Apalachicola NERR Meteorological Metadata

January - December 2008

Last Update: September 16, 2011

**I. Data Set & Research Descriptors**

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**2) Entry verification:**

The Data Logger program (APALACHICOLA\_APAEBMET.CR1) controls the sampling of the sensors. Meteorological conditions are measured every 5 seconds from each sensor and stored on the CR1000. Data are output to a file in array 15, which stores 15-minute averages, max, and min data. Compact flash module cards (CFM100) are used to interface between the CR1000 and the LoggerNet software. LoggerNet is used as a desktop application, and when necessary, as a laptop application for direct communication with the CR1000 in the field.

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. The Reserve performs secondary QAQC review by comparing flagged data and graphs produced during automated primary QAQC against monthly field logs and external data sources, when available. Outliers, suspect, and erroneous data found during this secondary review are appropriately flagged and coded using the NERRQAQC Excel macro. After secondary review by the Reserve is completed, the NERRQAQC Excel macro is used to append files and export them 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.

Lauren Levi is responsible for all data management.

**3) Research objectives:**

Data collected from the East Bay weather station complement those data taken from the East Bay water quality station. Data are also used for the analysis of other datalogger data collected at Cat Point and Dry Bar. Positioning the weather station in East Bay allows the Reserve to monitor changes in rainfall, photosynthetically active radiation, temperature, and other weather parameters influencing the water quality of East Bay. East Bay drains the Tate's Hell Swamp area, which was altered in the late 1960's and early 1970's by timber companies. An EPA grant allowed the Northwest Florida Water Management District to begin restoration of the site in 1995 to reduce non-point source runoff. East Bay is also an important nursery area for numerous fish and invertebrate species within Apalachicola Bay.

**4) Research methods:**

Data Collection Schedule: (CR1000)

i) 15 minute data are averages/totals of 5 second sampling over the period of 15 minutes.

In Use Dates are from 00:00 1/1/2008 to 23:45 12/31/2008.

ii) Parameters collected during each interval include:

Date, Julian date, Time, Average Temperature (°C), Maximum and Minimum Temperature (available from APA NERR), Time at maximum and minimum temperature, Relative Humidity, Wind speed, Wind Direction, Standard deviation of wind direction (collected as a standard parameter beginning on 10/10/2008), Maximum Wind Speed (collected as a standard parameter beginning on 1/28/2008) , Time at maximum wind speed, Total Precipitation (for that interval), Cumulative Precipitation (collected as a standard parameter beginning on 6/30/2008 )Total Photosynthetically Active Radiation (for that interval), and Battery Voltage.

In Use Dates are from 00:00 1/1/2008 to 23:45 12/31/2008.

Sensor Calibration QA/QC

Sensors are calibrated either annually or biannually according to the maintenance schedule dictated by the Weather SOPs. The sensors and their wires are inspected monthly to make sure that they are clean, moving freely, and undamaged. The arm of the wind sensor is checked monthly to assure that it is aligned to true north.

Data Storage/Interface with LoggerNet

Compact flash module cards (CFM 100) are used to interface between the CR1000 and the LoggerNet software supplied by Campbell Scientific. CFM100 cards are exchanged monthly. At the time of the exchange, a handheld Kestrel 4000 is used to measure weather conditions and compare them to the measurements of the sensors on the weather station. The CFM 100 card is downloaded with the LoggerNet software.

Telemetry

Campbell Scientific data telemetry equipment was installed at the East Bay weather station on 06/22/06 and transmits data to the NOAA GOES satellite, NESDIS ID #3B01C09E. 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/).

Data QA/QC

Data are uploaded from the CR1000 datalogger 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 undergoes secondary QAQC and export to the CDMO, as detailed in section 2 above.

**5) Site location and character:**

The Apalachicola National Estuarine Research Reserve is located in the northwestern part of Florida, generally called the panhandle. It is located adjacent to the City of Apalachicola, and encompasses most of the Apalachicola Bay system, including 52 miles of the lower Apalachicola River. Passes, both natural and manmade, connect Apalachicola Bay to the northeastern Gulf of Mexico. The sampling site is located in the upper reaches of East Bay. East Bay is separated from Apalachicola Bay by two bridges and a causeway and is located to the north of Apalachicola Bay proper. The bay is 8.2 km long, has an average depth of approximately 1.0 m MHW, and an average width of 1.8 km. The tides in East Bay are mixed and range from 0.3 m to 1.0 m (average 0.5 m).

The weather station is located at latitude 29 47.472' N and longitude 84 53.005' W. This site is less than 0.5 nautical miles west of the East Bay water quality station. The site is located near the tip of a peninsula, which separates Blount's Bay from West Bayou. The peninsula is dominated by marsh vegetation (mainly *Juncus roemerianus*). There is a cabbage palm hammock along the southeastern shoreline of the peninsula. The dominant upland habitat is primarily pineland forest to the northwest, which includes slash pine, saw palmetto, and sand pine. The weather station sensors are mounted on a 3-meter tower. The tower is mounted on a 2m platform. The wind sensor and PAR are mounted at the top of the tower at a height of 3 meters above the platform. The air temperature/relative humidity sensor and barometric pressure sensor are mounted on the tower at a height of 1.5 meters above the platform surface. The tipping bucket rain gauge is mounted on a 1m platform approximately 4m from the weather station platform. There is nothing nearby to shade the tower and the nearest wind block is the edge of the pine forest about one-half to three-quarters of a mile north to northwest of the station.

**6) Data collection period: January-December, 2008**

The Apalachicola weather monitoring station was erected on August 27, 1999 and began monitoring on September 3, 1999. The data submitted with this report encompasses data collected from 00:00 January 1, 2008 through 23:45 December 31, 2008

**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 comma separated format.

**8) Associated researchers and projects:**

Edmiston, H.L., Farhny, S., Lamb, M., Levi, L., Wanat, J., Avant, J., Selly, N./ Apalachicola National Estuarine Research Reserve. Tropical Storm and Hurricane Impacts on a Gulf Coast Estuary: Apalachicola Bay, Florida USA.

Dulaiova, H. / Florida State University Department of Oceanography. NOAA Graduate Research Fellowship. Determination of the distribution and volume of groundwater entering Apalachicola Bay from St. George Island.

Edmiston, H.L., Wanat, J., Levi, L., Stewart, J., Lamb, M., Fahrny, S./ Apalachicola

National Estuarine Research Reserve. Distribution and density of fishes and benthic invertebrates in Apalachicola Bay.

Edmiston, H.L., Levi, L., Wanat, J., Stewart, J., Lamb, M., Fahrny, S./ Apalachicola National Estuarine Research Reserve. System-Wide Monitoring Program (SWMP) for water quality, weather, nutrients & chlorophyll A, and submerged aquatic vegetation monitoring in Apalachicola Bay.

Gilhring, T./ Florida State University. The role of oligohaline marshes as a source or sink of nitrogen to the Apalachicola Bay.

Lewis, G. and Galperin, B./University of South Florida. A hydrodynamic model of Apalachicola Bay.

Niu, X./ Florida State University Department of Statistics, Edmiston, H.L., Bailey, G.O./ Apalachicola

National Estuarine Research Reserve. Time series models for salinity and other environmental factors in the Apalachicola estuarine system (1998). Estuarine, Coastal, and Shelf Science 46:549-563.

Peterson, R./ Florida State University. Origin and fate of suspended particulates in the Apalachicola River: Impact on Apalachicola Bay

Putland, J./ Florida State University Department of Oceanography. NOAA Graduate Research Fellowship.

Planktonic food web variations related to salinity and nutrient patterns in Apalachicola Bay.

Wang, H., W. Huang, M. Harwell, L. Edmiston, E. Johnson, P. Hsieh, K. Milla, J. Christensen,

J. Stewart, X. Liu. 2008. Modeling oyster growth rate by coupling oyster population and hydrodynamic models for Apalachicola Bay, Florida, USA. Ecological Modeling 211:77-89.

**II. Physical Structure Descriptors**

**9) Sensor Specifications:**

LiCor Quantum Pyranometer

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: 3/10/2006

In Use Dates are from 9:40 6/11/08 to 12/31/08 (multiplier = 1.235)

Wind Monitor: RM Young Model # 05103

Range: 0-60 m/s; 0-360° mechanical

Date of last calibration: 4/14/2006

In Use Dates are from 10:15 4/14/2008 to 23:45 12/31/2008

\*\*Note\*\* The arm of the wind sensor is checked monthly to ensure that it remains aligned to true north.

Temperature and Relative Humidity: Vaisala Model #: HMP45AC

Operating Temperature: -40 to 60°C

Temperature Measurement Range: -40 to 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: ± 0.6% RH

Date of Last calibration: 3/27/2007

In Use Dates are from 12:30 3/27/08 to 23:45 12/31/2008

Barometric Sensor: Vaisala model CS-105

Operating Range:

Pressure: 600 to 1060 mb

Temperature: -40 to 60C

Humidity: non-condensing

Accuracy: ±0.5 to 6.0 mb (20 to 60°C)

Stability: ± 0.1 mb per year

Date of Last calibration: 3/14/06

In Use Dates are from 12:30 1/01/2006 to 23:45 12/31/2008

Precipitation: Tipping Bucket Rain Gauge FIT Model #: TE 525

Range: 0.1 mm

Accuracy: 1.0% at <2"/hr

Date of Last calibration: 3/27/07

In Use Dates are from 00:15 1/01/2008 through 23:45 12/31/2008

Compact Flash Module

Model #: CFM100

Storage capacity: 64 MB

Operating range: Temperature: -35° to +65°C

Memory type: user selectable for either ring style (default) or fill and drop.

Power requirements: 12 V supplied through CR1000 peripheral port

In Use Dates are from 00:15 1/01/2008 to 23:45 12/31/2008

The CR1000 has two MB Flash EEPROM that are 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 CFM100 Compact Flash Module.

Date CR1000 Installed: 6/28/2006

**10) Coded variable indicator and variable code definitions:**

Site Definitions: The weather data master table files for the Apalachicola NERR are coded APAEBMET, indicating the location of the weather station (EB= East Bay) within the greater Apalachicola Bay (APA) system.

**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.

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

SIC Incorrect Calibration Constant, Multiplier or Offset

SNV Negative Value

SOC Out of Calibration

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

CRE Significant Rain Event

CSM See Metadata

CVT Possible Vandalism / Tampering

**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.

Relative Humidity (RH) values periodically are slightly greater than 100% throughout the year. The observed values, of +1 to 3%, are within the error range of the sensor and have been retained. The values can be attributed to a super-saturation event.

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.

Cumulative precipitation data are recorded from 00:00 to 23:59 with the daily total recorded at the midnight mark (00:00). The midnight CumPrcp value is actually the total from the previous day.

All Reserves were required to align their wind direction sensors to True North by April 1, 2008. APA NERR’s wind sensor has been aligned to True North since 2003.

Throughout the year if RH values were higher than 103%, the data were rejected and flagged as <-3> [GQR] (CSM).

On 6/11/2008 from 08:45 to 09:30, the weather station was powered down to switch sensors.

Elevated nighttime PAR data were recorded throughout the year. Data that exceeded the maximum noise signal were rejected <-3> [GQR] (CSM). <http://www.sunrisesunset.com/predefined.asp> was used to determine sunset and sunrise times for each month. An hour was allowed on either side of sunrise and sunset to allow for residual sky-light.