Tijuana River (TJR) NERR Meteorological Metadata
January - December 2014
Latest Update: March 1, 2016

I. Data Set & Research Descriptors

1) Principal investigator(s) & contact persons

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2) Entry verification

Data are uploaded from the CR1000 data logger to a Personal Computer (IBM compatible). Files are exported from or 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.
Justin McCullough is responsible for all data management.

3) Research objectives (Campbell Weather Station):

The principal objective is to record long-term and episodic meteorological data for the Tijuana River Estuary in order to observe any environmental changes or trends over time. Data are also used as corollary information in ongoing biological, hydrological and geographical 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 removed and sent back to Campbell Scientific for calibration at minimum of every two years. There were no other analyses done on the meteorological data at present.

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, Minimum, and their times from 5-second data:
Maximum and Minimum Air Temperature (°C)(these data are available from the Reserve)
Maximum Wind Speed(m/s)
-Wind Direction Standard Deviation (degrees) from 5-second data
-Totals:
Precipitation (mm), PAR (millimoles/m2), and Cumulative Precipitation (mm)

Recommended calibration frequency for the MET station sensors:

-Temperature/Humidity- yearly recalibration
-Rain Gauge- yearly recalibration
-Wind Speed/Direction- every 2 years (depending on the sensor)
-Barometric Pressure- every 2 years recalibration
-Photosynthetically Active Radiation - LI-COR Quantum Sensor and Apogee Quantum Sensor - every 2 years
-CR1000-every 5 years (required beginning 2014, one year initial grace period)

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 is bordered by a military helicopter training base. Vegetation in the area is dominated by common pickleweed (Salicornia pacifica) 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 28.5sec N and a Longitude of 117deg 07min 37.3sec W. The station is about 800m northeast of the water quality sampling station at Oneonta Slough. The vegetation surrounding the weather station is 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 is attached to the fence 2.4 meters to the south-southwest of the main tower. It is 2m above the ground to limit interference from the security fence surrounding the weather station. It was moved from its previous location of .5m west of the tower, 1.75m above the ground 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 01/01/2014 00:00 and continued through 12/31/2014 23:45:00.

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 retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The NERRS retains the right to be fully credited for having collected and process the data. Following academic courtesy standards, the NERR site where the data were collected should be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. The data set enclosed within this package/transmission is only as good as the quality assurance and quality control procedures outlined by the enclosed metadata reporting statement. The user bears all responsibility for its subsequent use/misuse in any further analyses or comparisons. The Federal government does not assume liability to the Recipient or third persons, nor will the Federal government reimburse or indemnify the Recipient for its liability due to any losses resulting in any way from the use of this data.

Requested citation format:
NOAA National Estuarine Research Reserve System (NERRS). System-wide Monitoring Program. Data accessed from the NOAA NERRS Centralized Data Management Office website: http://www.nerrsdata.org/; *accessed* 12 October 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 meteorological station is part of the NERRS System Wide Monitoring Program (SWMP) that also includes data collection for water quality, using YSI data loggers for in situ measurements (temperature, salinity, dissolved oxygen, turbidity, pH and water depth) and grab samples to analyze nutrient contents (orthophosphate, chlorophyll, ammonia, nitrate/nitrite) in the laboratory.

II. Physical Structure Descriptors

9) Sensor specifications

Parameter: Photosynthetically Active Radiation (PAR)
LI-COR Quantum Sensor
Units: mmoles m^{-2} (total flux)
Sensor type: High stability silicon photovoltaic detector (blue enhanced)
Model#: LI190SA
Serial#: Q48068
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}
Multiplier: 1.258
Date of last calibration: June 28, 2012
Dates in service: 03/01/2013 – 01/15/2015 (see section 13. Other Remarks for more detail about data collected with this sensor).

Parameter: Photosynthetically Active Radiation (PAR)
Apogee Quantum Sensor
Units: mmoles/m^2 (total flux)
Sensor type: High stability silicon photovoltaic detector (blue enhanced)
Model#: SQ-110
Serial#: 12144
Light spectrum waveband: 410 to 655 nm
Temperature dependence: .06± .06% per °C
Stability: ± 2% change over 1 yr
Operating Temperature: -40°C to 70°C; Humidity: 0 to 100%
Sensitivity: 0.2 mV per µmol m^{-2} s^{-1}
Multiplier: 0.025
Date installed: 4/17/2013
Date of last calibration: November 8, 2012
Dates in service: 4/17/2013 - 1/15/2015

Parameter: Wind speed
Units: meter per second (m/s)
Sensor type: three lightweight hemispherical cups
Model#: R.M. Young 03002 Wind Sentry Anemometer and Vane
Serial#: WS8364
Range: 0-50 m/s (112 mph); gust survival 60 m/s (134 mph)
Accuracy: +/- 0.5m/s (1.1mph)
Date of last factory calibration: unknown
Dates in service: 1/1/2014 – 9/30/2014 (exact install date is unknown)

Parameter: Wind direction
Units: degrees
Sensor type: balanced vane, 22 cm turning radius
Model#: R.M. Young 03002 Wind Sentry Anemometer and Vane
Serial#: 8364
Range: 360° mechanical, 352° electrical (8° open)
Accuracy: +/- 5°
Date of last factory calibration: unknown
Dates in service: 1/1/2014 - 9/30/2014 (exact install date is unknown)

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
Serial#: 57955
Range: 0-100 m/s (224 mph); gust survival 100 m/s (220 mph)
Accuracy: ± 0.3m/s
Date of last factory calibration: September 5, 2014
Dates in service: 09/30/2014 – 04/16/2015

Parameter: Wind direction
Units: degrees
Sensor type: balanced vane, 38 cm turning radius
Model#: R.M. Young 05103-5 Wind Monitor
Serial#: 57955
Range: 360° mechanical, 355° electrical (5° open)
Accuracy: ± 3°
Date of last factory calibration: September 5, 2014
Dates in service: 09/30/2014 – 04/16/2015

Parameter: Temperature and Relative Humidity
Model#: HC2S3
Serial#: 608378861
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: 7/18/2012
Dates in service: 03/01/2013 – 05/19/2014

Parameter: Temperature and Relative Humidity
Model#: HC2S3
Serial#: 0061217910
Operating Temperature: -40 to +100°C
Temperature Measurement Range: -40 to +60°C
Temperature Accuracy: ± 0.1°C (@23°C)
Long-term Temperature Stability: <.1°C/year
Relative Humidity Measurement Range: 0-100% non-condensing
RH Accuracy: ± 0.8% RH (@23°C)
Long-term RH Stability: <1% RH/year
Date of last calibration: 9/26/2013
Dates in service: 05/19/2014 – 04/16/2015

Parameter: Barometric Pressure
Model#: PTB101B
Serial#: p4830023
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: April 27, 2011
Dates in service: 05/18/2011 – 05/19/2014

Parameter: Barometric Pressure

Model#: PTB110B
Serial#: K1040006
Operating Temperature: -40 to +60C
Pressure Measurement Range: 600-1060 mb
Humidity: non-condensing
Accuracy: ±0.3 mb at +20 °C
Stability: ± 0.1 mb per year
Date of Last calibration: March 6, 2014
Dates in service: 05/19/2014 – 04/16/2015

Parameter: Precipitation
Model#: TE525
Units: millimeters (mm)
Sensor type: Tipping Bucket Rain Gauge
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: Oct 16, 2012
Dates in service: 10/16/2012 – 06/20/2014

Parameter: Precipitation
Serial#: 59850-514
Model#: TR-525UWS
Units: millimeters (mm)
Sensor type: Tipping Bucket Rain Gauge
Rainfall per tip: 0.01 inch
Operating range: Temperature: 0° to +/- 50°C; Humidity: 0 to 100%
Accuracy: +/- 1.0% up to 2 in./hr
Date of last calibration: July 15, 2014
Dates in service: 07/24/2014 – 04/16/2015

Datalogger:
Model: CR1000
Serial#: 005478
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 12/31/2014

CR1000 firmware/OS version: cr1000.Std.21 01/01/2014 – 12/31/2014
CR1000 Program Versions: TJRTLMET_VER5.5_20140519.CR1, TJRTLMET_VER6_20140612a.CR1, TJRTLMET_VER6_20140612b.CR1, TJRTLMET_VER6_20141016.CR1

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 passing initial QAQC checks. During secondary and tertiary QAQC 1, -3, and 5 flags may be used to note data as suspect, rejected due to QAQC, or corrected.

-5	Outside High Sensor Range
-4	Outside Low Sensor Range
-3	Data Rejected due to QAQC
-2	Missing Data
-1	Optional SWMP supported Parameter
0	Passed Initial QAQC Checks
1	Suspect Data
2	Open - reserved for later flag
3	Open - reserved for later flag
4	Historical Data: Pre-Auto QAQC
5	Corrected Data

12) QAQC code definitions

QAQC codes are used in conjunction with QAQC flags to provide further documentation of the data and are also applied by insertion into the associated flag column. There are three (3) different code categories, general, sensor, and comment. General errors document general problems with the CR1000, sensor errors are sensor specific, and comment codes are used to further document conditions or a problem with the data. Only one general or sensor error and one comment code can be applied to a particular data point, but some comment codes (marked with an * below) can be applied to the entire record in the F_Record column.

General Errors	
GIM	Instrument Malfunction
GIT	Instrument Recording Error, Recovered Telemetry Data
GMC	No Instrument Deployed due to Maintenance/Calibration
GMT	Instrument Maintenance
GPD	Power Down
GPF	Power Failure / Low Battery
GPR	Program Reload
GQR	Data Rejected Due to QA/QC Checks
GSM	See Metadata
Sensor Errors	
SDG	Suspect due to sensor diagnostics
SIC	Incorrect Calibration Constant, Multiplier or Offset
SIW	Incorrect Wiring
SMT	Sensor Maintenance
SNV	Negative Value
SOC	Out of Calibration
SQR	Data rejected due to QAQC checks
SSD	Sensor Drift
SSN	Not a Number / Unknown Value
SSM	Sensor Malfunction
SSR	Sensor Removed
Comments	
CAF	Acceptable Calibration/Accuracy Error of Sensor
CCU	Cause Unknown
CDF	Data Appear to Fit Conditions
CML	Snow melt from previous snowfall event
CRE*	Significant Rain Event

CSM* See Metadata
CVT* Possible Vandalism/Tampering
CWE* Significant weather event

13) Other remarks / notes

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

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%.

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.**

All periods where sensor values deviated noticeably from the rest of the data set, e.g. periods of high or low temperature, low barometric pressure etc., were evaluated against data from nearby weather stations (Ream Field NALF and Imperial Beach pier) and also compared to local daily analog measurements when available. All such periods were found to be comparable with the ancillary data.

Due to sensor drift, all PAR data collected during 2014 with the LiCor sensor (Q48068) were replaced with PAR data collected by the Apogee PAR sensor that was installed during the same time period. Both data sets are available from the Reserve.

BP data are considered suspect due to an out of calibration sensor from 5/18/2014 00:00 - 5/19/2014 11:30. The sensor should have been swapped by 5/18/2014.

5/19/2014 11:45 all data were rejected due to a program reload following the Air Temperature/RH and BP sensor swaps.

6/12/2014 10:45 and 14:45 all data were rejected due to program uploads.

Rejected precipitation data from 6/20/2014 14:00 – 7/24/2014 13:00: Upon replacing the antennae on 6/20 at 14:00PST, it was necessary to move the location of the rain gauge from about .5m west of the meteorological station tower, 1.5m above the ground. A new rain gauge was purchased and installed a few days later, however, it was not functioning properly. This was not noticed until

mid-July and was corrected on July 24th. There was one rain event on 7/14/2014 that was not captured. The new rain gauge resides 2.4m south-southwest of the tower, 2m above the ground.

Corrected Wind Speed data from 9/30/2014 13:30 – 10/16/2014 10:15: Due to an incorrect multiplier and offset being applied to the wind speed measurements after maintenance, data from the above dates had to be corrected and were flagged as <5> SIC CSM. Data spanning over a 15-minute period in which both multipliers and offsets were used were rejected. The 03002-L (multiplier =0.75, offset=0.2) was replaced with the 05103 (multiplier 0.098, offset=0). Data were corrected by subtracting the offset from the raw value and dividing that number by 0.75. The new value was then multiplied by the 0.098 multiplier.

10/16/2014 10:30 All data were rejected following the program upload to correct the wind sensor multiplier and offset.

11/7/2014 05:00 - 06:30 all data are missing due to unknown reasons. Data at 06:45 were rejected due to more than likely not being a full 15 minutes of 5-second data.

12/25/2014 05:00 - 08:00 all data are missing due to unknown reasons. Data at 08:15 were rejected due to more than likely not being a full 15 minutes of 5-second data.

12/25/2014 19:00 - 12/26/2014 07:30 all data are missing due to unknown reasons. Data at 07:45 were rejected due to more than likely not being a full 15 minutes of 5-second data.