

Hudson River (HUD) NERR Meteorological Metadata
January 1, 2013 – December 31, 2013
Latest Update: December 20, 2023

I. Data Set and Research Descriptors

1) Principal investigator(s) and contact persons

Sarah H. Fernald, Research Coordinator/Research Assistant

Email: shfernal@gw.dec.state.ny.us

Chris Mitchell, Research Assistant

Email: cgmitch@gw.dec.state.ny.us

Address:

Hudson River NERR
Norrie Point Environmental Center
256 Norrie Point Way
PO Box 315
Staatsburg, NY 12580

Phone: 845-889-4745 x111

Fax: 845-889-4749

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 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.

Persons responsible for data verification are the Research Assistant and the Research Coordinator.

3) Research objectives – The objective of this study is to monitor the meteorological conditions at the Tivoli Bays component site of the Hudson River National Estuarine Research Reserve. Measurements of air temperature, relative humidity, barometric pressure, precipitation, photosynthetically active radiation, and wind speed and direction are taken throughout the year at the Tivoli Bays Field Station. A water quality-monitoring program has been ongoing since 1991 at this component site, and the meteorological data will help provide ancillary data. This will help us to better understand the relationships between the atmospheric conditions and aquatic environments at this site.

4) Research methods –

Campbell Scientific data telemetry equipment was installed at the field station on 11/14/2005 at 16:30 and transmits data to the NOAA GOES satellite, NESDIS ID #3B00B4F4. 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>.

Data are backed-up to a PC file appended hourly via serial connection to the CR1000. The data are downloaded and pre-processed as described in Section 2. QA/QC flags are applied on the following anomalous data criteria:

Air Temperature:

- Sample not greater than 45 C or less than –40 C

Relative Humidity:

- Sample not greater than 100% or less than 0%

Pressure:

- Pressure greater than 1060 mb or less than 900 mb

Wind Speed:

- Wind speed greater than 30 m/s
- Wind speed greater than 30 m/s or less than 0 m/s

Wind Direction:

- Wind direction not greater than 360 degrees or less than 0 degrees

Rainfall:

- Precipitation not greater than 25 mm in 15 min

Photosynthetically Active Radiation (PAR)

- Sample not greater than 5000 mmol/m² or less than –1.0 mmol/m²

Time:

- 15-minute interval recorded

For routine maintenance, sensors are investigated at least once a month to ensure there is no damage or blockage to the sensors. According to Campbell Scientific, sensors are to be calibrated every two 2 years for proper data collection. After that time, the sensors are removed from the tower, and shipped to their respective manufacturers for proper and professional calibration. In order to avoid missing data, a second set of sensors is calibrated and available to be installed on the tower to continue data collection. The CR1000 controller is calibrated once every five years in accordance with Campbell Scientific recommendations.

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)

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)

5) Site location and character –

The Hudson River National Estuarine Research Reserve (HUDNERR) is a multi-component site totaling approximately 5,000 acres. Each component of the reserve is referenced by River Mile (RM) of the Hudson River in New York State proceeding north from the southern tip of Manhattan (RM 0). The reserve includes the following four component sites: Piermont Marsh, Rockland County (RM 24)(41°02'30"N 73°54'15"W), Iona Island, Rockland County (RM 45)(41°18'15"N 73°58'45"W), Tivoli Bays, Dutchess County (RM 98)(42°02'15"N 73°55'10"W), and Stockport Flats, Columbia County (RM 124)(42°02'30"N 73°46'00"W). The four component sites include open water, tidal wetland, and adjacent upland buffer habitats and are representative of the diverse plant and animal communities that occupy the salinity gradient within the Hudson River Estuary. Development within the watersheds of the four component sites ranges from predominantly urban/suburban to forested/agricultural.

The weather station (FS) is located at the Tivoli Bays component site in Annandale, NY (42°01'05.46"N 73°55'01.13"W). A 30 foot, aluminum tower is used to elevate some of the weather monitoring equipment. The tower is on the deck of an office building, on the west side, 9 feet off the ground. The wind anemometer, wind speed, and light sensors are located at the top of the tower, 39 feet off the ground. The datalogger and the barometric pressure sensor are enclosed within a fiberglass case attached to the tower, 12 feet off the ground. A heated rain gauge is next to the tower, attached to the building, 16 feet off the ground. The temperature/humidity sensor is next to the tower, attached to the deck handrail, 12 feet off the ground. GOES telemetry equipment includes a larger solar panel and battery, a larger enclosure to house the battery, a Campbell TX-312 transmitter, associated GPS for time synchronization and a Yagi antenna.

Although trees surround the area, the tree line begins approximately 60 feet from the tower in most directions. The trees are at similar heights to the tower, but the sensors are not shaded at that location. The tower is approximately 1.2 miles Southeast of the Tivoli South Bay water quality monitoring station, 2.3 miles Southeast of the Tivoli North Bay water quality monitoring station, and 0.2 miles Northwest of the Saw Kill Creek water quality monitoring station.

6) Data collection period – Weather data have been collected at the Field Station at Tivoli Bays since July 1999. Weather data provided in this document were collected between 01/01/2013 at 00:00 through 12/31/2013 at 23:45.

Data Retrieval intervals were as follows:

12/28/2012 @ 11:45 - 01/30/2013 @ 12:15

01/30/2013 @ 12:30 – 02/22/2013 @ 14:00

02/22/2013 @ 14:15 – 03/15/2013 @ 10:00
03/15/2013 @ 11:45 – 04/26/2013 @ 10:30
04/26/2013 @ 10:45 – 05/30/2013 @ 14:15
04/26/2013 @ 10:45 – 06/03/2013 @ 13:45
06/03/2013 @ 14:15 – 07/03/2013 @ 13:30
07/03/2013 @ 13:45 – 08/27/2013 @ 11:30
08/27/2013 @ 11:45 – 10/02/2013 @ 13:15
10/02/2013 @ 13:30 – 10/03/2013 @ 10:15
10/03/2013 @ 10:30 – 10/08/2013 @ 11:45
10/08/2013 @ 12:00 – 12/03/2013 @ 14:15
12/03/2013 @ 14:30 – 12/30/2013 @ 11:45
12/30/2013 @ 12:00 – 01/15/2013 @ 11:15

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 Hudson River NERR water quality-monitoring program examines the physical and chemical constituents of the tributary waters and the tidal waters of the freshwater tidal marshes at the Tivoli Bays component site. Measurements include seston, dissolved oxygen, alkalinity, pH, temperature, salinity, conductivity, and concentrations of nitrate, phosphate, sulfate, and chloride. These data are used to identify long-term trends and to determine the relationship between meteorological conditions and the aquatic environments at this site.

Associated researchers working at the Tivoli Bays component site include scientists from the Cary Institute of Ecosystem Studies in Millbrook, NY, Yale School of Forestry and Environmental Studies in New Haven, CT, Bard College, Annandale-on-Hudson, NY, Simon's Rock College, Great Barrington, MA, Cornell University Center for the Environment, Cornell

Institute for Resource Systems, Cornell Department of Natural Resources, Ithaca, NY, State University of New York College of Environmental Science and Forestry, Syracuse, NY and Rensselaer Polytechnic Institute in Troy, NY.

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

Serial Number: Y1120003

Date of Calibration: 10/26/2011

Dates of Sensor Use: 11/30/2011 – 02/22/2013

Serial Number: A3510055

Date of Last Calibration: 09/26/2012

Dates of Sensor Use: 02/22/2013 – 10/02/2013

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: $\pm 2\%$ RH (0-90%) and $\pm 3\%$ (90-100%)

Temperature dependence of RH measurement: $\pm 0.05\%$ RH/°C

Serial Number: Y1120003

Date of Calibration: 10/26/2011

Dates of Sensor Use: 11/30/2011 – 02/22/2013

Serial Number: A3510055

Date of Last Calibration: 09/26/2012

Dates of Sensor Use: 02/22/2013 – 10/02/2013

Parameter: Temperature

Units: Celsius

Sensor type: PT100 RTD, IEC 751 1/3 Class B, with calibrated signal conditioning

Model #: HC2-S3 Temperature and Relative Humidity Probe

Operating Temperature: -40°C to +60°C

Range: -40°C to +60°C

Accuracy: ± 0.1 °C @ 23°C

Serial Number: 61102825

Date of Last Calibration: 04/12/2013
Dates of Sensor Use: 10/02/2013 – 08/10/2015

Parameter: Relative Humidity
Units: Percent
Sensor type: ROTRONIC® Hygromer IN-1
Model #: HC2-S3 Temperature and Relative Humidity Probe
Range: 0-100% non-condensing
Accuracy at 23°C: +/- 0.8% RH with standard configuration settings
Temperature dependence of RH measurement +/- 3% (-40 to 60C)

Serial Number: 61102825
Date of Last Calibration: 04/12/2013
Dates of Sensor Use: 10/02/2013 – 08/10/2015

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

Serial Number: B2450025
Date of Last Calibration: 08/24/2011
Dates of Sensor Use: 10/03/2011 – 10/02/2013

Serial Number: W5040014
Date of Last Calibration: 09/12/2013
Dates of Sensor Use: 10/02/2013 – 08/10/2015

Parameter: Wind speed
Units: meter per second (m/s)
Sensor type: 12 cm diameter 3-cup wheel assembly, 40 mm hemispherical cups
Model #: R.M. Young 03001-5 Wind Monitor
Range: 0-50 m/s (112 mph); gust survival 60 m/s (134 mph)
Accuracy: +/- 0.5 m/s
Note: This sensor has an offset of 0.2

Serial Number: 03001-5
Date of Last Calibration: 08/19/2011
Dates of Sensor Use: 10/03/2011 – 10/02/2013

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 05103-45-L Alpine Wind Monitor
Range: 0-60 m/s (134 mph); gust survival 100 m/s (220 mph)
Accuracy: +/- 5%

Serial Number: WN125404
Date of Last Calibration: 04/23/2013
Dates of Sensor Use: 10/02/2013 – 09/11/2015

Parameter: Wind direction
Units: degrees
Sensor type: balanced vane, 16 cm turning radius

Serial Number: 03001-5
Date of Last Calibration: 08/19/2011
Dates of Sensor Use: 10/03/2011 – 10/02/2013

Parameter: Wind direction
Units: degrees
Sensor type: balanced vane, 38 cm turning radius

Serial Number: WN125404
Date of Last Calibration: 04/23/2013
Dates of Sensor Use: 10/02/2013 – 09/11/2015

Parameter: Photosynthetically Active Radiation
Units: mmols 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: <±2% change over 1 yr
Operating Temperature: -40°C to 65°C; Humidity: 0 to 100%
Sensitivity: typically 5 µA per 1000 µmoles s⁻¹ m⁻²

Serial Number: Q35108
Multiplier Value: 1.47
Date of Last Calibration: 08/22/2011
Dates of Sensor Use: 10/03/2011 – 10/02/2013

Serial Number: Q30333
Multiplier Value: 1.35
Date of Last Calibration: 09/06/2013
Dates of Sensor Use: 10/02/2013 – 08/10/2015

Parameter: Precipitation (heated rain gauge)
Units: millimeters (mm)
Sensor type: Tipping Bucket Rain Gauge
Model #: TE525
Rainfall per tip: 0.01 inch
Operating range: Temperature: 70° to - 40°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

Serial Number: 06-12
Date of Last Calibration: 9/12/2012
Dates of Sensor Use: 09/12/2012 – 03/15/2013

Parameter: Precipitation (heated rain gauge)

Units: millimeters (mm)

Sensor type: Tipping Bucket Rain Gauge

Model #: RM52202-L

Rainfall per tip: 0.1 mm

Operating range: -20°C to +50°C (heated); Humidity: 0 to 100%

Accuracy: 2% up to 25 mm/hr, 3% up to 50 mm/hr

Serial Number: Unknown

Date of Calibration: 03/15/2013

Dates of Sensor Use: 03/15/2013 – 10/02/2013

Serial Number: 27014 -7

Date of Calibration: 10/02/2013

Dates of Sensor Use: 10/02/2013 – 10/07/2014

Transmitter

Model #: TX312

On-board memory: Non-volatile flash for setup parameters. 16 Kbytes for data.

Data Transmission Rates: 100, 300 and 1200 BPS

Transmit Power: 5.6 Watts for 100 and 300 bps, 11.2 watts for 1200 bps

Frequency range: 401.701 MHz – 402.09850 MHz

Channel bandwidth: 100/300 BPS 1.5 KHz; 1200 BPS 3 KHz

Time Keeping: Initial setting accuracy: ± 100 microseconds synchronized to GPS; Drift ± 10 milliseconds/day over operating temperature range; GPS scheduled updates are 1 at power up and once per day thereafter. Once every 28 hours required for continual operation.

Operating range: -40° to +60°C; Storage -50° to +70°C; 0-99% RH, non-condensing

Power requirements: 10.8 to 16 VDC, 5 mA during GPS fix and 2.6 Amps during transmission

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.

CR1000 Data Logger

Serial Number 5083

Date of Calibration: 06/05/2006

Date of Installation: 01/18/2007

Dates of Use: 01/18/2007 – 10/02/2013

CR1000 Data Logger

Serial Number J8743

Date of Calibration: 03/2013

Date of Installation: 10/02/2013

Dates of Use: 10/2/2013 - 10/09/2019

CR1000 Firmware Version (s):

OS 24 Installed on 03/19/2012

OS 26 Installed on 10/03/2013

CR1000 Program Version(s):

HUDFSMT_6.0_100311

Dates Used: 10/03/2011- 10/08/2013

HUDFSMT_6.0_100813

Dates Used: 10/08/2013 – 08/13/2015

10) Coded variable definitions - List the sampling station, sampling site code, and station code used in the data.

Sampling station:	Sampling site code:	Station code:
Field Station at Tivoli Bays	FS	hudfsmet

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 Licor 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 mmol/m² over a 15 minute interval.

Relative Humidity data greater than 100 are within range of the sensor accuracy of +/-3%.

The 3001 MET One Wind Set has an offset of 0.2 and does not record values of 0.

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.

Data coded CRE GSM (Significant Rain Event) or CWE GSM (Significant Weather Event)

Data are coded CWE when the observed conditions or associated temperatures are indicative of snow/ice events. The CWE code is used because the nature of snow, even utilizing a precipitation gauge with a heating element, is subject to blowing out of the collection device. Snowfall totals calculated using a tipping bucket, likely underestimate the amount of precipitation which actually fell. Data are coded CRE when the 24 hour rainfall total exceeds 20mm. The data for both CRE and CWE events will be coded until the event ends, and cumulative total for the day reset's at 00:00

Data Coded CRE GSM (Significant Rainfall Events) or CWE GSM (Snow/Ice event)

5/30/2013 14:45 – 05/30/16:45 for total precipitation and through 05/31/2013 00:00 for cumulative precipitation.

6/6/2013 17:15 – 06/08/2013 13:45 for total precipitation and through 06/09/2013 00:00 for cumulative precipitation.

07/22/2013 18:45 – 07/23/2013 16:00 for total precipitation and through 07/24/2013 00:00 for cumulative precipitation.

08/9/2013 00:15 – 08/09/2013 17:30 for total precipitation and through 08/10/2013 00:00 for cumulative precipitation.

12/29/2013 11:45 – 12/29/2013 21:30 for total precipitation and through 12/30/2013 00:00 for cumulative precipitation.

Data Coded CSM (See Metadata)

01/30/2013 12:15

<-3> [SSM] (CSM) Both air temperature and relative humidity were rejected due to a sensor malfunction. A minimum air temperature reading of -37.8 was recorded. Maximum and minimum air temperatures are not included in the dataset but are available from the reserve.

02/22/2013 14:00 – 14:30

<-3> [SMT] (CSM) Both air temperature and relative humidity were rejected due to maintenance. The HMP45C sensor serial number Y1120003 was replaced with the same model sensor, serial number A3510055.

02/22/2013 14:30

<5> [SMT] (CSM) Total precipitation false tips from maintenance were corrected from 0.3 back to 0.0. Cumulative precipitation data were corrected from 14:30 to the end of the day at 02/23/2013 00:00.

03/15/2013 10:15 – 11:45

<-2> [GPD] (CSM), <-3> [GPR](CSM) All parameters are missing due to a power down to replace the rain gauge and swap the TX312 transmitter. An updated logger program was reloaded following the power down.

03/15/2013 11:45

<5> [SMT] (CSM) Total precipitation false tips from maintenance were corrected from 2.3 back to 0.0. Cumulative precipitation data were corrected from 11:45 to the end of the day at 03/16/2013 00:00. During maintenance (see above) a new rain gauge was installed that records rainfall tips as 0.1mm, instead of 0.254mm recorded by the previous sensor.

5/22/2013 02:15 – 6/3/2013 13:45

Relative humidity/Temp. Sensor malfunctioned due to storm event. New probe was installed on 6/3/2013

06/03/2013 14:00 – 14:15

<-2> and <-3> [GPD] (CSM) data are missing and rejected due to the station being powered down to swap the air temperature/relative humidity sensor from HMP45C to a new HC2-S3.

06/03/2013 14:15 – 06/04/2013 00:00

<1> (CSM) Cumulative precipitation values are suspect. Total precipitation values were not recorded and the extra tips recorded as cumulative precipitation may have been from accidental tips during maintenance while the station was powered down.

06/15/2013 00:15 – 07/02/2013 14:00

<1> [SSM] (CSM) Total and cumulative precipitation are considered suspect due to rain bucket clog found on 07/02/2013 13:45. The exact date the bucket began to clog is unknown, but 06/15/2013 is a reasonable assumption. Precipitation rain bucket was found clogged due to cicadas. Bucket was full; total/cumulative rainfall was suspect. Cumulative precipitation data are considered suspect through the end of the day.

07/03/2013 13:45

Air temperature and relative humidity were rejected due to maintenance. The sensor was removed from the gill shield to check for debris.

08/27/2013 11:30

Air temperature and relative humidity were rejected due to maintenance. The sensor was removed from the gill shield to check for debris.

10/2/2013

<-3> [GPR] (CSM) @ 13:30 – 13:45 Program reload was performed, new cr1000 was installed during the process

<-2> [GPD] (CSM) @ 14:00-14:45 new sensors were installed during this time frame, no data was collected. Old sensors were swapped out and/or calibrated. Air temperature/relative humidity, barometric Pressure, PAR, wind sensor, and precipitation gauge swapped.

10/2/2013 @ 15:00 – 10/3/2013 @ 10:15

<-3> (CSM) A new wind sensor was installed during the sensor swap however a mounting issue required that the sensor be deployed temporarily and incorrectly aligned and the accuracy of the data was questionable. The new mount was installed on 10/3/13 10:15 and then realigned in the accordance with manufacturers specifications.

10/03/2013 10:00 – 10:15

<5> [SMT] (CSM) Total precipitation false tips from maintenance were corrected from 0.2 and 0.5 back to 0.0. Cumulative precipitation data were corrected from 10:00 to the end of the day at 10/04/2013 00:00.

10/3/2013 @ 10:30 – 10/08/2013 @ 11:45

<-3> [SIC](CSM) An incorrect multiplier was utilized during this period for the new wind sensor. The multiplier was corrected with an updated program on 10/08/13 12:00, <-3> [GPR] (CSM). The interim wind speed and max wind speed data as a result can not be considered accurate and is therefore rejected.

10/08/2013 @ 12:00 – 12/3/2013@ 14:15

<1> (CSM) An electrical short was discovered in the wiring of the rain gauge. The rain gauge was repaired and determined to be operational. The data during the two sampling periods for Total and Cumulative Precipitation should be regarded as suspect, as their validity and accuracy cannot be assured.

Elevated nighttime PAR values were recorded throughout the year. All nighttime PAR data was compared to sunrise and sunset times as per www.sunrisesunset.com. Any values greater than 0.0 were flagged and coded as <1> (CSM). The values are considered questionable and likely related to colder temperatures and/or higher moisture conditions. The highest occurrence of these nighttime readings was observed and noted in the winter months.