

JOB NERR Meteorological Metadata

Months and year the documentation covers: 01/01/2013 to 12/31/2013

Latest Update: October 7, 2024

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, 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.

Data management is performed by Angel Dieppa and Enid Malavé.

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

Campbell Scientific data telemetry equipment was installed at the JOJBMET station on 07/20/06 and transmits data to the NOAA GOES satellite, NESDIS ID #3B018394. 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> or <http://nerrsdata.org>.

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), Battery Voltage (volts)
- Maximum and Minimum Air Temperature (°C) and their times from 5-second data (these data are available from the Reserve)
- Maximum Wind Speed (m/s) and time from 5-second data
- Wind Direction Standard Deviation (degrees)

Totals:

Precipitation (mm), PAR (millimoles/m²), and Cumulative Precipitation (mm)

Calibration plan follows SWMP SOP’s. Wind Sensor, Temp, RH, Solar Radiation, Barometer are calibrated in a 2 year basis and Rain Bucket in a yearly basis.

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)

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 in Salinas, Puerto Rico. Its coordinates are latitude 17 57' 23.34" and longitude 66 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 to 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 sensor (9.75 m high), Temperature/ Humidity sensor (2.7m high), Barometric Pressure sensor (2.7 m high), and PAR 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 1 meter over the ground. The sensors are wired 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 Station 09
- 4.2 Km. from Station 10
- 1.8 Km. from Station 19
- 3.1 Km. from Station 20

6) Data collection period

The weather station was installed in 1999. On 7/20/06 new telemetry equipment was installed. During January 1st to December 31st, 2013 data was collected and saved in a computer where the meteorology station is connected via wire and transmitted via NOAA-GOES near real time telemetry.

During year 2013 data were acquired following SWMP SOP's. This is in 15 minutes interval year round.

Data were downloaded from the station on the following dates in 2013:

File Start Date and Time	File End Date and Time
01/01/2013 00:00	03/31/2013 23:45
02/04/2013 10:15*	05/08/2013 11:00
04/01/2013 00:00	05/08/2013 11:00
05/08/2013 11:15	06/21/2013 15:30
06/21/2013 15:45	06/30/2013 23:45
07/01/2013 00:00	09/13/2013 13:45
09/13/2013 14:00	09/30/2013 23:45
10/01/2013 00:00	11/14/2013 11:45
11/14/2013 12:00	12/06/2013 09:15
12/06/2013 09:30	01/15/2014 07:45

*From 2/24/2013 at 6:15 to 3/22/2013 at 9:45 data were recovered from telemetry due to issues with the computer connecting to the station. Raw file is unavailable.

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 collects 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).

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

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: ± 0.2 °C @ 20°C

Temp-RH SN F1640118

Date of Last calibration: 04/25/2010

Dates of Sensor Use: 02/11/2011 – 05/19/2015

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: +/- 2% RH (0-90%) and +/- 3% (90-100%)

Temperature dependence of RH measurement: +/- 0.05% RH/°C

Temp-RH SN F1640118

Date of Last calibration: 04/25/2010

Dates of Sensor Use: 02/11/2011 – 05/19/2015

Parameter: Barometric Pressure

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

Barometer SN Q43066

Date of Last calibration: 04/23/2010

Dates of Sensor Use: 02/11/2011 - 05/19/2015

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: +/- 0.3 m/s

Wind sensor Mod 051003-5 SN WM100693

Date of last calibration: 03/31/2010

Dates of Sensor Use: 02/15/2011 - 05/19/2015

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: +/- 3 degrees

From 3/18/11 @ 8:30AM the sensor was oriented to True North. Prior to that date, sensor was oriented to Magnetic North.

Wind sensor Mod 051003-5 SN WM100693

Date of last calibration: 03/31/2010

Dates of Sensor Use: 02/15/2011 - 05/19/2015

Parameter: Photosynthetically Active Radiation (PAR)

LI-COR Quantum Sensor

Units: mmol 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: $<\pm 2\%$ change over 1 yr

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

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

LiCor Sensor: Q43066

PAR Multiplier = 1.1187

Date of last calibration: 02/19/2010

Dates of Sensor Use: 02/15/2011 - 05/19/2015

Parameter: Precipitation (non heated rain gauge)

Units: millimeters (mm)

Sensor type: Tipping Bucket Rain Gauge

Model #: TR-525USW

Rainfall per tip: 0.01 inch

**Rain Gauge SN 43619-410

Date of Last calibration: 11/16/2012

Dates of Sensor Use: 11/16/2012 - 06/15/2015

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.

Serial Number: unknown

Date CR1000 Installed: 07/21/2006 – 05/19/2015

Date CR1000 Calibrated: unknown

CR1000 Firmware Version (s): CR1000.Std.10, date of update unknown

CR1000 Program Version(s): JOJBMET_5.53_060712

10) Coded variable definitions

Sampling station:	Sampling site code:	Station code:
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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
SSD	Sensor Drift
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%.

Suspect Data:

Beginning 02/11/2013 through the end of the year temperature and relative humidity are considered suspect due to an out of calibration sensor, <1>[SOC](CSM). This includes 02/24/2013 06:15 – 03/22/2013 09:45 temperature and relative humidity data that are coded as GIT.

Suspect Telemetry recovered data:

From 02/24/2013 at 06:15 to 03/22/2013 at 09:45 data were recovered from telemetry due to issues with the computer connected to the station. Telemetry data are considered suspect, {CSM}, <1>[GIT].

Significant rain events, both total and cumulative precipitation are coded with [GSM] (CRE), total coded for the duration of the event and cumulative through the end of the day:

<u>Date</u>	<u>Precipitation (mm)</u>	<u>Event associated with</u>
05/06/13	46.5	Low pressure
7/18/2013	30.5	Tropical wave
9/4/2013 - 9/5/2013	169.9	Tropical Storm Gabrielle
9/7/2013	30.5	
9/8/2013	51.6	
10/04/2013	36.1	
11/03/2013	37.1	