are flagged and coded <0> CSM and users should note that drift for that period may have exceeded acceptable limits as well. If users are comfortable assuming that drift was linear (in a real world environment it is unlikely to be entirely linear), these data may be 'corrected' for assumed linear drift at the user's discretion using manufacturer's instructions.

Slightly elevated nighttime PAR data occurred during 2010. It is believed that moisture seeping into the sensor may have caused these elevated readings. These data were flagged as suspect <1> CSM. http://www.sunrisesunset.com/ was used to help determine the cutoff times for sunrise and sunset.

All precipitation data (total and cumulative) for 2010 are considered suspect due to the rain gauge being out of calibration. Precipitation data are flagged and coded as <1> SOC CSM with the exception of total precipitation values on 12/17/2010 at 10:15-11:00 and 12/27/2010 at 11:45-12:15, 12:45, 13:00, 13:30, and 14:00 were flagged and coded as <1> SOC CML. Cumulative values are flagged from the beginning of the melt until the end of the day. Those data are also considered suspect due to snow melt. Precipitation data during periods of at or near 0 degrees Celsius are suspect due to the potential freezing of the mechanical rain gauge. Dates for potential freezing are:
1/31/2010
2/7/2010
2/10/2010
2/16/2010
2/25/2010
2/26/2010

1/18/2010 18:30 to 1/19/10 14:30 missing data due to the UPS battery backup on the computer dying. 14:45 data are rejected due to more than likely not being a full 15 minutes of 5-second data.

PAR values of 0.0 were rejected from 1/19/2010 15:00 until 3/4/2010 12:45. Because there is no documentation of why the readings were 0.0, the data are coded as GSM CCU, see metadata - cause unknown. The reading at 13:00 was rejected because it may not be a full 15 minutes of 5-second data.

March 13, 2010 15:00 a maximum wind speed of 30.2 was recorded. Although this is higher than the upper limit we use, it is still within sensor specs and believed to be accurate.

July 15, 2010 - New CR1000 program uploaded to reflect Par Multiplier added to program. Data flagged from downtime of unit 11:30 to 12:15. 11:30 data are rejected due to more than likely not being a full 15 minutes of 5-second data following the program upload. Data from 11:45-12:15 are rejected for maintenance.

Cumulative PAR values were corrected following the CR1000 program reload on July 15, 2010. Precipitation was recorded earlier in the day; however, the upload reset cumulative precipitation values. No precipitation occurred during or following the reset, therefore, cumulative precipitation values were changed from 0 to 3.3 to reflect values recorded earlier in the day.

October 11, 2010 – Missing data from unknown cause from 9:45 – 11:45. 12:00 data are rejected due to possible not being a full 15 minutes of 5-second data.

October 27, 2010 negative PAR values that exceeded the maximum signal noise of the sensor were rejected.