

Tijuana River (TJR) National Estuarine Research Reserve Meteorological Metadata
January - December 2009
Latest Update: July 6, 2015

I. Data Set & Research Descriptors

1) Principal investigator(s) & contact persons

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2) Entry verification

Data are uploaded from the CR1000 datalogger to a personal computer (IBM compatible) using LoggerNet software from Campbell Scientific. 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 summary statistics, 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.

Michelle Cordrey is responsible for meteorological data management.

3) Research objectives (Campbell Weather Station):

The principal objective is to record long-term and episodic meteorological data for the Tijuana Estuary in order to observe any environmental changes or trends over time. Data are also used as corollary information in ongoing biologic, hydrologic and geographic studies being conducted at the reserve.

4) Research Methods

A model cr1000 Campbell Scientific datalogger samples meteorological sensors every 5 seconds. At 15 minute intervals, averages or instantaneous readings are taken, depending upon sensor type, and written to a storage table on the cr1000.

Monthly, sensors on the weather station are inspected for damage or debris. If any is found, it is repaired and/or cleaned. Sensors are required 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). There were no other analyses done on the meteorological data at present.

Recommended calibration frequency for the MET station sensors:

- Temperature/Humidity- yearly recalibration
- Rain Gauge- yearly recalibration
- Wind Speed/Direction- yearly or every 2 years (depending on the sensor)
- Barometric Pressure- every 2 years recalibration
- PAR- every 2 years recalibration

Campbell Scientific data telemetry equipment was installed at the Tidal Linkage station on 06/12/2006 and transmits data to the NOAA GOES satellite, NESDIS ID #3B01468A. 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 collection information:

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 Air Temperature (°C), Minimum Air Temperature (°C), and their times from 5-second data (these are not included in the data, but are available from the TJR NERR)

Maximum Wind Speed (m/s) and its time from 5-second data

Wind Direction Standard Deviation (degrees) from 5-second data

Totals:

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

5) Site location and character:

The Tijuana River NERR is located on the Southern Pacific Coast, next to the California border with Mexico at a latitude of 32 deg. 34 min. N and Longitude of 117 deg. 07 min. W. The area surrounding the 2,531 acre reserve is heavily developed by residential housing as is the watershed which drains into the estuary. Approximately 2/3 of the watershed is in Mexico and is subject to periodic raw sewage outflows. The North Eastern section of is bordered by a military helicopter training base. Vegetation in the area is dominated by common pickleweed (*Spartina virginica*) and Pacific cordgrass (*Spartina foliosa*).

Description of the specific sampling station:

The weather station is located approximately 30m west of the TR NERR Visitor Center at a Latitude of 32deg 34min 28.52sec N and a Longitude of 117deg 07min 37.32sec W. The station is 50m north of the water quality sampling station. The vegetation surrounding the weather station are mainly upland scrub species.

The anemometer, wind direction and PAR sensors are located at the top of a 3.5 meter aluminum tower. The temperature and humidity sensors are located midway up (1.75m) and on the west side of the tower. The barometric pressure sensor is mounted in the CR1000 enclosure at a height of 1.5m. The Tipping Bucket rain gauge sits on a separate 2 meter high pole located approx. a meter to the west of the main tower. It is above the ground to limit interference from the security fence surrounding the weather station. The sensors were wired to the cr1000 following the protocol in the CDMO Manual.

6) Data collection Period

Data was collected for all parameters at the station from 1/1/2009 00:00 and continued through 12/31/2009 23:45.

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:

National Estuarine Research Reserve System (NERRS). 2012. System-wide Monitoring Program. Data accessed from the NOAA NERRS Centralized Data Management Office website: www.nerrsdata.org; accessed 12 October 2012.

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. Data are available in comma delimited format.

8) Associated researchers and projects

The Tijuana River NERR has a water quality station located at the Tidal Linkage. The principal objective of this study is to record long-term water quality data for the Tijuana Estuary in order to observe any physical changes or trends in water quality both spatially and over time. Additionally, NERR SWMP tier 1 nutrient monitoring is being conducted at the Tidal Linkage station. Dr. Eric Terrell at Scripps Institute of Oceanography has been utilizing the meteorological data as ancillary data for a met station they have located on the Imperial Beach pier.

II. Physical Structure Descriptors

9) Sensor specifications

Parameter: Photosynthetically Active Radiation
Units: mmols m⁻² (total flux)
Sensor type: High stability silicon photovoltaic detector (blue enhanced)
Model#: LI190SA
Serial#: q40041
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: Q33685 (**see Remarks section for more information**)
Multiplier: 2.201
Date of Calibration: 12/03/2008
Dates in Service: 12/16/2008 - 06/16/2009

Serial Number: Q40041 (**see Remarks section for more information**)
Multiplier: 1.258
Date of Calibration: 07/12/2008
Dates In Service: 06/16/2009 - current as of 12/31/2009

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 05103-5 Wind Monitor
Range: 0-60 m/s (130 mph); gust survival 100 m/s (220 mph)
Accuracy: +/- 2%
Date of last calibration: September 03, 2003
Dates in Service: exact start date is unknown - 6/15/2009
Serviced in field on 6/15/2009 and found to performing be within factory specifications
Dates in service (since in field calibration): 6/15/2009 - 1/20/2011

Parameter: Wind direction
Units: degrees
Sensor type: balanced vane, 38 cm turning radius
Model#: R.M. Young 05103-5 Wind Monitor
Range: 360° mechanical, 355° electrical (5° open)
Accuracy: +/- 5%
Date of last calibration: September 03, 2003
Dates in Service: exact start date is unknown - 6/15/2009
Serviced in field on 6/15/2009 and found to performing be within factory specifications
Dates in service (since in field calibration): 6/15/2009 - 1/20/2011

Parameter: Temperature and Relative Humidity
Model#: HMP45AC
Serial#: Y4410095
Operating Temperature: -40 to +60°C
Temperature Measurement Range: -40 to +60°C
Temperature Accuracy: ± 0.2 °C (20°C)
Relative Humidity Measurement Range: 0-100% non-condensing
RH Accuracy: +/-2% RH (0-90%) and +/-3%(90-100%)
Date of last calibration: 10/28/2003 (**please see remarks section for more information**)
Dates in service: exact start date is unknown - 03/01/2012

Parameter: Barometric Pressure

Model#: PTB101B
Serial#: P4830024
Operating Temperature: -40 to +60C
Pressure Measurement Range: 600-1060 mb
Humidity: non-condensing
Accuracy: ± 0.5 to 6.0 mb (+20-60C)
Stability: ± 0.1 mb per year
Date of Last calibration: October 4, 2005
Dates in service: exact start date is unknown - 05/18/2011

Parameter: Precipitation
Units: millimeters (mm)
Sensor type: Tipping Bucket Rain Gauge
Model#: TE525
Rainfall per tip: 0.01 inch
Operating range: Temperature: 0° to $\pm 50^{\circ}\text{C}$; Humidity: 0 to 100%
Accuracy: $\pm 1.0\%$ 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: August 8, 2008
Dates in service: 08/08/2008 - 07/23/2010

Datalogger: Model: CR1000

Specs: The CR1000 has two MB Flash EEPROM that is used to store the Operating System. Another 128 K Flash is used to store configuration settings. A minimum of 2 MB SRAM is (4 MB optional) is available for program storage (16K), operating system use, and data storage. Additional storage is available by using a compact flash card in the optional CFM100 Compact Flash Module.
Dates in service: 7/12/2006 - current as of 12/31/2009

10) Coded variable definitions

Sampling station:	Sampling site code:	Station code:
Tidal Linkage	TL	tjrtlmet

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 "good". 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.

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.

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

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.**

ATemp/RH and BP data are flagged as suspect and coded as SOC (sensor out of calibration) for all of 2009. The ATemp/RH sensors have been installed since 10/28/2003 and have not been calibrated since installation. Please note that the ATemp/RH sensor may have been calibrated in July 2008, however, no records, notes, or calibration certificates could be found to verify this. The BP sensor was last calibrated/installed on 10/4/2005. All wind parameters are flagged as suspect and coded as SOC from 1/1/2009 until the sensor was serviced on 6/15/2009.

Records and documentation for PAR sensor calibration and installation are not available. The information available in the sensor specification section for the PAR sensor may not be accurate.

PAR data from 1/1/2009 00:00 through the sensor swap on 6/15/2009 were compared to 2010-2012 data for the same time period and were found to have much lower values. These data are flagged as suspect <1> CSM, including slightly negative data that would normally be coded CAF. Reasons for the lower values are unknown and calibration certificates are not available to check for sensor drift. These data may be useful when looking at trends.

Data were either missing or rejected on the following dates due to program reloads. Data are rejected due to program reloads since more than likely the averages and totals are not a full 15 minutes of 5-second data.

6/15/2009 09:15 -10:15 missing, 10:30 rejected

6/16/2009 09:00 missing, 09:15 rejected

6/17/2009 13:15 rejected

12/03/2009 15:45 rejected

Cumulative precipitation data on 6/16/2009 reset to 0 during the program reload. Data were corrected to reflect precipitation that occurred earlier during the day.

Beginning after the sensor swap on 6/15/2009 10:45, PAR data were rejected due to unknown sensor error causing erratic readings and negative values outside of the manufacturer's specified range. A secondary PAR sensor was collecting data at the same time but it was not located in an optimal location and the data is still being evaluated for accuracy. Please contact the Research Coordinator listed at the top of this document if you are interested in this data.