

Jacques Cousteau (JAC) National Estuarine Research Reserve Meteorological
Metadata
October - December 2002
First Update: April 2003
Latest update: **October 26, 2023**

I. Data Set & Research Descriptors

1) Principal investigator & contact persons:

Contact Persons:

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2) Entry verification

a) Data Input Procedures:

The 15-minute, 1-hour average, and 24-hour meteorological data were downloaded from each instrument on the weather station to a Campbell Scientific CR10X datalogger. The CDMO Data Logger Program (nerr303.csi) was loaded into the CR10X and controls the sensors and data collection schedule (see 2b of the Entry Verification section for the data collection schedule). The CR10X then interfaced with the PC208W software supplied by Campbell Scientific.

This software was located on a computer to which the data was uploaded (every 2-3 weeks) via a short haul modem to a computer located at the RSC Marine Science and Environmental Field Station. The data was saved as a raw data file (i.e. nc101002, Nacote Creek October 10, 2002) onto a separate hard drive and backed up onto a zip file.

Once an entire month of data was available, the CDMO Weather Data Management Program (WDMP) was used to convert the files to an Access database. This program was developed in Visual Basic to interface with the NERRS data collection schedule (see 2b of the Entry Verification section for the data collection schedule). The WDMP will automatically input and convert the monthly raw data file into an Access Database. There are three main steps the WDMP performs. First, it converts the comma delimited monthly raw data file into an Access Database. Secondly, it checks the data against a predetermined set of error criteria (see Part C of this section). Finally, it produces error and summary reports. Any anomalous data were investigated and are noted below in

Anomalous Data section. Any data corrections that were performed are noted in the Data Correction section below.

Common errors noted in the monthly error reports were wind speeds below the 0.5 m/s criteria, temperature change of greater than 3 C in a 15 minute period, and precipitation difference of greater than 5mm in 15 minutes. All errors of these types were double checked with other data that could support such "anomalous" weather changes and noted in the sections that follow. Wind speeds below the 0.5 m/s criteria are common between 1900 and 0600 hours and are not individually checked. Both raw data files and Access databases were saved to the local harddrive and backed up periodically to zip disk. S. Evert, Richard Stockton College conducted the data management and QA/QC activities.

The Centralized Data Management Office converted all SWMP weather data collected with CR10X program versions prior to version 4.0 which was distributed in October 2003. 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 produces averages, maximums and minimums every fifteen minutes (array 15), every hour (array 60) and every day (array 144) for any sensors hooked up to the CR10X. Specifically, the 150 and 151 fifteen minute data were converted to the new 15 array; the hourly 101, 102, 105 and 106 data were converted to the new 60 array; and the daily 241, 242, 243, 244, 245 and 246 data were converted to the new 144 array. With the new format, the use of 55555's to code for deleted data and 11111's to code for missing data has been abandoned. Hence, all 55555's or 11111's contained in the SWMP weather data collected prior to Version 4.0 of the CR10X program were removed and left blank.

b) Data Collection Schedule

i) Data is collected in the following formats.

- (1) Sample data points are collected every 15 minutes.
- (2) Hourly averages are collected every 60 minutes.
- (3) Every 24 hours daily averages, maximums with time, and minimums with time.

ii) 15 minute sample point parameters:

Array 150: Date, Time, Air Temperature (c), Relative Humidity (%), LiCor (par), Barometric Pressure (mb), Wind Speed (m/s), Wind Direction
Array 151: Rainfall (mm)

iii) Hourly average parameters: D

Array 101: Date, Time, Air Temperature (c), Relative Humidity (%), LiCor (par), Barometric Pressure (mb)
Array 102: Date, Time, Wind Speed (m/s), Wind Direction, Wind Speed Maximum (m/s)

iv) Daily Averages parameters:

Array 241: Date, Time, Air Temperature (c), Relative Humidity (%), LiCor (par), Barometric Pressure (mb)
Array 242: Date, Time, Wind Speed (m/s), Wind Direction, Wind Direction Standard Deviation (using Yamartino's Algorithm)

v) Daily Maximum parameters:

Array 243: Date, Time, Air Temperature (c), Time, Relative Humidity (%), Time, LiCor (par), Time, Barometric Pressure (mb), Time, Wind Speed (m/s), Time, Battery Voltage, Time

vi) Daily Minimum parameters:

Array 244: Date, Time, Air Temperature (c), Time, Relative Humidity (%), Time, LiCor (par), Time, Barometric Pressure (mb), Time, Wind Speed (m/s), Time, Battery Voltage, Time

c) 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

3) Research objectives:

The principal objective is to record long-term meteorological data for the JC NERR in order to observe any environmental changes or trends over time.

4) Research methods:

The Campbell Scientific weather station samples 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. An instantaneous sample is taken every 15 minutes and that data is stored in array 150. The CR10X datalogger can store over three weeks of data before it

overwrites the data. If the short haul modem link failed and data could not be collected from the datalogger to the computer the data would be downloaded from the CR10X to a laptop computer following procedures in Part D. Section 4.5 of the CDMO Operations Manual. 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 year.

5) Site location and character:

The Jacques Cousteau National Estuarine Research Reserve (JCNERR) at Mullica River/Great Bay is located at 39° 30.6'N, 74° 19.45'W on the northeast coast of the United States on the Atlantic Ocean. The estuary is near Tuckerton, New Jersey about 14 kilometers north of Atlantic City. The met station is located adjacent to the Nacote Creek, a tributary of the Mullica river. The met station is located on property owned by the RSC Marine Science and Environmental Field Station in Port Republic, NJ, approximately one (1) mile south of the Chestnut Neck marina on the Mullica river and ¼ mile northeast of Rt. 9 in Port Republic, NJ.

The unit is mounted on a 13-meter tower adjacent to the Nacote Creek, approximately 20 m from the high tide line. The elevations above the marsh surface are as follows; Barometric pressure - 2.2 m, temperature and relative humidity - 2.9 m, PAR - 4.5 m, wind - 12.5 m, highest point on tower (lightning rod) - 14 m. The rain gauge is 1.0 m above the surface and 1.5 m north of the tower. The area is sparsely covered with clam shell debris and upland grasses.

6) Data collection period:

The meteorological monitoring program was started in October 2002 at the JCNERR. The Reserve has a long-standing program in the collection of water quality data and other met data is available (from another location and instrument) before 10/02 by contacting the Research Coordinator listed above.

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 the 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/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 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 text format and Access data tables.

8) Associated researchers and projects:

Check with Research Coordinator for latest information

II. Physical Structure Descriptors

9) Sensor specifications, operating range, accuracy, date of last calibration

LiCor Quantum Sensor

Model # LI190SB

Stability: <±2% change over 1 yr

Operating Temperature: -40 to 65°C

Sensitivity: typically 5 µA per 1000µmoles s⁻¹ m⁻²

Light spectrum wavelength: 400 to 700 nm

Date of last calibration: April, 2002

Wind Monitor

Model # 05103

Range: 0-60 m/s; 360° mechanical

Date of last calibration: October, 2001

Temperature and Relative Humidity

Model #: HMP45C

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%)

Uncertainty of calibration: ± 1.2% RH

Date of Last calibration: April, 2002

Barometric Sensor

Model # CS-105

Operating Range: Pressure: 600 to 1060 mb

Temperature: -40 to +60C

Humidity: non-condensing

Accuracy: ±0.5 to 6.0 mb (+20 to 60C)

Stability: ± 0.1 mb per year

Date of Last calibration: October, 2001

Tipping Bucket Rain Gauge

Model #: TE 525

Range: 0.1 mm

Accuracy: 1.0% at <2"/hr

Date of Last calibration: August, 2002

10) Coded variable indicator and variable code definitions:

NC=Nacote Creek

JAC=Mullica River/Jacques Cousteau NERR

11) Data anomalies/Data corrections:

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.

Please note: JulD=Julian Date and CalD=Calendar Day

Wind speeds below the 0.5 m/s criteria are common between 1900 and 0900 hours and occurred throughout each month.

October 2001

During the first month of deployment an operating error occurred allowing the overwriting of the first 12 calendar days of data. All data between 10/1/02 and 10/13/02 is invalid.

The following data appear to be correct:

ArrayID	JulD	CalD	Time	Error Message
151	299	26	430	Precip difference from 26 (299) 430 (2.032) to 26 (299) 445 (7.874) is greater than 5mm
151	299	26	500	Precip difference from 26 (299) 500 (6.604) to 26 (299) 515(.254) is greater than 5mm

Correction:

Precipitation:

During the revisit of the data and metadata for precipitation edits, see below under Remarks, it was noted that 15 minute total precipitation data were missing from the 2002 JAC dataset. After looking into the reasons for this it was determined that those data were erroneously removed at some point in the past, possibly during efforts to combine the arrays. Fifteen minute precipitation values were entered into the dataset by the CDMO and are considered suspect.

The following wind direction data were converted to zero:

ArrayID	JulID	CalD	Time	Error Message
150	287	14	1730	Wind direction is greater than 360 or less than 0 on 14 (287) 1815 (-.19127)
150	287	14	1815	Wind direction is greater than 360 or less than 0 on 14 (287) 1815 (-.19128)
150	296	23	1330	Wind direction is greater than 360 or less

than 0 on 23 (296) 1330 (-.19121)

150 298 25 215 Wind direction is greater than 360 or less
than 0 on 25 (298) 215(-.28701)

November 2002

The following data appear to be correct:

ArrayID	JulID	CalD	Time	Error	Message
150	323	19	800		Air temp difference from 19 (323) 800 (.31599) to 19 (323) 815 (3.5491) is greater than 3.0 degrees C

December 2002

The following data appear to be correct:

ArrayID	JulID	CalD	Time	Error	Message
151	11	345	1700		Precip difference from 11 (345) 1700 (3.048) to 11 (345) 1715 (9.398) is greater than 5mm
151	11	345	1715		Precip difference from 11 (345) 1715 (9.398) to 11 (345) 1730 (1.778) is greater than 5mm
150	25	359	1230 - 1430		Pressure is greater than 1040 or less than 980 on 25 (359) from 1230 through 1430 (978.35 - 979.96) *identified as correct by comparison to nearby NWS station where Pressure values fell below 980 during this time
101	5	339	900		Air temp. average in 1 hour data (-.00324) is less than 15 minute minimum (.036) by at least 10%
101	10	344	2000		Air temp. average in 1 hour data (-.09072) is greater than 15 minute maximum (-.10111) by at least 10%

12) Missing Data:

Arrays:

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The following data is missing due to overwritten data from October 1 - October 12, 2003:

ArrayID	JulID	CalD	Time	Error	Message
150	1	274	245	Missing	150 Array data (15 minute data) from 1 (274) 245 to 12 (285) 245
101	1	274	1200	Missing	101 Array data (Hourly Averages) from 1 (274) 1200 to 12 (285) 200
102	1	274	1200	Missing	102 Array data (Hourly Average Wind Parameters) from 1 (274) 1200 to 12 (285) 200
241	1	274	2400	Missing	241 data (Daily Averages) from 1 (274) 2400 to 11 (284) 2400
242	1	274	2400	Missing	242 data (Daily Average Wind Parameters) from 1 (274) 2400 to 11 (284) 2400
243	1	274	2400	Missing	243 data (Daily Max/Time Values) from 1 (274) 2400 to 11 (284) 2400
244	1	274	2400	Missing	244 data (Daily Min/Time Values) from 1 (274) 2400 to 11 (284) 2400

13) Other Remarks:

On 10/26/2023 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.

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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 the revisit of the data and metadata for precipitation edits, see above, it was noted that 15 minute total precipitation data were missing from the 2002 JAC dataset. After looking into the reasons for this it was determined that those data were erroneously removed at some point in the past, possibly during efforts to combine the arrays. Fifteen minute precipitation values were entered into the dataset by the CDMO and are considered suspect.

The Centralized Data Management Office converted all SWMP weather data collected with CR10X program versions prior to version 4.0 which was distributed in October 2003. 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 produces averages, maximums and minimums every fifteen minutes (array 15), every hour (array 60) and every day (array 144) for any sensors hooked up to the CR10X. Specifically, the 150 and 151 fifteen minute data were converted to the new 15 array; the hourly 101, 102, 105 and 106 data were converted to the new 60 array; and the daily 241, 242, 243, 244, 245 and 246 data were converted to the new 144 array. With the new format, the use of 55555's to code for deleted data and 11111's to code for missing data has been abandoned. Hence, all 55555's or 11111's contained in the SWMP weather data collected prior to Version 4.0 of the CR10X program were removed and left blank.

Monthly totals not available when there was missing data during a month.

Rain Events:

October

Date	Rainamount (mm)
12	2.540
13	1.524
15	2.286
16	21.082
17	1.016
18	.254
20	.254
24	1.016
25	7.620
26	52.070
29	27.686
30	13.970
31	.762

November

Date	Rainamount (mm)
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1	.508
5	7.366
6	20.066
11	3.556
12	28.702
13	5.334
16	35.052
17	29.972
18	.254
21	21.336
22	5.588
27	4.064
30	.508

"Monthly Total" 162.3

December

Date	RainAmount (mm)
2	.254
5	12.192
7	.508
11	33.020
12	.762
13	32.512
14	2.540
16	1.016
20	16.002
24	2.286
25	17.780

"Monthly Total" 118.9