

**Reserve Name** JOB NERR Meteorological Metadata  
**Months and year the documentation covers:** 01/01/2007 to 12/31/2007  
**Latest Update:** April 19, 2013

## **I. Data Set and Research Descriptors**

### **1) Principal investigator(s) and contact persons**

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### **2) Entry verification**

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 or 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 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. Angel Dieppa is responsible for all data management.

A Sutron Sat-Link2 transmits data to the NOAA GOES satellite, NESDIS ID # 3B018394 and NWS Location ID JOXP4. The transmissions are scheduled hourly and contain four (4) datasets reflecting fifteen minute data sampling intervals. The telemetry data is flagged as "Provisional" data and after going through QAQC process is considered "Authentic" dataset used for long term monitoring and study. This data can be viewed by going to <http://cdmo.baruch.sc.edu>.

### **3) Research objectives**

The principal objective is to record long-term meteorological data to track changes in meteorological conditions that can be associated to changes in estuarine habitats and conditions and regionally as well. A secondary objective is

to promote the access and use of reliable baseline information by federal and local agencies, universities, researchers, educators and local communities to enhance the process by which they make decisions regarding their daily activities. This data is also invaluable in the identification and development of future monitoring and research activities.

This meteorological weather station is located at 0.40Km off the Jobos Bay coast and record data and information of the conditions affecting the estuary. The station is part of a System Wide Monitoring Program (SWMP) designed to evaluate the relative contributions of climate on coastal forcing and watershed inputs to hydrodynamics, nutrient dynamics, and other ecological processes within the estuary. Data is used as a reference of atmospheric conditions for ongoing research projects at the Reserve as a support from NERR and for other short and long-term environmental monitoring projects within the Reserve.

#### **4) Research methods**

The Campbell Scientific weather station sampled every 5 seconds to produce 15 minute averages for air temperature, relative humidity, barometric pressure, wind speed and wind direction and 15 minute totals for rainfall and PAR. On a monthly basis, sensors on the weather station are inspected for damage or debris. If any is found, it is repaired and/or cleaned. The recommended calibration intervals for the meteorological sensors are as follows:

- Temperature/Humidity- annual recalibration
- Rain Gauge- annual recalibration
- Wind Speed/Direction- bi-annual recalibration
- Barometric Pressure- bi-annual recalibration
- PAR- bi-annual recalibration

During 2007 we have not calibrated the sensors as per the SOP's, nevertheless we have check the output values for temperature, relative humidity, wind speed and barometric pressure against a Kestrel 6000 hand held instrument. We also compare the output values for the rain gauge with a pluviometer from the NWS installed 10 feet apart of our instrument. Finally, we compare PAR values with a LiCOR sensor.

Campbell Scientific data telemetry equipment was installed at the JOBJBMET station on 07/20/06 and transmits data to the NOAA GOES satellite, NESDIS ID #3B018394. (Where 3B0297EC 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>.

#### **5) Site location and character**

The Jobos Bay National Estuarine Research Reserve (JBNERR) is located on the southern coastal plain of the island of Puerto Rico, a reserve within the West Indies geographical area. JBNERR is composed of two major areas: (1) Mar Negro, located on the western margin of the Bay, and (2) Cayos Caribe (a chain of 17 tear-shaped islets located to the southeast) and Cayos Barca (a chain of 7 tear-shaped islets located to the southwest boundaries) both with a back-reef system. The Mar Negro area comprises the bulk of the Reserve, and consists of mangrove forests and a complex system of lagoons and channels interspersed with salt and mud flats. Coral reefs and sea grass beds, with small beach deposits and upland areas fringe Cayos Caribe and Cayos Barca mangrove islands.

A description of the specific sampling station follows:

The weather station is situated in front of the JBNERR Visitor's Center, located in the community of Aguirre, Salinas, Puerto Rico. Its coordinates are latitude  $17^{\circ} 57' 23.34''$  and longitude  $66^{\circ} 13' 22.56''$ . The tower base is about 9m above sea level, approximately 110m north from Jobos Bay's southern shoreline. The station is installed in a 10 meter tower in front of the Main Building, the wind and PAR sensors are above the building height. At 11 meters to the northwest side of the tower there is a tree with a height of 15 meters presenting a minor obstruction the sensors. In the southern region of Puerto Rico where JBNERR is located the winds persists from southeast and northeast, therefore the tree does not represent a significant obstruction for the winds. The high of the sensors are: Wind Sentry Anemometer (9.75 m high), Temperature/ Humidity sensor (2.7m high), Barometric Pressure sensor (2.7 m high), and LiCor Sensor (9.60 m high) are all located on a 10m aluminum tower following the descriptions outlined in the CDMO Manual V 5.1. The Tipping Bucket Rain gauge is located to the SW side of the tower. The top of the bucket is 35 centimeters above the ground. The sensors were wired to the CR10X and since 7/21/2006 to a CR1000 following the protocol in the CDMO Manual.

The weather station is at the following distance from SWMP stations used for water quality monitoring:

- 2.2 Km. from S09
- 4.2 Km. from S10
- 1.8 Km. from S19
- 3.1 Km. from S20

## **6) Data collection period**

The weather station was installed in 1999, on 7/20/06 a new telemetry equipment was installed. During January 1<sup>st</sup> 00:00 to December 31<sup>st</sup>, 2007 23:45 data were collected, transmitted and saved in the laboratory computer where the meteorology station is connected.

## **7) Distribution**

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 this 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 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.

NERR weather 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 separated format.

## **8) Associated researchers and projects**

The Jobos Bay NERR maintains four water quality monitoring stations as part of the System Wide Monitoring Program (SWMP) to monitor variability in the estuarine environment. Meteorological station collect continuous information that support water quality data intended to address short-term variability and long-term changes in estuarine water parameters within the bay (i.e., localized impacts of seasonal storms and hurricane events, variability due to tidal circulation, seasonal and interannual differences in rainfall, magnitude and influence of major events such hurricanes, spatial extent of oceanic and tidal forcing. Data will also be of fundamental baseline for future development of a hydrodynamic model for the Jobos Bay estuary with the help of CaRICOOS.

Our water quality monitoring program is a key component of SWMP. Variables measured include Temperature, Dissolved Oxygen, Turbidity, pH, Salinity and Depth in 4 permanent stations equipped with YSI datasondes. At the same stations, nitrogen, phosphorus, and chlorophyll are measured in a monthly basis.

SWMP data has been incorporated in the Conservation Effects Assessment Project (CEAP), a collaborative study of USDA, NOAA and JBNERR that pretends to implement best management practices in agricultural lands to improve water quality within the aquifer and Jobos Bay. Also, the Caribbean Regional Association for the Caribbean Regional Integrated Coastal Ocean Observing System (CaRICOOS) integrated and monitors Real Time data from our SWMP stations.

## II. Physical Structure Descriptors

### 9) Sensor specifications

Parameter: Temperature

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:  $\pm 0.2$  °C @ 20°C

Date of Last calibration: 02/18/2004

Parameter: Relative Humidity

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:  $\pm 2\%$  RH (0-90%) and  $\pm 3\%$  (90-100%)

Temperature dependence of RH measurement:  $\pm 0.05\%$  RH/°C

Date of Last calibration: 02/18/2004

Parameter: Barometric Sensor

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:  $\pm 0.5$  mb @ 20°C;  $\pm 2$  mb @ 0°C to 40°C;  $\pm 4$  mb @ -20°C to 45°C;  $\pm 6$  mb @ -40°C to 60°C

Stability:  $\pm 0.1$  mb per year

Date of Last calibration: 02/18/2004

Parameter: Wind speed

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:  $\pm 0.3$  m/s

Date of last calibration: 02/18/2004

Parameter: Wind direction

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:  $\pm 3$  degrees

Date of last calibration: 02/18/2004

Parameter: LI-COR Quantum Sensor

Units: mmol m<sup>-2</sup> (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:  $\leq \pm 2\%$  change over 1 yr

Operating Temperature: -40°C to 65°C; Humidity: 0 to 100%

Sensitivity: typically 5  $\mu\text{A}$  per 1000  $\mu\text{moles s}^{-1} \text{m}^{-2}$

Date of last calibration: 02/18/2004

Parameter: Precipitation (non heated rain gauge)

Units: millimeters (mm)

Sensor type: Tipping Bucket Rain Gauge

Model #: RG-2000-C

Rainfall per tip: 0.01 inch

Date of Last calibration: 02/18/2004

The CR1000 has 2 MB of 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 upgrade) available for program storage (16K), operating system use, and data storage. Additional storage is available by using a compact flash card in the optional CFM100 Compact Flash Module

CR1000 installed: 7/21/2006

## 10) Coded variable definitions

Sampling station:

Sampling site code:

Station code:

Jobos Meteorology

jb

jobjbm

## 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 deployment or 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.

### General Errors

|     |                                   |
|-----|-----------------------------------|
| GIM | Instrument Malfunction            |
| GMT | Instrument Maintenance            |
| GPF | Power Failure / Low Battery       |
| GQR | Data Rejected Due to QA/QC Checks |
| GPR | Program Reload                    |
| GPD | Power Down                        |

### Sensor Errors

|     |                                                      |
|-----|------------------------------------------------------|
| SIC | Incorrect Calibration Constant, Multiplier or Offset |
| SSN | Not a Number / Unknown Value                         |
| SNV | Negative Value                                       |
| SOC | Out of Calibration                                   |
| SSM | Sensor Malfunction                                   |
| SSR | Sensor Removed                                       |

### Comments

|     |                                                 |
|-----|-------------------------------------------------|
| CAF | Acceptable Calibration/Accuracy Error of Sensor |
| CDF | Data Appear to Fit Conditions                   |
| CRE | Significant Rain Event                          |
| CSM | See Metadata                                    |

## 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 mmol/m<sup>2</sup> over a 15 minute interval.

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

Missing Data:

Data range from 01/01/07 0:00 to 02/05/7 10:00 are missing due to a data lost after a hard disk failure.

#### Rejected Data:

All data were rejected on 2/5/2007 at 10:15. These data are not a full 15 minutes of 5 second data.

All data were rejected on 6/25/2007 at 09:15. These data were recorded after a program upload and are not a full 15 minutes of 5 second data.

PAR data were rejected from 6/25/2007 at 09:15 until 9/13/2007 at 14:30. The multiplier was missing from the CR1000 program, so only 0.0 was recorded for these dates and times. The 9/13/2007 14:30 data were rejected because it was not a full 15 minutes of 5 second data.

#### Suspect Data:

##### **CDMO Edit 10/30/2012**

**The meteorological sensors at JOB have been installed since 2/18/2004 and have not been calibrated at the recommended frequency. ATemp, RH, and Precipitation data are flagged as suspect for all of 2007 (these data were out of calibration as of 2/18/2006). BP, wind parameters, and PAR are flagged as suspect from 2/18/2007 through the end of the year. All out of calibration data are flagged as suspect and coded as SOC (sensor out of calibration). Recommended calibration frequencies are as follows:**

- Temperature/Humidity- annual recalibration
- Rain Gauge- annual recalibration
- Wind Speed/Direction- bi-annual recalibration
- Barometric Pressure- bi-annual recalibration
- PAR- bi-annual recalibration

Relative humidity sensor did not reach 100% relative humidity values even under heavy rain events. Data were flagged as suspect.

#### Corrected Data:

The following data points were corrected after noticing the values where 1000 times over the real value. We check the Total Precipitation values against a local rain gauge that we monitor for the NWS. To correct them we simply divided the value by 1000.

| Date/Time        | Date/Time        | Date/Time        | Date/Time        | Date/Time        |
|------------------|------------------|------------------|------------------|------------------|
| 02/19/2007 15:15 | 03/29/2007 17:45 | 04/21/2007 02:45 | 05/29/2007 00:15 | 06/11/2007 01:00 |
| 02/19/2007 15:30 | 03/29/2007 18:00 | 04/21/2007 03:00 | 05/29/2007 00:45 | 06/11/2007 01:15 |
| 02/19/2007 15:45 | 03/29/2007 18:15 | 04/21/2007 03:15 | 05/30/2007 02:00 | 06/11/2007 01:45 |
| 02/19/2007 16:00 | 03/29/2007 18:45 | 04/21/2007 03:30 | 05/30/2007 02:15 | 06/11/2007 02:00 |
| 02/19/2007 16:15 | 03/29/2007 19:15 | 04/21/2007 08:00 | 05/30/2007 02:30 | 06/11/2007 02:45 |
| 02/19/2007 16:30 | 03/29/2007 20:00 | 04/21/2007 08:15 | 05/30/2007 05:00 | 06/11/2007 04:15 |
| 02/19/2007 16:45 | 03/29/2007 20:45 | 04/22/2007 16:30 | 05/30/2007 08:15 | 06/11/2007 04:30 |
| 02/19/2007 17:00 | 03/29/2007 21:30 | 04/22/2007 21:00 | 05/30/2007 10:30 | 06/11/2007 04:45 |

|                  |                  |                  |                  |                  |
|------------------|------------------|------------------|------------------|------------------|
| 02/19/2007 17:15 | 03/29/2007 21:45 | 04/22/2007 21:15 | 05/30/2007 18:45 | 06/11/2007 05:00 |
| 02/19/2007 17:30 | 03/29/2007 22:30 | 04/22/2007 21:30 | 05/30/2007 19:00 | 06/11/2007 05:15 |
| 03/03/2007 05:15 | 03/29/2007 23:30 | 04/24/2007 07:30 | 05/30/2007 19:15 | 06/11/2007 05:30 |
| 03/03/2007 12:30 | 03/30/2007 00:45 | 04/24/2007 07:45 | 05/31/2007 00:15 | 06/11/2007 05:45 |
| 03/04/2007 06:00 | 03/30/2007 02:15 | 05/01/2007 08:15 | 05/31/2007 00:30 | 06/11/2007 06:00 |
| 03/13/2007 13:15 | 03/30/2007 04:15 | 05/01/2007 08:30 | 05/31/2007 00:45 | 06/11/2007 06:45 |
| 03/14/2007 07:45 | 03/30/2007 06:45 | 05/01/2007 09:00 | 05/31/2007 01:00 | 06/11/2007 08:30 |
| 03/17/2007 02:30 | 03/30/2007 09:15 | 05/01/2007 12:15 | 05/31/2007 01:15 | 06/11/2007 14:30 |
| 03/17/2007 03:15 | 03/30/2007 12:00 | 05/01/2007 12:30 | 05/31/2007 01:30 | 06/11/2007 14:45 |
| 03/17/2007 04:00 | 03/30/2007 15:30 | 05/01/2007 12:45 | 05/31/2007 01:45 | 06/11/2007 15:00 |
| 03/22/2007 10:30 | 03/30/2007 21:00 | 05/01/2007 13:00 | 05/31/2007 02:00 | 06/11/2007 15:15 |
| 03/26/2007 21:30 | 03/31/2007 07:15 | 05/01/2007 13:15 | 05/31/2007 02:15 | 06/11/2007 16:15 |
| 03/27/2007 03:15 | 03/31/2007 20:45 | 05/01/2007 13:30 | 05/31/2007 02:30 | 06/12/2007 07:30 |
| 03/27/2007 04:30 | 04/01/2007 23:45 | 05/01/2007 19:00 | 05/31/2007 02:45 | 06/12/2007 07:45 |
| 03/27/2007 04:45 | 04/04/2007 00:15 | 05/02/2007 03:30 | 05/31/2007 03:00 | 06/12/2007 08:00 |
| 03/27/2007 05:00 | 04/09/2007 09:15 | 05/07/2007 22:30 | 05/31/2007 03:15 | 06/12/2007 08:15 |
| 03/27/2007 05:15 | 04/17/2007 03:15 | 05/07/2007 22:45 | 05/31/2007 03:30 | 06/12/2007 20:30 |
| 03/27/2007 05:30 | 04/18/2007 04:30 | 05/08/2007 00:45 | 05/31/2007 03:45 | 06/12/2007 23:30 |
| 03/27/2007 06:00 | 04/18/2007 04:45 | 05/08/2007 01:00 | 05/31/2007 04:00 | 06/12/2007 23:45 |
| 03/27/2007 06:15 | 04/18/2007 05:00 | 05/08/2007 01:15 | 05/31/2007 04:15 | 06/13/2007 00:15 |
| 03/27/2007 06:30 | 04/18/2007 05:15 | 05/08/2007 01:45 | 05/31/2007 04:30 | 06/13/2007 00:30 |
| 03/27/2007 06:45 | 04/20/2007 01:00 | 05/08/2007 02:00 | 05/31/2007 04:45 | 06/13/2007 08:45 |
| 03/27/2007 08:00 | 04/20/2007 17:45 | 05/11/2007 02:45 | 05/31/2007 05:00 | 06/13/2007 09:00 |
| 03/27/2007 16:45 | 04/20/2007 21:45 | 05/11/2007 11:00 | 05/31/2007 05:15 | 06/15/2007 09:45 |
| 03/27/2007 18:45 | 04/20/2007 22:00 | 05/11/2007 11:15 | 05/31/2007 05:30 | 06/17/2007 08:45 |
| 03/27/2007 19:00 | 04/20/2007 22:15 | 05/12/2007 04:15 | 05/31/2007 05:45 | 06/17/2007 09:00 |
| 03/27/2007 19:15 | 04/20/2007 22:30 | 05/13/2007 00:15 | 05/31/2007 06:30 | 06/17/2007 09:15 |
| 03/28/2007 20:45 | 04/21/2007 01:00 | 05/13/2007 01:45 | 06/05/2007 06:15 | 06/17/2007 10:30 |
| 03/28/2007 21:00 | 04/21/2007 01:15 | 05/28/2007 00:15 | 06/09/2007 07:00 | 06/17/2007 10:45 |
| 03/28/2007 21:30 | 04/21/2007 01:30 | 05/28/2007 00:30 | 06/09/2007 09:30 | 06/24/2007 10:00 |
| 03/29/2007 15:45 | 04/21/2007 01:45 | 05/28/2007 09:00 | 06/10/2007 16:15 | 06/25/2007 02:30 |
| 03/29/2007 16:15 | 04/21/2007 02:00 | 05/28/2007 23:15 | 06/10/2007 16:30 | 06/25/2007 06:30 |
| 03/29/2007 16:45 | 04/21/2007 02:15 | 05/28/2007 23:30 | 06/10/2007 16:45 |                  |
| 03/29/2007 17:15 | 04/21/2007 02:30 | 05/28/2007 23:45 | 06/11/2007 00:45 |                  |