Old Woman Creek (OWC) NERR Meteorological Metadata

January- December 2010

Latest Update: 23 March, 2020

I. DATA SET AND RESEARCH DESCRIPTORS

1. Principal investigator and Contact Person

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1. Entry Verification

Data Input Procedures:

The data was downloaded to a Campbell Scientific CR1000 datalogger, and 15 minute data was collected. One hour average data were not collected and 24 hour data were collected in a separate file. The data were collected in a storage module and retrieved monthly and then downloaded into a computer containing the Loggernet software. The data were also saved as a monthly raw data file (month01.dat) onto a CD read/write disc drive. 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.

Dave Klarer is responsible for all data management.

1. Research Objectives

The objective of this work is to record weather data over a long time period for Old Woman Creek to look at long term trends and seasonal variability in weather conditions. An added function is to provide the weather data so that researchers can examine the impact of changing weather conditions on the ecology of the estuary. Since this estuary is a storm driven system and the source of water in the estuary is a function of both storm activity in the watershed and on the lake proper, weather information is critical when studying the estuary.

1. Research Methods (Campbell Weather Station)

A Sutron Sat-Link2 transmitter was installed at this station on 07/19/2006 and transmits data to the NOAA GOES satellite, NESDIS ID #3B017310. The transmissions are scheduled hourly and contain four (4) datasets reflecting fifteen minute data sampling intervals. The telemetry data is “Provisional” data and not the “Authentic” dataset used for long term monitoring and study. This data can be viewed by going to [http://cdmo.baruch.sc.edu](http://cdmo.baruch.sc.edu/).

The Wind Sentry, temperature and relative humidity sensor, barometric sensor and the LiCor PAR sensor are located on a 10-meter tower following the descriptions outlined in the CDMO Manual V 4.0. The tipping rain gauge is located about 2-3 meters southeast of the tower. The sensors are wired to the CR1000 following the protocol in the CDMO Manual.

The Campbell weather station samples every 5 seconds to produce 15 minute and daily averages of air temperature, relative humidity, barometric pressure, wind speed and wind direction. Precipitation and PAR values are totaled for each 15 minute period. The data are collected with a CR1000 and stored onto a card by the CFM100. This storage card is also usually changed every month. When the storage module or storage card is changed, usually once a month, the sensors on the weather station are inspected for damage and cleaned, if necessary. All sensors except the rainfall collector are sent to Campbell Scientific for recalibration at least every two years. When the storage module is changed, a handheld Kestrel 4000 is run to provide a general check of the sensors.

* 1. Data Collection Schedules

The CR1000 also samples every 5 seconds to produce 15 minute averages, maximums and minimums of air temperature , average and maximum wind speed, and averages only for relative humidity, barometric pressure and wind direction. Total amounts for rainfall and PAR are collected every 15 minutes.

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 OWC NERR:

Air Temperature (°C)

Maximum and times from 5-second data:

Wind Speed, (m/s)

Totals from 5-second data:

Precipitation (mm), PAR (millimoles/m2), and Cumulative Precipitation (mm)

* 1. Error/Anomalous Data Criteria

**Data are flagged as -5 Outside high sensor range:** Used during primary QAQC when a value is above the upper limit of the sensor range. Upper limits used for primary QAQC are:

|  |  |
| --- | --- |
| Temp | 45 deg |
| RH | 100 % |
| BP | 1060 mb |
| WSpd | 30 m/s |
| WDir | 360 degrees |
| TotPrcp | 25 mm in 15 minutes |
| TotPAR | 5000 mmoles/m^2 for 15 minutes |

Table 6. Upper limits for MET data

**Data are flagged -4 Outside low sensor range:** Used during primary QAQC when a value is below the lower limit of the sensor range. Lower limits used for primary QAQC are:

|  |  |
| --- | --- |
| Temp | -40 deg |
| RH | 0 % |
| BP | 900 mb |
| WSpd | 0 m/s |
| WDir | 0 degrees |
| TotPAR | <0 mmol/m^2 for 15 minutes |

1. Site Location and Character

The Old Woman Creek State Nature Preserve and National Estuarine Research Reserve is located on the southern shore of Lake Erie east of the City of Huron, Ohio. The reserve lies within the Lake Erie Biogeographic Region. Old Woman Creek drains a primarily row-crop agricultural watershed, with corn, soybeans, and winter wheat being the most important crops. The weather station is located within the boundaries of the reserve, due east of the parking lot at the Michael Dewine Center for Coastal Research in a field that is maintained in early succession. This ensures that there is no tall vegetation that will interfere with the weather station. The tower is located within a fenced (6 foot chain link fencing) enclosure about 5 meters square. The enclosure has a gravel base. The coordinates of the station are 410 22’40.01” N and 820 30’ 29”W. Wind speed and wind direction sensors are atop a 10 meter tower, while the PAR sensor is located off of the south-west edge of the tower at approximately 3 meters in height. The air temperature/RH sensor is located on the tower at a height of 1.8 meters. The barometric pressure sensor is inside the CR1000 enclosure at a height of 1.5 meters (the sensor is vented to the outside). The precipitation bucket is mounted 2-3 meters southeast of the tower on a 0.9 meter stand. The weather station is located within 1 kilometer of three of the SWMP water quality data logger sites (WM, OL, and SU) and within 5 kilometers of the fourth water quality data logger site (BR). The site is 604 feet above sea level.

1. Data Collection Period

Weather data was collected from 1 January 00:00 though 31 December, 2010 23:45.

1. Distribution

NOAA/ERD retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The OWC Research Coordinator (RC) 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 water quality data and metadata can be obtained from the Research Coordinator at the individual NERR site (please see section 1. Principal investigators and contact persons), from the Data Manager at the Centralized Data Management Office (please see personnel directory under general information link on CDMO homepage) an online at the CDMO homepage http://cdmo.baruch.sc.edu/. Data are available in comma separated format.

1. Associated Research and Monitoring Project

Three of the four SWMP data loggers (WM, OL, SU) are located within 1 kilometers of this weather station, and the fourth (BR) is located within 5 kilometers. The two sites were established to determine the role of the estuary in mitigating storm flow though the system and the impact of Lake Erie on the estuary. Samples for nutrient analysis are also collected at these sites when the data loggers are swapped out.

1. Sensor specifications, operating range, accuracy, date of last calibration

Parameter: PAR (Photosynthetic Active Radiation)

Units: mmoles m-2 (total flux)

Sensor type: High stability silicon photovoltaic detector (blue enhanced)

Model LiCor Quantum Sensor#LI190SB

Light spectrum waveband: 400 to 700 nm

Temperature dependence: 0.15% per 0C maximum

Stability: <+2% change over 1 year

Operating Temperature: -400 to +650 C

Sensitivity: typically 5 microA per 1000 micromoles/second/meter2

Light Spectrum Wavelength: 400 to 700 nm

Date of Last Calibration:

After 8 September 2009 at 15:00 date of last calibration: 13 May, 2009

PAR Multiplier: 1.333 (output 6.21 microamps per 1000 µmol s-1 m-2)

After 9 November 2010 12:00:00 date of last calibration: 29 June, 2010

PAR Multiplier: 1.1894 (output 6.96 microamps per 1000 µmol s-1 m-2)

Parameter: Wind speed

Units: meters per second (ms-1)

Sensor type: 18 cm diameter 4-blade helicoids propeller molded of polypropylene

Model: R.M. Young Model #05103 Wind Monitor

Range: 0-60 m/s (130 mph); gust survival 100 m/s (220 mph)

Accuracy: + 2%

Date of last calibration: 2 November 2006

Parameter: Wind direction

Units: degrees

Sensor type: balanced vane, 38 cm turning radius

Model: R.M. Young Model #05103 Wind Monitor

Range: 3600 mechanical, 3550 electrical (50 open)

Accuracy: + 5%

Date of last calibration: 2 November 2006

Parameter: Temperature

Units: degrees Celsius

Sensor type: Platinum resistance temperature detector (PRT)

Model: Vaisala HMP45C Temperature and Relative Humidity Probe

Operating Temperature: -400C to +600C

Accuracy: + 0.20C at 200C

Date of Last Calibration: 14 May,2009

Parameter: Relative Humidity

Units Percent

Sensor type: Vaisala HUMICAP© capacitive relative humidity sensor

Model: Vaisala HMP45C Temperature and Relative Humidity Probe

Range: 0-100% non-condensing

Accuracy: +/- 2% RH (0-90%) and +/- 3% RH (90-100%)

Temperature dependence of RH measurement: + 0.05% RH/0C

Date of Last Calibration: 14 May, 2009

Parameter: Barometric Pressure

Units: millibars (mb)

Sensor type Vaisala Barocap© silicon capacitive pressure sensor

Model #Vaisala PTB 101B (Campbell Scientific #CS-105

Operating Range: Pressure 600-1060 mb

Temperature Range: -400 to + 600C

Humidity: non-condensing

Accuracy: + 0.5mb at 200C; + 2mb at 00C to 400C; + 4mb at –200C to 450C; + 6mb at –400C to 600C

Stability: + 0.1 mb per year

Date of Last Calibration: 21 May, 2009,

Parameter: Precipitation (heated rain gauge)

Units: millimeters (mm)

Sensor Tipping Bucket Rain Gauge

Model#: Met One Model 385Heated Rain Gauge

Sensitivity: 0.2mm

Accuracy: +1% at 25 to 76 mm per hour at 210C

Date of Last Calibration: 2 August, 2007

after 11/09/2010 (12:00:00) 8 November 2010

Storage Module for CR1000

Model #CFM100

Storage capacity: up to 256 MB (based on size of retrievable card)

Operating range: temperature: -350C to +650C

Access speed: 200-400 Kb/sec

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

Power requirements: 12V supplied through CR1000 peripheral port

Campbell Scientific 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 using a compact flash card in the optional CFM100 Compact Flash Module.

Installed on: 7/19/2006

1. Coded variable indicator and variable code definitions:

owcowmet is the code given to the weather station site. owc =Old Woman Creek, ow= old woman meteorological sampling station, met=meteorological data set. Data files from this station will be coded with this 8 letter code followed by the dates of the data in the particular file.

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

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 QA/QC Checks

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

CCU Cause Unknown

CVT\* Possible Vandalism/Tampering

13. Other remarks/notes

Data are missing due to equipment or associated specific sensors not being deployed, equipment failure, time of maintenance or calibration of equipment, or repair/replacement of a sampling station platform. Any NANs in the dataset stand for “not a number” and are the result of low power, disconnected wires, or out of range readings. If additional information on missing data is needed, contact the Research Coordinator at the reserve submitting the data.

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%.

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

**CDMO Edits for PAR sensor drift 03/23/2020**

There were noticeable changes in PAR values following the swap to a freshly calibrated sensor (assumed to be accurate) on 04/17/2012. A calibration certificate is not available for the sensor that was installed from November 9, 2010 14:15 to April 17, 2012 08:00 (Q43764). Acceptable drift is +/- 2% for this sensor; however, that information is not available and based on the noticeable jump in values following the sensor swap, all PAR data 1 year prior the sensor swap, from 04/17/2011 08:00 to 04/17/2012 08:00 are flagged and coded as <1> SSD CSM. PAR data for the remainder of this deployment, 11/9/2010 14:15 - 04/17/2011 07:45 are flagged and coded <0> CSM, unless otherwise flagged and coded, and users should note that drift for that period may have exceeded acceptable limits as well. If users are comfortable assuming that drift was linear (in a real world environment it is unlikely to be entirely linear), these data may be ‘corrected’ for assumed linear drift at the user’s discretion using manufacturer’s instructions. PAR data from 11/09/2010 14:15 - 12/31/2010 23:45 are already flagged and coded as either rejected or suspect, no <0> CSM data for this time period.

**Suspect Data:**

All wind data for the year are considered suspect. The last date that the sensor was calibrated/serviced was November 2006.

There were occasional elevated nighttime PAR readings. These readings for the most part were lower than the maximum signal noise for the Licor. These data were flagged as suspect. All other readings appear to be normal. There is a possibility that moisture may be seeping into the PAR sensor overtime and causing these elevated readings to occur. Several other Reserves are experiencing problems with moisture in their PAR sensor and are seeing much higher elevated nighttime readings. **See note above about CDMO edits for PAR sensor drift.**

**Rejected Data:**

**January-February 2010:** There were abnormal maximum and minimum air temperature readings on 1/31/2010 at 09:00 and 2/1/2010 at 08:45. These reading may have occurred because of the extremely cold air temperatures. All other data during that time period appeared to fit conditions.

**January, March, May-November 2010:** The PAR sensor occasionally recorded NAN’s and abnormally high PAR values. These data were rejected and coded as SSM. All data beginning on January 20, 2010 (from the first occurrence of the NAN’s and elevated PAR) through the November 9, 2010 sensor switch that are not rejected or otherwise flagged, are marked as suspect. The elevated PAR values and NAN’s may indicate a problem with the PAR sensor.

**November 2010:** all PAR data from 11/9/2010 (12:00) through 11/12/2010 (10:45) due to incorrect calibration number.

**Missing Data:**

**November 2010:** station was down for repairs 11/09/2010 at 13:45

Station was down for repairs 11/12/2010 from 11:15 to 12:00