Tijuana River (TJR) National Estuarine Research Reserve Meteorological Metadata
January - December 2006
Latest Update: **October 23, 2023**

I. Data Set & Research Descriptors

1) Principal investigator(s) & contact persons

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2) Entry verification

The meteorological sensors at the station are sampled every five seconds by a Campbell Scientific datalogger. At 15 minute intervals the 5 second data are written to file (see section below for sampling details) on the datalogger. The data are downloaded in comma delimited ascii format via modem from the datalogger at 15 minute intervals to a computer located in the Tijuana River NERR visitor's center using loggernet software provided by Campbell Scientific. Following download from the datalogger the data are automatically uploaded via FTP to a mySQL database server at San Diego State University (SDSU) where it is made available near-real time for viewing on the web (http://www.perl.sdsu.edu/TRNERR). Raw data files are kept both at Tijuana River NERR and at SDSU.

Data are QA/QC'd using Microsoft Access as a front-end, using ODBC, to the SQL database to generate reports which detail data outliers and anomalies (see section 2c for the CDMO Meteorological Data Collection Error/Anomalous Data Criteria). Graphs are generated using a web interface to the SQL database to aid in identifying anomalous data. Any necessary edits are made directly to the SQL database using Microsoft Access. A log is generated on the SQL server of any changes made to the database. Any anomalous data were investigated and are noted below in the Anomalous Data Section. Any data corrections that were performed are noted in the Data Correction Section below. All error messages and anomalous data were compared to reference data obtained from a nearby (1/2 mile) weather station operated by the U.S. Navy and another located on the Imperial Beach pier operated by the Scripts Institute of Oceanography.

Following preliminary editing, data are exported from Access into the EQWin database software where reports, queries and graphs are generated before data is exported from EQWin as a tab delimited text file and is uploaded to the CDMO. Michelle Cordrey is responsible for 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

Prior to July 2006 a model cr10x Campbell Scientific data logger was used at the station. The program on the cr10x sampled every 5 seconds to produce both hourly and daily averages of those measurements of air temperature, relative humidity, barometric pressure, rainfall, wind speed and wind direction. Additionally, instantaneaous samples were recorded every 15 minutes. In July 2006 the cr10x model was upgraded to a cr1000 Campbell Scientific data logger and the program was changed to record only 15 minute readings which were either averaged, instantaneous or totalized measurements depending on sensor type. Periodically, 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.

On July 12 2006, the Campbell Scientific logger model used at the station was upgraded from a model cr10x to a cr1000 and additional satellite telemetry equipment was installed at the station. Hourly and Daily averages and totals are no longer collected. The station was installed and logging began on July 12th, but over the next few days the program was rewritten a number of times. The prelinary data during that time was not included in the dataset as there were issues with the program(ranges, sensor types etc..) and the sensor wiring.

The Campbell Scientific data telemetry equipment is used at this station to transmit to the NOAA GOES satellite, NESDIS ID # 3B01468A. The transmissions are scheduled hourly and contain four (4) datasets reflecting the fifteen min data sampling interval. The telemetry 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.

a) Data Collection Schedule

The sensors are sampled every 5 seconds and the results are placed in volatile memory on the Campbell Scientific datalogger. Measurements are recorded from the 5 sec data every 15 minutes, 60 minutes and 24 hours for the following parameters for each time interval:

From January 1 until July 12, 2006 the data collection protocol was as follows: all parameters listed below were sampled at 15 minute, 60 minute and 24 hour intervals:

Averages:
Temperature, relative humidity, barometric pressure, wind speed, wind direction, battery voltage

Maximums:
Temperature, Maximum Temperature Time, relative humidity, Maximum Relative Humidity Time, barometric pressure, Maximum Barometric Pressure Time, Wind Speed, Maximum Wind Speed Time

Minimums:
Temperature, Minimum Temperature Time, relative humidity, Minimum Relative Humidity Time, barometric pressure, Minimum Barometric Pressure Time, Wind Speed, Minimum Wind Speed Time

Total:
Precipitation, Licor

Beginning on July 12, 2006 through December 31, 2006 only 15 minute intervals were collected.

Beginning on August 26, 2006 through December 31, 2006 the number of parameters collected was reduced to the following for each 15 minute interval:

Averages:
Temperature, relative humidity, barometric pressure, wind speed, wind direction, battery voltage

Maximums:
Temperature, Maximum Temperature Time, Wind Speed, Maximum Wind Speed Time

Minimums:
Temperature, Minimum Temperature Time

Total:
Precipitation, Licor

b) Error/Anomalous Data Criteria

Air Temp:
- 15 min sample not greater than max for the day
- 15 min sample not less than the min for the day
- 15 min sample not greater than 3.0 C from the previous 15 minutes
- Max and min temp recorded for the day
- 1 hour average not greater than 10% above the greatest 15 min sample recorded in the hour

Relative Humidity:
- Not changed by more than 25% from the previous 15 minutes
- Max and min humidity recorded for the day
- 1 hour average not greater than 10% above the greatest 15 min sample recorded in the hour

Rainfall:
- Precipitation not greater than 5 mm in 15 min
- No precipitation for the month

Wind Speed:
- Wind speed greater than 30 m/s
- Wind speed less than .5 m/s

Wind Direction:
- Wind direction not greater than 360 degrees
- Wind direction not less than 0 degrees

Pressure:
- Pressure greater than 1040 mb or less than 980 mb
- Pressure changes greater than 5 mb per hour
- Maximum and minimum values recorded for the day
- 1 hour average not greater than 10% above the greatest 15 min sample recorded in the hour

Time:
- 15 minute interval recorded

For all data:
- Duplicate interval data

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 TJR NERR Visitor Center at a Latitude of 32deg 34min 28.32sec N and a Longitude of 117deg 07min 37.05sec W. The station is 50m north of the water quality sampling station. The vegetation surrounding the weather station are mainly upland scrub species.

The base of the station is at approximately 4 meters above mean sea level. The anemometer, wind direction and Licor sensors are located at the top of a 3.5 meter aluminum tower. The temperature and humidity sensors are located 2 meters up and on the west side of the tower. 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 cr10x or cr1000 following the protocol in the CDMO Manual.

6) Data collection period:
Weather data collection began at the Tidal Linkage station in 1999 and has been operational since. Data was collected for the entire year of 2006 from 1/01/2006 00:15 through 12/31/2006 23:45.

7) Distribution:

According to the Ocean and Coastal Resource Management Data Dissemination Policy for the NERRS System-wide Monitoring Program,

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 section 1. Principal investigators and contact persons), from the Data Manager at the Centralized Data Management Office (please see the CDMO Staff link on the CDMO home page) and online at the CDMO home page http://cdmo.baruch.sc.edu/. Data are available in text 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, operating range, accuracy, date of last calibration:

Parameter: LI-COR Quantum Sensor
Units: mmoles m-2 (total flux)
Sensor type: High stability silicon photovoltaic detector (blue enhanced)
Model#: LI190SA
Serial#: Q9301
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
Date of last calibration: September 11, 2003
Dates in service: 1/1/2006 – 12/31/2006

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: 1/1/2006 – 12/31/2006

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: 1/1/2006 – 12/31/2006

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: October 28, 2003
Dates in service: 1/1/2006 – 12/31/2006

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: 01/01/2005 – 12/31/2006

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: June 12, 2006
Dates in service: 1/1/2006 – 12/31/2006

Datalogger : Model CR10x
Dates in service: 1/1/2006 – 7/12/2006

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 – 12/31/2006

10) Coded variable indicator and variable code definitions:
Site definitions: TL = Tidal Linkage
Station code = tjrtlmet

11) Anomalous data/suspect data:

Arrays:
During 2022 all pre-2007 weather data were revisited by the CDMO. Historically those datasets included 15 minute, hourly (60), and daily data arrays (144). As directed by the NERRS Data Management Committee, the CDMO removed the hourly and daily data arrays leaving only the 15 minute data to make the entire NERRS SWMP weather dataset consistent in its reporting. All references to the 60 and 144 arrays were left in the metadata document as they may still provide valuable information, but users should be aware that they are largely no longer relevant. The updated datasets were uploaded to the database and made available through the various data applications at www.nerrsdata.org/get/landing.cfm throughout the fall of 2022.

CDMO Edit 11/01/2012
ATemp, RH, PAR, and Wind data are considered suspect for the following dates at TJR. The sensors were not calibrated at the recommended frequency.
ATemp and RH suspect for all of 2006 (calibrated/installed 10/28/2003)
PAR suspect from 9/11/2006 until the end of the year (calibrated/installed 9/11/2003)
Wind parameters from 10/28/2006 until the end of the year (calibrated/installed 10/28/2003)

PAR data for the entire year are to be considered suspect due to wiring problems.

January 2006

a) From 01/05/2006 and 01/09/2006 higher than average air temperature values were recorded which were inconsistent with surrounding data set. The data are consistent with an ancillary station located ¼ mile away so were not deleted.

February 2006

a) From 02/07/2006 and 02/12/2006 higher than average air temperature values were recorded which were inconsistent with surrounding data set. The data are consistent with an ancillary station located ¼ mile away so were not deleted.

March 2006

On 3/11/2006 at 10:00 precipitation was greater than 5mm over 15 minutes. These data were retained.

April 2006

a) On 04/03/2006 higher than average air temperature values and lower than average relative humidity were recorded which were inconsistent with surrounding data set. The data are consistent with an ancillary station located ¼ mile away so were not deleted.

May 2006

On 5/22/2006 at 02:00 precipitation was greater than 5mm over 15 minutes. These data were retained.

June 2006

a) On 06/27/2006 higher than average air temperature values and lower than average relative humidity values were recorded which were inconsistent with surrounding data set. The data are consistent with an ancillary station located ¼ mile away so were not deleted.

July 2006

a) On 07/22/2006 higher than average air temperature values were recorded which were inconsistent with surrounding data set. The data are consistent with an ancillary station located ¼ mile away so were not deleted.

August 2006

No anomalous data

September 2006

No anomalous data

October 2006

a) From 10/26/2006 higher than average air temperature values were recorded which were inconsistent with surrounding data set. The data are consistent with an ancillary station located ¼ mile away so were not deleted.

November 2006

a) From 11/06/2006 to 11/07/2006 higher than average air temperature values were recorded which were inconsistent with surrounding data set. The data are consistent with an ancillary station located ¼ mile away so were not deleted.

December 2006

No anomalous data

12) Deleted data

Arrays:
During 2022 all pre-2007 weather data were revisited by the CDMO. Historically those datasets included 15 minute, hourly (60), and daily data arrays (144). As directed by the NERRS Data Management Committee, the CDMO removed the hourly and daily data arrays leaving only the 15 minute data to make the entire NERRS SWMP weather dataset consistent in its reporting. All references to the 60 and 144 arrays were left in the metadata document as they may still provide valuable information, but users should be aware that they are largely no longer relevant.

The updated datasets were uploaded to the database and made available through the various data applications at www.nerrsdata.org/get/landing.cfm throughout the fall of 2022.

January 2006
No data deleted

February 2006
No data deleted

March 2006
No data deleted

April 2006
Due to missing 15 minute BP, precipitation, PAR and battery volt data on April 5, 2006 at 01:30, hourly and daily data for these parameters were deleted at 02:00 and 24:00.

May 2006
No data deleted

June 2006
No data deleted

July 2006
No data deleted

August 2006
For the following dates and times data were deleted due to missing 5 second data when the weather station was programmed after the CR1000 installation:
7/16/2006 16:30
08/29/2006 09:00
8/31/2006 13:15

For the following dates and times maximum wind speed times were deleted. There was an error resulting in the mismatch of data fields with this parameter.
8/29/2006 08:00 through 8/30/2006 06:45.

September 2006
No data deleted

October 2006
For the following dates and times PAR data exceeded the maximum signal noise error for the Licor sensor, - 2.214 mmoles/m2 over a 15 minute interval. These data were deleted:
10/13/2006 21:30-23:15
10/14/2006 01:30-01:45

November 2006
For the following dates and times PAR data exceeded the maximum signal noise error for the Licor sensor, - 2.214 mmoles/m2 over a 15 minute interval. These data were deleted:
11/19/2006 20:15-22:00. 22:30

The following PAR data were deleted due to a sensor/program malfunction:
11/3/2006 00:00 through 11/30/2006 23:45

December 2006
The following PAR data were deleted due to a sensor/program malfunction:
12/1/2006 00:00 through 12/31/2006 23:45

13) Missing Data

Arrays:
During 2022 all pre-2007 weather data were revisited by the CDMO. Historically those datasets included 15 minute, hourly (60), and daily data arrays (144). As directed by the NERRS Data Management Committee, the CDMO removed the hourly and daily data arrays leaving only the 15 minute data to make the entire NERRS SWMP weather dataset consistent in its reporting. All references to the 60 and 144 arrays were left in the metadata document as they may still provide valuable information, but users should be aware that they are largely no longer relevant. The updated datasets were uploaded to the database and made available through the various data applications at www.nerrsdata.org/get/landing.cfm throughout the fall of 2022.

Missing data are denoted by a blank in the data set. Data are missing due to equipment failure or power loss, where no sensors were deployed, for maintenance or calibration of equipment, elimination of obvious outliers or elimination of data due to calibration problems. For more details on deleted data, see the Anomalous Data/Suspect Data section. To find out more details about missing data, contact the Research Coordinator at the site submitting the data.

14) Other Remarks

On 10/23/2023 this dataset was updated to include embedded QAQC flags for anomalous/suspect data. System-wide monitoring data beginning in 2007 were processed to allow for QAQC flags and codes to be embedded in the data files rather than detailed in the metadata alone (as in the anomalous/suspect, deleted, and missing data sections above). Prior to 2007, rejected data were deleted from the dataset so they are unavailable to be used at all, but suspect data were only noted in the metadata document. Suspect data flags <1> were embedded retroactively in order to allow suspect data to be easily identified and filtered from the dataset if desired for analysis and reporting purposes. No other flags or codes were embedded in the dataset and users should still refer to the detailed explanations above for more information.

Arrays:
During 2022 all pre-2007 weather data were revisited by the CDMO. Historically those datasets included 15 minute, hourly (60), and daily data arrays (144). As directed by the NERRS Data Management Committee, the CDMO removed the hourly and daily data arrays leaving only the 15 minute data to make the entire NERRS SWMP weather dataset consistent in its reporting. All references to the 60 and 144 arrays were left in the metadata document as they may still provide valuable information, but users should be aware that they are largely no longer relevant. The updated datasets were uploaded to the database and made available through the various data applications at www.nerrsdata.org/get/landing.cfm throughout the fall of 2022.

Precipitation:
During the initial years of NERRS SWMP weather data collection the CR10X programming was inconsistent in how precipitation values were recorded. For most reserves, zeros were not recorded when rainfall had not occurred between 2001-

2003, instead no rainfall was represented by a blank cell. The CDMO verified which datasets were impacted by this issue for the 2001-2006 datasets and inserted zeros when the metadata indicated that no precipitation occurred and data were not missing for other reasons. In some cases, zero values for precipitation data were evaluated and removed where the metadata confirmed that no rainfall should have been in the dataset. The pre-2007 data did not go through a thorough QAQC process again at that time (in addition to previous QAQC); however, if discrepancies were noticed between what was documented in the metadata and what was in the dataset, additional updates may have been made. The updated datasets were uploaded to the database and made available through the various data applications at www.nerrsdata.org/get/landing.cfm throughout early 2023.

During precipitation edits mentioned above it was noted that all hourly readings from 01/01/2006 through 07/11/2006 08:30 were missing with no explanation in the metadata. Those data were found in an archived original file and added back to the dataset.

a) Although the station is sited the recommended distance away from buildings and obstructions, it has been observed that recorded wind values at the station during periods of high winds from the east may be less than actual due to interference by the Tijuana River NERR visitor's center. The amount of interference has not yet been determined.

b) Negative PAR data have been observed during the night at this station; small negative values are within range of the sensor and are due to normal errors in the sensor and the CR10X Datalogger. The Maximum signal noise error for the Licor sensor is +/- 2.214 mmoles/m2 over a 15 minute interval. These data were retained.