

Reserve Name: JOB NERR Meteorological Metadata
Months and year the documentation covers: 01/01/2016 to 12/31/2016
Latest Update: 01/09/2020

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 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.

A Campbell Sci. transmitter is used to deliver 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> or <http://nerrsdata.org>.

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 JOBJBMET 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>.
<http://cdmo.baruch.sc.edu> or <http://nerrsdata.org>.

All data are recorded in Eastern Standard Time (EST) year-round.

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 1 or 2 year basis and Rain Bucket in a yearly basis.

Calibration information:

Recommended calibration frequency for the MET station sensors:

- Temperature/Humidity- yearly recalibration
- Rain Gauge- yearly recalibration
- Wind Speed/Direction- yearly or every 2 years (depending on the sensor)
- Barometric Pressure- every 2 years recalibration
- PAR- every 2 years 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 Sentry Anemometer (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

SWMP Station Timeline:

Station Code	Station Name	SWMP Status	Location	Active Dates	Reason Decommissioned	Notes
jobjmet	Jobos Bay Weather	P	17° 57' 23.34 N, 66° 13' 22.56 W	01/01/2001 -	NA	NA

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, 2016 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 2016 data is acquired following SWMP SOP's. This is in 15 minutes interval year round.

Raw file start and end dates and times:

File Start Date and Time	File End Date and Time
12/22/2015 10:00	01/12/2016 09:45
01/01/2016 00:00	01/26/2016 15:30
01/26/2016 15:45	02/09/2016 07:45
02/09/2016 08:00	02/23/2016 14:30
02/23/2016 14:45	03/09/2016 08:45
03/09/2016 09:00	03/30/2016 10:00
03/30/2016 10:15	04/21/2016 08:30
04/21/2016 08:45	05/04/2016 09:30
05/04/2016 09:45	05/18/2016 08:45
05/18/2016 09:00	06/01/2016 11:45
06/01/2016 12:00	06/16/2016 08:45
06/16/2016 09:00	07/12/2016 09:30
07/12/2016 09:45	08/01/2016 09:15
08/01/2016 09:30	08/16/2016 10:45
08/16/2016 11:00	08/30/2016 09:45
08/30/2016 10:00	09/13/2016 07:45
09/13/2016 08:00	09/28/2016 14:15
09/28/2016 14:30	10/11/2016 08:45
10/11/2016 09:00	10/24/2016 08:30
10/24/2016 08:45	11/07/2016 07:45
11/07/2016 08:00	11/21/2016 11:30
11/21/2016 11:45	12/07/2016 14:45
12/07/2016 15:00	12/21/2016 09:00
12/21/2016 09:15	01/10/2016 10:15

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:

NOAA National Estuarine Research Reserve System (NERRS). System-wide Monitoring Program. Data accessed from the NOAA NERRS Centralized Data Management Office website: <http://www.nerrsdata.org/>; *accessed* 12 October 2016.

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 www.nerrsdata.org. Data are available in comma delimited 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 inter-annual 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 data sondes. At the same stations, nitrogen, phosphorus, and chlorophyll are measured in a monthly basis.

II. Physical Structure Descriptors

9) Sensor specifications

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.

Sensors working from 06/19/2015 to present (as of 12/31/2016)

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

Serial Number: Y3940017

Date of Calibration: 02/13/2013

Dates of Sensor Use: 06/19/2015– current as of 12/31/2016

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
Serial Number: Y3940017
Date of Calibration: 02/13/2013
Dates of Sensor Use: 06/19/2015– current as of 12/31/2016

Parameter: Barometric Pressure
Units: millibars (mb)
Sensor type: Vaisala Barocap © silicon capacitive pressure sensor
Model #: PTB101B (CS105)
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
Serial Number: Y2830017
Date of Calibration: 02/15/2013
Dates of Sensor Use: 06/19/2015– current as of 12/31/2016

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-L 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-L
Serial Number: 58413
Date of Calibration: 02/13/2013
Dates of Sensor Use: 06/19/2015– current as of 12/31/2016

Parameter: Wind direction
Units: degrees
Sensor type: balanced vane, 38 cm turning radius
Wind sensor Mod 051003-L
Serial Number: 58413
Date of Calibration: 02/13/2013
Dates of Sensor Use: 06/19/2015– current as of 12/31/2016
**Sensor oriented to True North.

Parameter: Photosynthetically Active Radiation (PAR)
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 $5\ \mu\text{A}$ per $1000\ \mu\text{moles s}^{-1}\text{ m}^{-2}$
Serial Number: Q50390
PAR Multiplier = 1.1742
Date of Calibration: 09/25/2013
Dates of Sensor Use: 06/19/2015– current as of 12/31/2016 New PAR Multiplier=1.1742

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
Operating range: Temperature: 0° to 50°C ; Humidity: 0 to 100%
Accuracy: $\pm 1.0\%$ up to 1 in./hr; $\pm 0, -3\%$ from 1 to 2 in./hr; $\pm 0, -5\%$ from 2 to 3 in./hr
Rain Gauge SN 43619-410
Most recent calibration: 06/15/15 (previous calibration 11/16/2012)

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.

Datalogger Campbell Sci.
CR1000-RMA
Serial Number: 5278
Date Installed: 06/19/2015 - current as of 12/31/2016
Date of Calibration: 05/29/2015

CR1000 Firmware Version (s): New firmware 06/19/2015, version unknown.

CR1000 Program Version(s):

JOBJBMET_V5.5_041608 used from 04/16/2008 to 02/27/2015
JOBJBMET_V5.5_022715 used from 02/27/2015 to 06/17/2015
JOBJBMET_V5.5_022715 used from 06/17/2015 to current as of 12/31/2016

10) Coded variable definitions

Sampling station:	Sampling site code:	Station code:
Jobos Meteorology	jb	jobjbmet

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
CCU	Cause unknown
CDF	Data appear to fit conditions
CML	Snow melt from previous snowfall event

CRE*	Significant rain event
CSM*	See metadata
CVI*	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. These values are automatically flagged and coded as <1> (CAF).

Relative Humidity data greater than 100 are within range of the sensor accuracy of +/-3% and are flagged and coded as suspect, <1> (CAF). Values greater than 103 are rejected <-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. **Note: Cumulative precipitation is no longer available via export from the CDMO. Please contact the Reserve or the CDMO for more information or to obtain these data.**

CDMO PAR Sensor Drift Edits 01/09/2020:

There were noticeable changes in PAR values following the swap to a freshly calibrated sensor (assumed to be accurate) on 10/11/2018. The sensor (Q50390) was removed and was not post calibrated to check for drift. Since drift numbers are not known all PAR data 1 year prior to the sensor swap, from 10/10/2017 08:15 to 10/10/2018 08:15 are flagged and coded as <1> SSD CSM (unless otherwise flagged and coded, such as rejected data). PAR data for the remainder of this deployment (06/19/2015 08:30 – 10/10/2017 08:00) are flagged and coded as <0> CSM (unless otherwise flagged and coded) 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.

Rejected Data:

Elevated Nighttime PAR

From 01/01/16 to 12/31/16 there are consistent elevated night PAR values (>0) after dusk, those were manually rejected.

Significant rain events* (Total precipitation coded for the event, cumulative coded through the end of the day). Data coded as GSM CRE:

Date	Precipitation (mm) (from cumulative precipitation values)	Notes
02/19/2016	27.2	all parameter CRE Timestamps with rain coded
04/29/2016 -04/30/2016	42.00	Timestamps with rain coded
05/30/2016 - 05/31/2016	75.2	Timestamps with rain coded
06/02/2016	20.80	Timestamps with rain coded
07/31/2016	26.9	Timestamps with rain coded
08/06/2016	21.6	Timestamps with rain coded
08/13/2016	16.5	Timestamps with rain coded
10/03/2016	40.13	Timestamps with rain coded Hurricane Mathew passed south of PR**
10/08/2016	20.82	Timestamps with rain coded
10/18/2016	64.5	Timestamps with rain coded
10/19/2016	19.8	Timestamps with rain coded
11/20/2016	16.0	Timestamps with rain coded
11/28/2016	29.2	Timestamps with rain coded
12/02/2016	20.3	Timestamps with rain coded

*Significant rain events are considered to affect water quality parameters during a period of time, typically >1 inch.

**Hurricane Mathew may have affected data at all water quality stations from 09/28/16 to 10/08/16.