**Apalachicola (APA) NERR Meteorological Metadata**

**January 2017 – December 2017**

**Latest Update: February 19, 2019**

**I. Data Set and Research Descriptors**

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

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Rebecca Domangue PhD was the Research Coordinator until December 2017 when she left the Reserve.

Florida Department of Environmental Protection

Apalachicola National Estuarine Research Reserve

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**2) Entry verification –**

Data is downloaded from the CR1000 datalogger on a monthly basis via a compact flash memory card or via direct connection to an IBM compatible laptop computer. A laptop computer is used when necessary (i.e., during program uploads) to communicate directly with the CR1000 datalogger. Files are extracted from the memory card on a desktop computer and then processed and converted into a comma-delimited format using LoggerNet software. Files are then uploaded to the CDMO, in which 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. Outliers, suspect, and erroneous data found during this secondary review are appropriately flagged and coded by Reserve staff 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.

Jason Garwood is responsible for all Meteorological data management with assistance from Lauren Levi.

**3) Research objectives –**

The objective of this research is to monitor meteorological data on a long term basis. Data collected from the East Bay weather station complement those data taken from the East Bay water quality station. Data are also used in the analysis of other datalogger data collected at Cat Point, Dry Bar, Pilots Cove, and Little St. Marks. Weather station data will also be integrated with monitoring the Reserve is performing as a Sentinel Site for climate change. 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 as well as climate change sentinel sites located in East Bay marshes. 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 (CR1000):

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 m-2), and Cumulative Precipitation (mm) (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.)

Sensor Calibration QA/QC:

Sensors are calibrated either yearly or every 2 years according to the maintenance schedule dictated by the NERR System Wide Monitoring Program 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.

Recommended calibration frequency for the MET station sensors:

- Temperature/Humidity- yearly recalibration

- Rain Gauge- yearly recalibration

- Wind Speed/Direction- every 2 years recalibration for the RM Young 5103 sensor

- Barometric Pressure- every 2 years recalibration

- PAR- every 2 years recalibration

- CR1000- every 5 years (required beginning 2014, one year initial grace period)

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. Data is downloaded monthly either by exchanging the CFM card or direct download to a laptop. At the time of download, 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. A neighboring weather station operated by Florida Department of Environmental Protection, Division of State Lands, is used for further comparison when necessary.

Telemetry:

Campbell Scientific data telemetry equipment was installed at the East Bay weather station on 06/22/2006 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 are collected in Eastern Standard Time (EST) for the entire year.

**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' 27.24 N and longitude 84 53' 0.24 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. In accordance with NERR SWMP and CDMO requirements the weather station sensors are mounted at the top of a 3-meter tower. The temperature/relative humidity sensor and barometric pressure sensor (inside the CR1000 enclosure) are mounted on the tower at 1.5 meters. The tower is mounted on a 2 meter platform. The tipping bucket rain gauge is mounted on a 1 meter platform approximately 4 meters 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 1 kilometer north to northwest of the station.

SWMP Station Timeline:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Station Code | Station Name | SWMP Status | Location | Active Dates | Reason Decommissioned | Notes |
| APAEBMET | East Bay | P | 29°47'27.24 N,  84°53' 0.24 W | 01/01/2001 - | NA | NA |

**6) Data collection period –**

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, 2017 through 23:45 December 31, 2017.

|  |  |  |
| --- | --- | --- |
| **Raw File Name** | **Start Date/Time** | **End Date/Time** |
| apaebmet120816 | 12/08/2016 10:15 | 01/05/2017 09:30 |
| apaebmet010517 | 01/05/2017 09:45 | 02/08/2017 09:45 |
| apaebmet020817 | 02/08/2017 10:00 | 03/08/2017 12:30 |
| apaebmet030817 | 03/08/2017 12:45 | 04/04/2017 10:30 |
| apaebmet040417 | 04/04/2017 10:45 | 05/03/2017 08:00 |
| apaebmet050317 | 05/03/2017 08:15 | 06/05/2017 09:30 |
| apaebmet060517 | 06/05/2017 09:45 | 07/07/2017 07:45 |
| apaebmet070717 | 07/07/2017 08:00 | 08/02/2017 09:00 |
| apaebmet080217 | 08/02/2017 09:15 | 09/18/2017 10:45 |
| apaebmet091817 | 09/18/2017 11:00 | 10/09/2017 09:00 |
| apaebmet100917 | 10/09/2017 09:15 | 11/06/2017 09:00 |
| apaebmet110617 | 11/06/2017 09:15 | 12/08/2017 10:00 |
| apaebmet120817 | 12/08/2017 10:15 | 01/22/2018 09:15 |

**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 2017.

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](http://www.nerrsdata.org). Data are available in comma delimited format.

**8) Associated researchers and projects –**

Harper, J., Wren, K., Jones, D., Garwood, J., Garland, H., Snyder, C., Levi, L., Bourque, E./ NERRS Sentinel Sites Program for Understanding Climate Change Impacts on Estuaries

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.

Garwood, J., Harper, J., Levi, L., Lamb, M., Jones, D., Garland, H., Bourque, E., Yuan, W., Christopher, M., Cox, N. Apalachicola National Estuarine Research Reserve. Distribution and density of fishes and benthic invertebrates in Apalachicola Bay.

Harper, J., Levi, L., Jones, D., Lamb, M., Garwood, J., Garland, H., Bourque, E. 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.

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., Huang, W., Harwell, M., Edmiston, H.L., Johnson, E., Hsieh, P., Milla, K., Christensen, J., Stewart, J., Liu, X. 2008. Modeling oyster growth rate by coupling oyster population and hydrodynamic models for Apalachicola Bay, Florida, USA. Ecological Modeling 211:77-89.

Viveros, P. NOAA Graduate Research Fellowship, Phytoplankton composition and abundance in relation to salinity, nutrient and light gradients in the Apalachicola National Estuarine Research Reserve.

Anderson, C. Auburn University, School of Forestry and Wildlife Sciences. Response of coastal riverine wetlands to water allocations in an urbanizing watershed.

Smith, S. Florida A&M University post-doctoral research associate, ECSC/Environmental Sciences Institute, Drought, Reduced River Flow and Sea Level Rise: Exploring Climate Impacts on Carbon and Nitrogen Cycling in the Apalachicola Bay System.

Hagen, S., DeLorme, D., Walters, L., Wang, D., Weishampel, J., Yeh, G., Huang, W., Slinn, D., Morris, J. Ecological Effects of Sea Level Rise.

As part of the SWMP long-term monitoring program, ANNERR also monitors 15-minute water quality along with monthly grab samples and diel sampling for nutrient data which may be correlated with this meteorological dataset. These data are available at [www.nerrsdata.org](http://www.nerrsdata.org).

**II. Physical Structure Descriptors**

**9) Sensor specifications –**

Parameter: Temperature

Units: Celsius

Sensor type: 100 ohm platinum resistance temperature detector (PRT)

Model #: Rotronic HC2-S3 Temperature and Relative Humidity Probe

Operating Temperature: -40oC to +60oC

Range: -40oC to +60oC

Accuracy: +/- 0.1oC (@ 23oC)

S/N: 0061247971

Date of calibration: 03/07/2016

Dates of sensor use: 03/23/2016 – 03/08/2017

S/N: 0061212271

Date of calibration: 01/27/2017

Dates of sensor use: 03/08/2017 – Current as of 12/31/2017

Parameter: Relative Humidity

Units: Percent

Sensor type: Rotronic IN1 capacitive sensor

Model #: Rotronic HC2-S3 Temperature and Relative Humidity Probe

Range: 0-100% non-condensing

Accuracy: +/- 0.8% RH (@23oC)

Temperature dependence of RH measurement +/- 3% (-40 to 60C)

S/N: 0061247971

Date of calibration: 03/07/2016

Dates of sensor use: 03/23/2016 – 03/08/2017

S/N: 0061212271

Date of calibration: 01/27/2017

Dates of sensor use: 03/08/2017 – Current as of 12/31/2017

Parameter: Barometric Pressure

Units: millibars (mb)

Sensor type: Vaisala Barocap © silicon capacitive pressure sensor

Model #: PTB110

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

S/N: K0220004

Date of calibration: 01/13/2014

Dates of sensor use: 02/23/2016 – current as of 12/31/2017

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

S/N: WM127200

Date of calibration: 03/03/2016

Dates of sensor use: 04/11/2016– 04/04/2017

S/N: WM131274

Date of calibration: 01/31/2017

Dates of sensor use: 04/04/2017– current as of 12/31/2017

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

S/N: WM127200

Date of calibration: 03/03/2016

Dates of sensor use: 04/11/2016– 04/04/2017

S/N: WM131274

Date of calibration: 01/31/2017

Dates of sensor use: 04/04/2017– current as of 12/31/2017

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

Parameter: Photosynthetically Active Radiation

Units: millimoles m-2 (total flux)

Sensor type: Un-amplified quantum sensor, anodized aluminum with cast acrylic diffuser

Model #: SQ-110 Apogee

Light spectrum waveband: 410 to 655 nm

Temperature dependence: 0.06 ± 0.06% per °C

Stability: <±2% change over 1 yr

Operating Temperature: -40°C to 70°C; Humidity: 0 to 100%

Cosine Response: 45° zenith angle: +/- 2%; 75° zenith angle: +/- 5%

Sensitivity: 0.2mV per µmol s-1 m-2

Multiplier: 0.025

Field of view: 180°

S/N: 19559

Date of calibration: 12/01/2015

Dates of sensor use: 04/11/2016 – 05/25/2017

S/N: 22808

Date of calibration: 05/25/2017

Dates of sensor use: 05/25/2017 – current as of 12/31/2017

Parameter: Precipitation

Units: millimeters

Sensor type: Tipping Bucket Rain Gauge

Model #: TR525 USW

Funnel diameter: 8.0 inches

Rainfall per tip: 0.01 inch

Operating range: Temperature: 0° to 50°C; Humidity: 0 to 100%

Accuracy: +/- 1.0% up to 1 in./hr; +0, -3% from 1 to 2 in./hr; +0, -5% from 2 to 3 in./hr

S/N: 59238-314

Date of calibration: 03/08/2017

Dates sensor use: 05/14/2014 – current as of 12/31/2017

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 08/07/2006 – current as of 12/31/2017

CR1000 Datalogger

The CR1000 has 2 MB of 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.

CR1000

S/N: 005091

Calibration: 05/08/2006

Installed: 06/28/2006

Removed: 06/14/2013

S/N: 56121

Calibration: 05/31/2013

Installed: 06/14/2013 – current as of 12/31/2017

CR1000 Firmware Version 24 in use from 08:45 10/12/2012 – 14:15 02/14/2014

CR1000 Firmware Version 27 in use from 14:30 02/14/2014 – current as of 12/31/2017

CR1000 Program Version:

apaebmet\_5.6\_072513 in use 9:15 07/26/2013 – 12:00 01/23/2014.

apaebmet\_5.6\_122013 in use 12:15 01/23/2014 – 10:15 01/14/2015

apaebmet\_5.6\_010715 in use 10:30 01/14/2015 – 10:00 02/16/2016

apaebmet\_5.6\_020816 in use 10:15 02/16/2016 – 10:00 04/11/2016

apaebmet\_5.6\_032316 in use 10:30 04/11/2016 – current as of 12/31/2017

**10) Coded variable definitions -**

Sampling station: Sampling site code: Station code:

East Bay EB apaebmet

**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

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.

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.**

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>.

Small negative PAR values are within range of the LI-COR sensor and are due to normal errors in the sensor and the CR1000 Datalogger. The Maximum signal noise error for the LI-COR sensor is +/- 2.214 mmoles/m2 over a 15 minute interval. These values are automatically flagged and coded as <1> (CAF).

Small negative PAR values for Apogee sensor are flagged and coded as <1> (CSM)

Nighttime PAR values greater than 0.0 mmoles m-2 are flagged and coded as <1> (CSM), indicating that users should be aware of possible data inconsistencies. Nighttime periods were determined using sunrise-sunset times obtained from <http://www.sunrisesunset.com>. Consistently elevated nighttime PAR values may trigger the flagging of corresponding daytime PAR values.

01/22/2017 Missing data from 01/22/2017 @ 01:45 to 01/22/2017 02:45 reason unknown.

02/07/2017 18:45 - 23:45 for total precipitation and through 02/08/2017 00:00 for cumulative precipitation. Significant rain event (24 hr cumulative precip >50 mm) occurred on February 7th and is flagged in the data as GSM CRE.

03/08/2017 12:15 - 12:30 Replaced temperature sensor (61247971 removed 61212271 installed, rejected associated data). Conducted static calibration of rain gauge, rejected data recorded from calibration tips 11:30 - 12:30 for total precipitation and through 03/09/2017 00:00 for cumulative precipitation.

04/04/2017 10:00 - 10:45 Replaced old wind sensor (WM127200) with newly calibrated unit (WM131274). Reject associated data.

05/03/2017 rain gauge wire was found to be torn down and chewed up. Evidence of vandalism by raccoons. New cable ordered for replacement. Rain data rejected until rain gauge wire and conduit replaced on 05/25/2017. Rain data are rejected from 4/4/2017 @10:45 to 5/25/2017 @ 13:30 for total precipitation and through 5/26/2017 00:00 for cumulative precipitation.

05/25/2017 09:30 - 13:30 New PAR sensor installed (SN#22808). Old sensor removed (SN# 19559). Installation did not remedy night time positive PAR values.

06/06/2017 09:30 - 14:15 for total precipitation and through 06/07/2017 00:00 for cumulative precipitation. Significant rain event (24 hr cumulative precip >50 mm) occurred on June 6th and is flagged in the data as GSM CRE.

06/19/2017 Significant rain event (24 hr cumulative precip >50 mm) associated with Tropical Storm Cindy occurred June 19th through June 21st and is flagged in the data as GSM CRE. Total precipitation values are coded 06/19/2017 12:00 - 06/21/2017 01:30 while cumulative coding continues through 06/21/2017 00:00

07/07/2017 07:45 - 08:15 {CSM} Rain, temperature, and solar panel wiring damaged from animals. New hardware ordered.

07/07/2017 20:30 through 09/07/2017 00:00 All PAR data are flagged as suspect due to consistently elevated nighttime values during this period.

07/21/2017 08:45 rejected, Telemetry system down. Pulled Battery. Tested. Tested okay. Charged battery. Missing data: 07/21/2017 @ 09:00 to 07/24/2017 @ 07:30, rejected 07:45.

08/11/2017 09:00 - 12:00 {CSM} Visited station to replace wiring to components. Found a mother raccoon with 3 babies. Removed raccoons. Replaced solar panel, solar panel wiring, and rain and temperature gauge wiring. PAR data were rejected at 10:00 due to QAQC checks. Air temperature and relative humidity were also rejected due to QAQC checks from 11:30 - 12:00.

09/11/2017 00:15 - 09/12/2017 15:00 Significant Weather Event {CWE}{CSM} Hurricane Irma