

Chesapeake Bay Virginia (CBV) NERR Meteorological Metadata

January 1, 2009 to December 31, 2009

Latest Update: January 7, 2013

I. Data Set and Research Descriptors

1) Principal investigator(s) and contact persons.

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Responsible for Field Data Collection.

2) Entry verification –

a) Data Input Procedures:

Some History: In 2005, the Centralized Data Management Office converted all SWMP (System Wide Monitoring Program) weather data collected with CR10X program versions prior to version 4.0. This was necessary in order to merge the old data format (12 array output) with the new data format found in version 4.0 (3 array output). The new format (which was used in 2006 metadata reporting) produces averages, maximums and minimums every fifteen minutes (array 15), every hour (array 60) and every day (array 144) for any sensors connected to the CR10X.

At the Taskinas Creek Met Station prior to November 30th, 2006, 15-minute, 1-hour average, and 24-hour data were downloaded from each sensor on the weather station to a Campbell Scientific CR10X datalogger. The CDMO Data Logger Program (NERR.SCI) was loaded into the CR10X and controlled the sensors and data collection schedule. Data collected from the CR10X were stored on a Campbell Scientific storage module (SM4M) and downloaded manually onto a laptop computer using PC208W program from Campbell Scientific. Data were downloaded biweekly or monthly from the storage module located within the weather station.

The raw data files were then exported from the PC208W program in comma-delimited format (.DAT files) and opened in Microsoft Excel using the EQWIN Format Macro developed by CDMO to reformat the header columns, insert station codes, insert a date column, correct the time column format, and format all columns to the correct number of decimal places. This formatted file was then copied into the EQWIN weather.eqi file where the data were QA/QC checked and archived in a database. Data were investigated as recommended in the CDMO NERR SWMP Data Management Manual Version 5.2, and included the use of queries, graphs, and reports. EQWIN was also used to generate customized reports and export the data in a standardized format to send to

CDMO. Any anomalous data were investigated and noted in an Anomalous Data section (Section 11). Data tagged as being “anomalous” are double checked and where the data truly appear anomalous, they are compared with other regional meteorological data for verification. Any data corrections or removed data were noted in the Deleted Data section (Section 12). Any missing data was documented in the Missing Data section (Section 13).

After switching out the Campbell Scientific CR10X Datalogger for a CR1000 instrument at the Taskinas Creek Station (on December 1, 2006) programming changes dictated only 15-minute data being downloaded from each sensor. The CDMO Data Logger Program (CBV_CBVTCMET_V3.0_113006.CR1) was loaded into the CR1000 that controls the sensors and data collection schedule. Data are downloaded biweekly to monthly directly from the CR1000, as the storage module was no longer needed in this new configuration.

Although there have been some changes to the programming of the CR1000 over time (i.e. from 2006 to present), CBNERRVA staff currently program the CR1000 datalogger to collect data in the following formats:

- 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:
 - Maximum and Minimum Air Temperature (°C) (these data are not available in the dataset, but are available from the CBNERRVA)
- Maximum and times from 5-second data:
 - Maximum Wind Speed, (m/s)
- Totals from 5-second data:
 - Precipitation (mm), PAR (millimoles/m²), and Cumulative Precipitation (mm) (CBNERRVA started collecting this parameter on May 23rd, 2008 with new program)

Following the installation of the CR1000 (and associated programs), hourly and daily data were no longer collected. In addition, hardware and software changes resulted in a reduced parameter list which no longer included collecting the following parameters (now considered Non-SWMP or Optional parameters):

- Maximum Relative Humidity
- Maximum Relative Humidity Time
- Minimum Relative Humidity
- Minimum Relative Humidity Time
- Maximum Barometric Pressure
- Maximum Barometric Pressure Time
- Minimum Barometric Pressure
- Minimum Barometric Pressure Time
- Minimum Wind Speed
- Minimum Wind Speed Time

Data collected from the CR1000 Version 3.0 Meteorological Program were processed in a slightly different manner than the CR10X. Data were collected directly from the CR1000 and downloaded onto a laptop computer using the LoggerNET Ver. 3.2 program from Campbell Scientific. These raw data files are then exported from the LoggerNET program in comma-delimited format (.DAT files) and run through a PERL Script program (CONVERT1_GUI_BATCH_V4.exe) to convert the CR1000 raw data file to the CR10X format (with a .csv extension). This intermediate file can then be

opened with the EQWIN Format Macro developed by CDMO (November 2006) to reformat the header columns, insert station codes, insert a date column, correct the time column format, and format all columns to the correct number of decimal places (although with a reduced parameter list – see above). The formatted file could then be processed in EQWIN using the same methods described in the paragraph above for the CR10X data.

Effective with the submission of 2007 SWMP MET data, the data submission process was enhanced in order to improve the data delivery and availability of the non-telemetered NERRS SWMP data to the public. CDMO developed a new data upload tool for the submission raw 2007 MET files to the CDMO (including SWMP and Non-SWMP parameters) as well as a new QA/QC Process.

Data are still collected from the CR1000 data logger via Loggernet (Version 3.2) using a laptop computer (Dell Toughbook). Files are exported from LoggerNet in a comma-delimited format (.Dat files) and uploaded to the CDMO where they are stored in a Microsoft SQL provisional database and undergo automated primary QAQC and become part of the CDMO's online provisional database. During primary QAQC, data were flagged if they are missing, out of sensor range, or outside 2 or 3 standard deviations from the historical seasonal mean (although flagging data 2 or 3 standard deviation from the historical seasonal mean was discontinued around September 15, 2008 after deliberations from the Data Management Committee). The edited file is then returned to CBNERRVA where it is opened in Microsoft Excel and processed using the CDMO's NERRQAQC Excel macro (Now Version 2.01242009). 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 (ODIS). For more information on QAQC flags and QAQC codes, see Sections 11 and 12.

The Meteorological Program stored in the CR1000 was updated from Version 3.0 to Version 4.2 on 9/19/2007 to fix NAN values in the wind speed data and allow for negative PAR values. The Meteorological Program was again updated (from Version 4.2 to Version 5.5) on 5/23/2008 and 6/5/2008 to adjust for how PAR data was transmitted through the GOES system as well as allow for the collection of cumulative precipitation data and again on 6/5/2008 to account for a new 7-Wire Temperature/Humidity Sensor. The Meteorological program was updated one more time on 1/5/2009 (still version 5.5 however) to adjust the programming code to fix a problem with a fluctuating temperature probe.

Brief Summary of Standard, Non-Standard, and Flagged Data Criteria for 2009 Meteorological Data.

- Averages from 5-second data:
 - Air Temperature (Standard and Flagged)
 - Relative Humidity (Standard and Flagged)
 - Barometric Pressure (Standard and Flagged)
 - Wind Speed (Standard and Flagged)
 - Max Wind Speed (Standard and Flagged)
 - Wind Direction (Standard and Flagged)
 - Wind Direction Standard Deviation (Standard and Flagged)
 - Battery Voltage (Non-Standard and Not Flagged)
- Maximum, Minimum, and their times from 5-second data:
 - Maximum and Minimum Air Temperature (Non-Standard and Not Flagged)
- Times
 - Maximum and Minimum Air Temperature Time (Non-Standard and Not Flagged)
 - Maximum Wind Speed Time (Standard but Not Flagged)

- Totals:
 - Precipitation (mm) (Standard and Flagged)
 - PAR (millimoles/m²) (Standard and Flagged)
 - Cumulative Precipitation (mm) (Standard and Flagged)

Scott Lerberg was responsible for the QA/QC of the 2009 Weather data.

3) Research objectives:

The principal objective is to record long-term meteorological data within the York River watershed in order to observe any environmental changes or trends over time. Data may also be used for watershed research. Samples were taken every 5 seconds and averaged or totaled over 15 minutes for roughly two-week collecting intervals.

4) Research methods:

The Campbell Scientific weather station samples every 5 seconds to produce 15 minute averages (or totals in the case of rainfall and PAR readings) of measurements of air temperature, relative humidity, barometric pressure, rainfall, PAR, wind speed and wind direction (for more information see section 2). A bi-weekly to occasionally monthly sampling interval (depending on availability of staff personnel) was chosen to periodically inspect and perform field verifications of the accuracy of the sensors and collect and send the raw data to CDMO for primary QA/QC. Sensors are scheduled to be removed and sent back to Campbell Scientific for calibration at minimum of every two years (with the exception of the temperature/humidity sensor and tipping bucket which are scheduled to be calibrated every year). It should be noted that the wind monitor was replaced with a newly calibrated unit on January 5th, 2009 and the temperature/humidity probe, pressure sensor, and licor sensor were replaced with newly calibrated units on December 1, 2009. The tipping bucket rain gauge was also calibrated on December 1, 2009 using procedures outlined in CDMO SWMP Data Management Manual Version 6.2 (for more information see Section 9 of this document).

Campbell Scientific data telemetry equipment was installed at the Taskinas Creek station on 11/30/2006 and transmits data to the NOAA GOES satellite, NESDIS ID # 3B009218. 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>.

5) Site location and character :

The Chesapeake Bay National Estuarine Research Reserve in Virginia (CBNERRVA) is located on the York River, a tributary of the Chesapeake Bay. CBNERRVA maintains a long-term water quality-monitoring station and stream gauge station at Taskinas Creek, a tributary of the York River that is located in the transitional zone of the York River State Park. The Taskinas Creek weather station is also located within York River State Park. The park is located on the mainstem of the York River, which is 50 km long, 38 kilometers from the mouth of the river, and 2.25 kilometer wide near the weather station. The weather station is located (37°24' 50.79850" N, 76°42' 44.51934" W) on a bluff (11m elevation) 60m (horizontal distance) from the York River in a manicured lawn area of the park. No trees or other major structures are within a 35m radius of weather station. The stream gauge is located 2km NW (288 degrees) of the weather station and the

water quality station is located 200m (298 degrees) of the weather station. The weather station has a landscape fence around it to deter park visitors from tampering with it. All the instruments are located on the approximately 3.5 m aluminum tower following the descriptions outlined in the CDMO Manual V 4.0. The Tipping Bucket Rain gauge is located within 2m of the tower. The sensors were wired to the CR1000 following the protocol in the CDMO Manual. The station is located approximately 40 feet above mean sea level. Specific sensor heights are as follows:

Ground to Precipitation Gauge (center of tipping unit) = 172.8 cm
Ground to Screen on Funnel over Precipitation Gauge = 193.7 cm
From Humidity Sensor (Closest Sensor on Tower) to Precipitation Gauge = 157.5 cm
Ground to Bottom of Solar Panel = 170.8 cm
Ground to Top of Solar Panel = 201.9 cm
Ground to Temperature and Humidity Probe = 183.5 cm
Ground to Barometric Pressure Sensor (in box) = 171.5 cm
Ground to Par Sensor (TOP) = 336.6 cm
Ground to Wind Sensor (along main line) = 360.7 cm

6) Data collection period:

Weather data has been collected from this meteorological station at Taskinas Creek since 2000. Within the calendar year 20089 data was collected (by field downloads onto the laptop computer) on the following dates:

- 1) January 5, 2009 (from 01/01/2009 at 0:00 to 01/05/2009 at 14:30)
- 2) January 22, 2009 (from 01/05/2009 at 14:45 to 01/22/2009 at 11:30)
- 3) February 3, 2009 (from 01/22/2009 at 11:45 to 02/03/2009 at 09:15)
- 4) February 18, 2009 (from 02/03/2009 at 9:30 to 02/18/2009 at 09:30)
- 5) March 5, 2009 (from 02/18/2009 at 09:45 to 03/05/2009 at 10:00)
- 6) March 19, 2009 (from 03/05/2009 at 10:15 to 03/19/2009 at 08:30)
- 7) March 31, 2009 (from 03/19/2009 at 08:45 to 03/31/2009 at 08:15)
- 8) April 14, 2009 (from 3/31/2009 at 08:30 to 04/14/2009 at 08:15)
- 9) April 28, 2009 (from 4/14/2009 at 08:30 to 04/28/2009 at 08:30)
- 10) May 12, 2009 (from 04/28/2009 at 08:45 to 05/12/2009 at 08:00)
- 11) May 26 2009 (from 05/12/2009 at 08:15 to 05/26/2009 at 09:00)
- 12) June 9, 2009 (from 05/26/2009 at 09:15 to 06/09/2009 at 08:30)
- 13) June 22, 2009 (from 06/09/2009 at 08:45 to 06/22/2009 at 08:15)
- 14) July 6, 2009 (from 06/22/2009 at 08:30 to 07/06/2009 at 08:15)
- 15) July 20, 2009 (from 07/06/2009 at 08:30 to 07/20/2009 at 09:15)
- 16) August 3, 2009 (from 07/20/2009 at 09:30 to 08/03/2009 at 09:15)
- 17) August 17, 2009 (from 08/03/2009 at 09:30 to 08/17/2009 at 09:00)
- 18) August 31, 2009 (from 08/17/2009 at 09:15 to 08/31/2009 at 11:45)
- 19) September 28, 2009 (from 08/31/2009 at 12:00 to 09/28/2009 at 08:00)
- 20) October 12, 2009 (from 09/28/2009 at 08:15 to 10/12/2009 at 08:15)
- 21) October 28, 2009 (from 10/12/2009 at 08:30 to 10/28/2009 at 09:30)
- 22) November 16, 2009 (from 10/28/2009 at 09:45 to 11/16/2009 at 13:30)
- 23) December 01 2009 (from 11/16/2009 at 13:45 to 12/01/2009 at 11:00)
- 24) December 21, 2009 (from 12/01/2009 at 11:15 to 12/21/2009 at 10:00)
- 25) December 31, 2009 (from 12/21/2009 at 10:15 to 12/31/2009 at 23:45)

7) Distribution – This section will address data ownership and data liability with the following excerpt from the Ocean and Coastal Resource Management Data Dissemination Policy for the NERRS System-wide Monitoring Program in the metadata.

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:

CBNERRVA System Wide Monitoring Program. Since its initiation in 1995, CBNERRVA has fully participated in the NOAA/NERRS System-Wide Monitoring Program. Within the York River system, CBNERRVA maintains a network of long-term, year-round continuous water quality stations located at White House (2003-current), Sweet Hall Marsh (2000-current), Taskinas Creek (1995-current), Clay Bank (2001-current), Gloucester Point (2003-current) and Goodwin Island (1997-current). In 2002 and 2004, CBNERRVA implemented the NOAA/NERRS nutrient/plant pigment monitoring program and SAV Tier II Biological Monitoring Program, respectively. Beginning in 2000, CBNERRVA established a weather station at Taskinas Creek to support meteorological monitoring aspects of SWMP. In addition, CBNERRVA maintains additional weather stations at Sweet Hall Marsh, Goodwin Islands, and Harcum Creek to support York River watershed level studies and site-specific research projects.

National Atmospheric Deposition Program's National Trends Network (NADP/NTN) and Mercury Deposition Network (NADP/MDN). CBNERRVA staff maintains the southern Chesapeake Bay NADP/NTN and NADP/MDN station (ID: VA98) at Harcum, Va. The network's purpose is to collect data on the chemistry of precipitation for monitoring of temporal and geographical long-term trends of concentrations and loading rates. Measured physical parameters include air temperature, precipitation, PAR, wind speed and direction. Measured chemical parameters include hydrogen ion activity (acidity as pH), sulfate, nitrate, ammonium, chloride, base cations (such as calcium, magnesium, potassium and sodium), total mercury and methyl-mercury. The NADP/NTN and NADP/MDN stations were established in August, 2004 and December, 2004, respectively. Real-time delivery of physical parameters is currently available at this station through the National Weather Service's Hydrometeorological Automated Data System (HADS; NESDIS ID: 3B01236C; NWS Location ID: HAXV2). Real-time data are available via the web at <http://www.nws.noaa.gov/oh/hads/>. Archived precipitation chemistry data are available via the web at <http://nadp.sws.uiuc.edu>. Partners: CBNERRVA, NADP and VaDEQ.

Integrated Ocean Observing System (IOOS). The CBNERRVA Meteorological Monitoring Program supports the national and Mid-Atlantic Coastal Ocean Observing Regional Association (MACOORA) through its participation in NERRS SWMP. CBNERRVA is also actively engaged at a more subregional and local level through its support of the Chesapeake Bay Observing System (CBOS) and the Virginia Estuarine and Coastal Observing System (VECOS). Real-time delivery of physical parameters is currently available for three stations through the National Weather Service's Hydrometeorological Automated Data System; stations include Taskinas Creek (NESDIS ID: 3B009218; NWS Location ID: YRSV2), Sweet Hall Marsh (NESDIS ID: 3B0116F6; NWS Location ID: SHXV2) and Harcum (NESDIS ID: 3B01236C; NWS Location ID: HAXV2). Real-time delivery of data for a fourth station located at Goodwin Islands can be obtained through NOAA's National Data Buoy Center (Station ID: GDIV2) at <http://www.ndbc.noaa.gov/> and through the VECOS web site (Station ID: YRK000.00P) at <http://chsd.vims.edu/realtime/>.

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

Date of previous calibration: 9/6/2007. Date Installed 6/5/2008.

Date of last calibration: 7/10/2008. Date Installed 12/1/2009

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

Date of previous calibration: 9/6/2007. Date Installed 6/5/2008.

Date of last calibration: 7/10/2008. Date Installed 12/1/2009

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

Date of previous calibration: 9/6/2007. Date Installed 6/5/2008.

Date of last calibration: 7/10/2008. Date Installed 12/1/2009

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
Date of previous calibration 9/7/2006. Date Installed 11/30/2006
Date of last calibration 8/1/2008. Date Installed 1/5/2009

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
Date of previous calibration 9/7/2006. Date Installed 11/30/2006
Date of last calibration 8/1/2008. Date Installed 1/5/2009

Parameter: Photosynthetically Active Radiation

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: <±2% change over 1 yr
Operating Temperature: -40°C to 65°C; Humidity: 0 to 100%
Sensitivity: typically 5 µA per 1000 µmol s⁻¹ m⁻²
Date of previous calibration: 9/7/2007. Date Installed 6/5/2008. Multiplier = 1.467756
Date of last calibration: 4/9/2008. Date Installed 12/1/2009. Multiplier = 1.2657715

Parameter: Precipitation

Units: millimeters (mm)
Sensor type: Tipping Bucket Rain Gauge
Model #: TE525
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
Date of Last calibration: Calibrated on 12/1/2009 (before that was 6/2/2008)

CR1000

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.
Date CR1000 Installed: December 1, 2006

10) Coded Variable Definitions:

- Sampling station: Taskinas Creek
- Sampling site code: TC
- Station code: cbvtcmet

11) QAQC flag definitions – This section details the automated primary and secondary 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 – This section details the secondary QAQC Code definitions used in combination with the QAQC flags above.

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:

Some General 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 mmol/m² over a 15 minute interval. These data were automatically flagged as suspect data (<1>) and coded as “CAF” (or within accuracy error of sensor). More explanation can be found under bullet No. 3 (below).
- Relative Humidity data greater than 100 but within range of the sensor accuracy (+/-3%) have also been flagged as suspect data (<1>) and coded as “CAF” (or within accuracy error of sensor). This occurred on January 7, 2009 (eleven relative humidity readings of 101).
- Cumulative precipitation data are recorded from 00:00 to 23:59 with the daily total recorded at the midnight mark (00:00). The midnight CumPrpc value is actually the total from the previous day.

Explanations for Data Coded as *CSM* (see metadata) within Taskinas Creek 2009 Dataset

1. Precipitation Corrections (Flagged as 5 for Corrected Data).

- These were false rain gauge readings resulting from tipping the rain gauge (to check accuracy) during bi-weekly downloads as well as several readings during a time where the Rain Gauge was calibrated using the Static Method (on December 1, 2009). In addition, the cumulative precipitation data for days the rain gauge was checked or calibrated were also corrected and flagged as <5>.

<u>Date</u>	<u>Time</u>	<u>Original Value</u>
01/22/2009	11:45	01.016
02/03/2009	09:15	0.508
03/05/2009	10:15	1.778
03/19/2009	08:30	1.778
03/31/2009	08:30	0.508
04/14/2009	08:30	0.508
04/28/2009	08:45	0.508
05/12/2009	08:15	1.270
05/26/2009	09:00	0.508
06/9/2009	08:45	1.016
06/22/2009	08:15	0.508
07/6/2009	08:15	0.508
07/20/2009	09:15	0.508

08/03/2009	09:30	0.762
08/17/2009	09:15	0.508
08/31/2009	12:00	0.508
09/28/2009	08:15	1.016
10/12/2009	08:30	0.508
10/28/2009	09:45	0.508
11/16/2009	13:45	1.016
12/01/2009	11:15	1.016
12/01/2009	12:00	0.508 (rain gauge calibration)
12/01/2009	12:15	4.318 (rain gauge calibration)
12/01/2009	12:30	9.398 (rain gauge calibration)
12/01/2009	12:45	8.636 (rain gauge calibration)
12/01/2009	13:00	7.366 (rain gauge calibration)
12/01/2009	13:15	1.270 (rain gauge calibration)
12/21/2009	10:15	0.508

2. New Program Upload (Version 5.5) on 1/5/2009 and Sensor Switchouts on 1/5/2009 and 12/1/2009 (Data Flagged as -3 for Rejected Data).

- During program uploads, the 5-second data stored in the CR1000 is lost, which comprising the 15-minute data recorded during downloads. In a similar fashion, during times of sensor maintenance or sensor replacement, the 5-second readings are also inaccurate which compromises the corresponding 15-minute readings. The following describes the data for those two time periods (on 1/5/2009 and 12/1/2009) when maintenance was done on the Taskinas Creek MET station resulting in data which must be rejected as inaccurate (and has been coded appropriately!).
- On January 5th, 2009, a new version of the program was installed at the Taskinas Creek Station between the time period of 14:30 and 14:45. For this reason, all the data on 1/5/2009 at 14:45 have been flagged as “-3” and coded as “GPR” indicating that data has been rejected due to a program upload to the CR1000.
 - In addition, a newly calibrated wind monitor was installed during the time period of 14:30 and 15:00; however, as the related data have already been rejected due to the installation of the new CR1000 program at 14:45 on 1/5/2009, the data from 14:45 to 15:00 (so at 15:00) was flagged as “-3” and coded as “GMT” for station maintenance.
 - Finally, there was a small precipitation event at 14:00 on 1/5/2009. As the new program upload resets the cumulative precipitation to 0.00, the cumulative precipitation data from 1/5/2009 at 14:45 to 1/6/2009 have been changed to 0.254 (and flagged as “5” for corrected data and flagged as “GMT” for general station maintenance) to reflect what should have been recorded had the program upload not occurred between 14:30 and 14:45 and reset the precipitation data to 0.
- On December 1, 2009, newly calibrated temperature/humidity, pressure, and licor sensors were installed on the Taskinas MET station. Below are some notes from that day’s station maintenance.
 - PAR Data
 - PAR Data from 11:45 and 12:00 had initial values of “NAN” and were flagged as -4 (Outside Low Sensor Range) during the primary QA/QC process. During the secondary QA/QC process, these data were flagged as -3 (Rejected Data) and given the code of GMT (General Station Maintenance) as this was during the time the PAR Sensor was being replaced.

- In addition, even though there was a “real” value of 765.9 at 11:30 on 12/1/2009, I have also flagged this data as -3 (Rejected Data) as this data may have been taken while the sensor was being replaced (during the time of station maintenance).
 - Air Temperature/Humidity Data
 - An air temperature value of 0.2 was recorded at 11:30 on 12/1/2009 that represents bad data collected during the time the temperature/humidity sensor was being replaced. I have also flagged this data as -3 (Rejected Data) and Coded this data as GMT and CSM (see metadata).
 - A relative humidity value of 29 was recorded at 11:30 on 12/1/2009 that represents bad data collected during the time the temperature/humidity sensor was being replaced. I have also flagged this data as -3 (Rejected Data) and Coded this data as GMT and CSM (see metadata).
 - In addition, even though there was a “real” value for Air Temperature of 10.1 at 11:45 on 12/1/2009 and a “real” value for Relative Humidity of 42 at 11:45 on 12/1/2009, I have also flagged this data as -3 (Rejected Data) as some of the readings during this time period may have been taken while the sensor was being replaced (during the time of station maintenance).
 - Barometric Pressure Data
 - A pressure value of 966 was recorded at 11:15 on 12/1/2009 that represents bad data collected during the time the pressure sensor was being replaced. I have also flagged this data as -3 (Rejected Data) and Coded this data as GMT and CSM (see metadata).
 - In addition, even though there was a “real” value of 1019 at 11:30 on 12/1/2009, I have also flagged this data as -3 (Rejected Data) as this data may have been taken while the sensor was being replaced (during the time of station maintenance).
3. PAR Values between 1/1/2009 and 12/31/2009 (Data Flagged as 1 for Suspect Data)
- This issue was addressed in the general notes portion at the beginning of this section. On 9/19/2007 the new MET Program (version 4.2) was uploaded to the CR1000 at Taskinas Creek. This program (and subsequent programs) did allow for negative PAR values (which before were “corrected” to a zero value). These 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 data values were thus flagged as “1” indicating suspect data and coded “CAF” for being as acceptable within the error of the sensor.
 - Multiple records of elevated nighttime PAR values (flagged as suspect (<1>) and coded CSM) were recorded during this 12 month time period. In most cases, these elevated (very small) night-time readings were most likely due to moisture (sometimes due to rainfall events, but not always) affecting sensor readings. The dates were January 3, 4, 9, 12, 14, 17, 18, 19, 20, 22, 25, 26, 27, 28; February 3, 6, 14, 15, 17, 20, 24, 26; March 1, 2, 13, 14, 18, 21, 22, 23, 24, 25; April 9, 17; June 3,4; December 18, 19, 20, 31.