

Sapelo Island (SAP) NERR Meteorological Metadata
January – December 2008
Last Update on October 6, 2014

1) Principal investigators and contact persons:

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2) Entry Verification:

Data are uploaded from the CR1000 datalogger to a Personal Computer (IBM compatible). Files are exported from PC208W or 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. Patrick Hagan is responsible for all data management.

3) Research objectives:

The principal objectives are to record meteorological information for the Sapelo Island NERR's site that can be used 1) as a reference for meteorological data for research projects on the reserve, 2) to give meteorological context for our half hourly SWMP water quality data, and other long term environmental monitoring projects at the Reserve, 3) to observe and characterize important events such as storms, heat and cold waves, droughts, and heavy rainfalls, and 4) to detect trends and characterize climate variability over the long-term

4) Research Methods:

Campbell Scientific data telemetry equipment was installed at the Marsh Landing station on 02/15/2007 and transmits data to the NOAA GOES satellite, NESDIS ID # 3B036592. 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>.

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 SAP NERR):

Air Temperature (°C)

Maximum and times from 5-second data:

Wind Speed, (m/s)

Totals:

Precipitation (mm), PAR (millimoles/m²), and Cumulative Precipitation (mm) (Recorded as a standard parameter beginning 5/13/2008), Total Solar Radiation (kJ/m² and kW/m², available from SAP NERR)

5) Site location and character:

The site is located at N 31deg 25.068’, W 081deg 17.721’, about 15 feet above sea level. All sensors are mounted on a 10m-aluminum tower located in the northern corner of the Marsh Landing parking lot on the southwest corner of the island. The heights of the sensors on the tower are as follows:

temperature and relative humidity	2m
barometric pressure	1m
PAR	3m
precipitation gauge	6m
wind sensor	10m

It is bordered with salt marsh to the north and south with transition into pine forest occurring 1/2 mi to the east. On the immediate west lie the Duplin River and the ferry dock, which is also the location of our lower Duplin and marsh

Landing Water Quality sampling sites. The station is well exposed to all winds and weather with practically no blockage.

This region is subject to multiple severe weather phenomena partially due to the proximity to the ocean. These phenomena include severe summer thunderstorms, which can cause drastic, localized drops in pressure, temperature, and heavy rains; powerful fall and winter frontal systems carrying prolonged strong winds (usually NNE), drastic and sudden drops in temperature and pressure, and long, steady rains; and of course the late summer and early fall hurricanes. It must be noted that due to the remote location and proximity to the ocean our weather patterns can vary greatly from those on the mainland, particularly temperatures which tend to moderate due to our being surrounded by water. The nearest sites for comparison is the Grays Reef NOAA weather Buoy located about 20nm east of Sapelo Island and Glynco airport located approx. 30 mi to the SSE.

6) Data Collection Period:

The data collection period for 2008 ran from Jan 1, 2008 @00:00 to Dec 31, 2008 @ 23:45

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 research

Sapelo Island has a long history of maintaining research. In 1953, the University of Georgia Marine Institute (UGAMI) was formed and the island became a working laboratory for many. The research continues today with SAP NERR and UGAMI creating a unique partnership with much of the current research being done facilitated by SAP NERR and UGAMI together. Given UGAMI's long history on Sapelo, a bibliographic list of over 800 articles of current and previous research can be found on the UGAMI website:

<http://www.uga.edu/ugami> and on the Sapelo Island NERR site:

<http://www.sapelonerr.org> .

9) Sensor specifications:

Parameter: temperature

Units: Celsius

Sensor type: Platinum resistance temperature detector (PRT)

Model #: HMP45C temperature and relative humidity probe

Operating temperature: -40 to +60 deg C

Range Units: -40 to +60 deg C

Accuracy: +/- .2deg C @20deg C

Last calibration: 3/14/2005

Date installed: 2/19/2008

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 @20deg C: +/- 2% RH (0-90%) and +/- 3% (90-100%)

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

Last calibration: 3/14/2005

Date installed: 2/19/2008

Parameter: barometric sensor

Units: millibars (mb)

Sensor type: Vaisala Barocap silicon capacitive pressure sensor

Model #: CS-105

Operating range: 600-1061mb @-20 to +60deg C

Humidity: non condensing

Accuracy: +/- .5mb @20degC; +/- 2 mb @ 0-40deg C; +/- 4mb @-20 to 45deg C;
+/-6mb @ 40-60deg C

Stability: +/- .1mb/ year

Last calibration: 1/14/2005

Date installed: 2/19/2008

Parameter: wind speed
Units: Meters/second (m/s)
Sensor type: 12cm dia cup wheel assembly, 40 mm dia hemispherical cups
Model #: R.M. Young 03110-5 Wind Sentry
Range: 0-50m/s (112mph) gust survival; 60m/s (134mph)
Accuracy: +/-2%
Last calibration: 11/16/2005
Date installed: 8/12/2008

Parameter: wind direction
Units: degrees
Sensor type: balanced vane 16cm turning radius
Model #: R.M. Young 03110-5 Wind Sentry
Range: 360deg
Accuracy: +/- 5%
Last calibration: 11/16/2005
Date installed: 8/12/2008

Parameter: LI-COR quantum sensor
Units: mmoles m⁻² (total flux)
Sensor type: high stability silicone photovoltaic detector (blue enhanced)
Model #: LI190SB
Light spectrum waveband: 400-700nm
Temperature dependence: 0.15% per deg C max
Stability: <2% change/year
Operating temperature: -40 to 65deg C; 0-100% humidity
Accuracy: typically 5 uA per 1000umoles s⁻¹ m⁻²
Last calibration: 5/1/2006
Date installed: 8/12/2008 (multiplier 1.06, previous multiplier 1.04)

Parameter: precipitation
Units: millimeters (mm)
Sensor type: Tipping bucket rain gauge
Model#: TE525
Rainfall per tip: 0.01inch
Operating range: 32-50degC; 0-100% humidity
Accuracy: +/-1% up to 1in/hr; +0, -3% from 1-2in/hr, +0, -5% from 2-3in/hr
Last calibration: 8/12/2008

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 CFM100 Compact Flash Module.

Date CR1000 Installed: June 26, 2006

10) Coded Variable Definitions:

Sampling station: Marsh Landing

Sampling site code: ML

Station code: sapmlmet

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

CDMO UPDATE 10/6/2014: All PAR data for 2008 are considered suspect (unless flagged as rejected or missing). After reviewing several years of data (2007-2011), we believe an incorrect PAR multiplier was used during 2008 (2007 through March 2009). Since this cannot be verified, the data were not rejected and were instead marked as suspect.

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.

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

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%.

All Reserves were required to align their wind directions sensors to True North by April 1, 2008. To the best of the SAP NERR technician's knowledge, the wind direction has always been aligned to True North.

Throughout the year nighttime PAR data were occasionally elevated (>2.214 mmoles/m²). These data were flagged as suspect using the sunrise/sunset calendar for Darien, Georgia from <http://www.sunrisesunset.com/calendar.asp>.

Due to power failures and programming errors, data for 2/6/2008 15:15 through 5/13/2008 11:15 did not originate from a CR1000 raw file nor were they downloaded directly from the CDMO telemetered data. They were acquired from HADS (<http://www.nws.noaa.gov/oh/hads/>) via Wade Sheldon at the University of Georgia. The telemetered data had to be manually shifted (by the CDMO) by 5 hours to correct for GMT time. These data are considered suspect until the program upload that occurred on 5/13/2008 at 11:15-11:30. During this time there are occasional missing data. It is uncertain whether or not the data immediately following a period of missing data are a full 15 minutes of 5 second data. For most of those times, the data were not rejected; however, they should be used with caution. On 4/25/2008 at 10:00, the data that were not missing were rejected as these data do not appear to be a full 15 minutes of 5-second data.

Because HADS data have to be converted to integers for GOES compatibility, the data transmitted are no longer as precise as those recorded by the CR1000 (this is particularly true for PAR and BP data).

From 5/2/2008 through 5/21/2008 wind speed data are elevated for unknown reasons. These data were retained and flagged as suspect.

Max wind speed values on 5/11/2008 at 15:15 fall outside the upper limit of the sensor range. These data were rejected.

Throughout the year there were times when ATemp data were missing. RH data values are calculated using ATemp and since ATemp was missing for these times, RH data were rejected.

The raw file for 7/8/2008 14:30 through 8/7/2008 12:00 appeared to be shifted ahead by 5 hours. Max and min times for various parameters appeared to be correct and to correspond with what would be expected for sunrise and sunsets according to the PAR data. The CDMO shifted the data back 5 hours and removed any duplicate data. Because of this there are data missing from 8/7/2008

07:00 thru the program upload at 12:00. All data during this time is considered suspect due the way the data were recovered by adjusting the raw file.

From 7/8/2008 14:30 to 8/7/2008 11:45 CumPrcp did not record correctly during this time span, therefore those data were rejected.

From 8/7/2008 12:15 through 8/8/2008 00:00, CumPrcp data are flagged as suspect. Since data are missing in the hours prior to the CumPrcp recording rainfall on 8/7/2008, we do not know if some precipitation data were missed.

8/4/2008 09:15 to 09:45 MaxWSpd times recorded incorrectly as 00:00; therefore MaxWSpd is flagged as suspect.

On 8/9 at 07:30 the station appears to have been struck by lightning. The only damage was to a GPS antenna used for satellite transmissions and the wind instruments, which were replaced on 8/12 at 10:00. Although it is believed that the lightning strike occurred on 8/9/2008, the exact date and time cannot be confirmed. Because of this, wind data from 8/7/2008 12:15 until 8/9/2008 07:15 are flagged as suspect. From 8/9/2008 07:30 until 9/24/2008 11:00 WSpd and MaxWSpd data were rejected due problems associated with the lightning strike and then a sensor malfunction after the instruments were replaced on 8/12/2008. During this time WDir and SDWDir were either flagged as rejected or suspect. Suspect data were coded as CDF (data appear to fit conditions).

From 9/24/2008 11:45 through 9/29/2008 9:30 PAR values were recorded as 0.0. It appears as though the PAR multiplier is missing or an incorrect one was used during these dates and times. All PAR data were rejected.