North Carolina (NOC) National Estuarine Research Reserve
Research Creek Weather Station Metadata Report
January - December 2001
Latest Update: **April 17, 2023**

I. Data Set and Research Descriptors

1. Principal investigator(s) and contact persons

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2. Entry verification

a) Data Input Procedures:

The 15-minute data, one-hour average, maximum and minimum data, and 24-hour average, totals, maximum and minimum data were downloaded from each instrument on the weather station to a Campbell Scientific CR10X datalogger (the CDMO datalogger program was loaded into the CR10X and controls the sensors and data collection schedule (see Part B of section 2 for the data collection schedule)). The CR10X then interfaced with the PC208W software supplied by Campbell Scientific. This software was located on a computer at the NOC NERR lab, to which the data was uploaded every hour via telemetry. The data were saved in two separate areas on the computer and the Real Time Data Display software (provided by Campbell), displayed the near real time data in graphs and charts. Using an automated software package (Automate, by Unisyn), the data were uploaded hourly as jpeg files to our website server.

Once a month the data were backed-up on zip disk and transferred to another computer at the NCNERR lab. The data file was cut into month files and then converted to an Access database using the CDMO Weather Data Management Program (WDMP). This program was developed in Visual Basic to interface with the NERRS data collection schedule (see Part B of this section for the data collection schedule). To convert the raw monthly data file to an access database, the WDMP performed three main steps. First, it converted the comma delimited monthly raw data file into an Access Database. Secondly, it checked the data against a predetermined set of error criteria (see Part C of this section). Finally, it produced error and summary reports. Any anomalous data, missing data or data corrections were investigated and noted below in the Anomalous data, missing data and data corrections section. 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 the 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.

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) 15 minute data are instantaneous readings except for PAR and precipitation data that are totalized from 5 second samples sorted by date and time. (Arrays 150 and 151)
2) Hourly averages (Arrays 101 and 102) are calculated from 5 second samples sorted by date and time except for PAR and precipitation data that are hourly totals calculated from 15 minute totals (Arrays 105 and 106).
3) Daily average (arrays 241 and 242), maximum with time, and minimum with time (arrays 243 and 244) are calculated from 5 second samples sorted by date and time except for PAR and precipitation data which are 24 hour totals calculated from hourly totals (arrays 245 and 246).

ii) 15 minute sample point parameters: Date, Time, Air Temperature (°C), Relative Humidity (%), LiCor (PAR), Barometric Pressure (mb), Wind Speed (m/s), Wind Direction (Array 150); Rainfall (mm) (Array 151)

iii) Hourly average parameters: Date, Time, Air Temperature (°C), Relative Humidity (%), Barometric Pressure (mb) (Array 101); Wind Speed (m/s), Wind Direction, Wind Speed Maximum (Array 102)

iv) Hourly total parameters: LiCor (PAR) (Array 105); Rainfall (mm) (Array 106)

v) Daily Average parameters: Date, Time, Air Temperature (°C), Relative Humidity (%), Barometric Pressure (mb) (Array 241); Wind Speed (m/s), Wind Direction, Wind Direction Standard Deviation (using Yamartino's Algorithm) (Array 242)

vi) Daily Total parameter: LiCor (PAR) (Array 245); Rainfall (mm) (Array 246)

vii) Daily Maximum parameters: Date, Time, Air Temperature (°C), Time, Relative Humidity (%), Time, LiCor (PAR), Time, Barometric Pressure (mb), Time, Wind Speed (m/s), Time, Battery Voltage, Time (Array 243)

viii) Daily Minimum parameters: Date, Time, Air Temperature (°C), Time, Relative Humidity (%), Time, LiCor (PAR), Time, Barometric Pressure (mb), Time, Wind Speed (m/s), Time, Battery Voltage, Time (Array 244)

c) Error/Anomalous Data Criteria

Air Temp:
- 15 min sample greater than max for the day
- 15 min sample less than the min for the day
- 15 min sample greater than 3.0 °C from the previous 15 minutes

- Max and Min values not recorded for the day
- 1-hour average greater than 10% above the greatest 15 min sample recorded in the hour

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

Rainfall:
- Precipitation greater than 5 mm in 15 minutes
- No precipitation for the month

Wind Speed:
- Wind speed greater than 30 m/s
- Wind speed less than 0.5 m/s

Wind Direction:
- Wind direction greater than 360 degrees
- Wind direction less than 0 degrees

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

Time:
- 15-minute interval not recorded

For all data:
- Duplicate interval data

3. Research Objectives

Our objectives are to establish long-term monitoring of the weather at Masonboro Island, to obtain better data on storms and to be able to correlate the weather and water quality Additionally, the weather data collected will be used in support of other ongoing projects within the Reserve and nearby area.

4. Research methods (Campbell Weather Station)

Data were collected from the weather sensors

The weather station is located on an abandoned dredge spoil island next to Research Creek east of the Intracoastal Waterway near Masonboro Island. It is 2.1 km from the NOC NERR lab, directly across the Intracoastal Waterway from Whiskey Creek, at N 34° 9.328', W 77° 51.054'. The weather station consists of a 3-meter aluminum tower, which is slightly offset from the top of the spoil. The tower holds the wind sentry sensors (wind speed and direction) at a height of 3.68 m; the Li-COR sensor is at a height of 3.66 m. The temperature and relative humidity sensor is mounted on the tower

at 2.39 m and the barometric pressure, which is inside of the CR10X housing, is mounted at a height of 1.75 m. The rain gauge is located on a separate platform 7.62 m east south east of the tower and is mounted at a height of 1.79 m. The sensors were wired to the CR10X (Campbell datalogger) according to the protocol in the CDMO Manual.

5. Site location and character

The four components of North Carolina's National Estuarine Research Reserve (from north to south) are: Currituck Banks, Rachel Carson, Masonboro Island and Zeke's Island. They are located along the southeastern coast of the United States in the Atlantic Ocean. Currently, only water quality and weather data from Masonboro and Zeke's Island components are transferred to the CDMO. The two water quality sites are:

A. Research Creek, Masonboro Island
The Masonboro Island site is 0.72 km north east from the mouth of Whiskey Creek, and east of the Intracoastal Waterway (ICW), in a small navigable channel called Research Creek at 34° 09'21.7" latitude and 77° 50'59.9" longitude. The site has a salinity range of 18-35 ppt and a tidal range that averages 1.2 meters.

B. East Crib, Zeke's Island
The Zeke's Island site is located 1.8 km south of Federal Point boat launch in a tidal basin estuary at 33° 56'23.5" latitude and 77° 56'28.1" longitude. This site receives minimal freshwater input from leakage of the Cape Fear River through the 5.6 km rock jetty that separate the two bodies of water. The New Inlet, which opened in 1761 and remained stable until artificial closure in 1881, has provided ocean water to the estuary in the past.
It has opened and closed throughout its history at the whim of each passing hurricane. The inlet closed after hurricane Bonnie in 1998 and has remained closed for this set of data. The site has a salinity range of 15-35 ppt and a tidal range that averages 2 meters.
Depth varies, but typically it can be found to range from 0.11 to 2.30 meters. Bottom type substratum consists of sand and detritus based sediment. There are few pollutants from land. Marsh and dunes surround the site, which is not accessible to road traffic and has minimal boat traffic.

C. Research Creek Meteorological Station
The meteorological site is located on Masonboro Island, 2.09 km from the NOC NERR lab, and approximately 76.2 m from the Masonboro Island water quality deployment site at 34° 9.328'N latitude and 77° 51.054'W longitude. The station sits at an elevation of approximately 4.88 m above sea level, slightly offset from the highest point of the spoil, which has a maximum elevation of approximately 5.8 m. The site is on an abandoned dredge spoil with scrub surrounding the periphery, and grassy cover in the central areas.

6. Data collection period

Collection of meteorological data began on March 15, 1997. Instruments were deployed prior to this date; however, data were for initial testing and verification of functions, and have since been discarded.

7. Distribution

According to the Ocean and Coastal Resource Management (OCRM) Data Dissemination Policy for the NERRS System Wide Monitoring Program (SWMP),

National Oceanic and Atmospheric Administration (NOAA)/Estuarine Reserves Division (ERD) retains the right to analyze, synthesize and publish summaries of the NERRS SWMP 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 publication In which any part of the data are used. Manuscripts resulting from the NOAA/OCRM supported research that are produced fro publication in open literature, including refereed scientific journals, will acknowledge that the research was conducted under an award from the ERD, OCRM, National Ocean Service (NOS), NOAA. The data enclosed within the 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 of third persons, nor will the Federal government reimburse or indemnify the Recipient for it 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 II. 1. Principal investigators and contact persons), from the Data Manger 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

The NOC NERR water quality site at Masonboro Island is located adjacent to the weather station. The principal objective of the water quality monitoring is to record long-term water quality data in order to observe and document any physical and chemical changes or trends in water quality over time. The weather station data will be used to augment this study.

Additional projects are ongoing and continually changing. Check with the Research Coordinator or other contact person for an updated list of research (see section I.1.).

II. Physical Structure Descriptors

9. Sensor specifications, range, accuracy and date of last calibration

From January 1, 2001 to May 3, 2001
Fluid Isolation Technology Tipping Bucket Rain Gauge
Model # GR-2000-C
Operating range: 0.1 mm
Accuracy:
Date of last calibration: unknown

Campbell Scientific temperature and relative humidity sensor
Model # HMP 35C
Range: -35 to +50(C
Accuracy:
Date of last calibration: unknown

Li-COR Pyranometer Quantum Sensor
Model # LI190SB
Range:
Accuracy:
Date of last calibration: 07/22/96

R.M. Young Wind Sentry Set, wind direction and speed
Model # 03001
Range of anemometer: 0-50 m/s
Range of wind direction:
Accuracy:
Date of last calibration: unknown

Vaisala Barometric Pressure sensor
Model # CS 105
Range: 600 to 1060 mb
Accuracy: +/- 0.45 mb
Date of last calibration: 04/05/95

From May 3, 2001 to June 30, 2001
Ecoharmony tipping bucket rain gauge
Model # TB4.
Range: 0 to 600 mm/hr
Accuracy: 0.01 inches per bucket tip; +/- 3% for intensities from 25-600 mm/hr
Date of last calibration: unknown, new (04/01)

Campbell Scientific Temperature and Relative Humidity
Model # HMP45AC
Range of -40 to 60(C; 0 to 100% non-condensing
Accuracy is +/- 0.2(C @ 20(C; @ 20(C +/- 2% RH (0 - 90% RH), +/- 3% RH (90 - 100% RH)
Date of last calibration: 02/12/01, new

LiCor Pyranometer Quantum Sensor.
Model # LI190SB
Range: 1% up to 10,000 ?moles???? s-1m-2, 400-700 nm
Accuracy: 5 ?A per 1000 ?moles???? s-1m-2, with a stability of <+/- 2% change per year
Date of last calibration: 01/18/01, new

R.M. Young Wind Sentry set (anemometer and sine vane)
Model # 03001
Range: 0-50 m/s (0-112 mph); 360(mechanical, 355(electrical (5(open)
Accuracy: 0.8 m/s at 10 degree displacement, and 1.8 m/s at 5 degree displacement
Date of last calibration: unknown, new (04/01)

Vaisala Barometric Pressure
Model # PTB101B
Range: 600-1060 mb
Accuracy: +/- 0.45 mb
Date of last calibration: 07/12/00, new

From July 1, 2001 to December 31, 2001

Ecoharmony tipping bucket rain gauge
Model # TB4.
Range: 0 to 600 mm/hr
Accuracy: 0.01 inches per bucket tip; +/- 3% for intensities from 25-600 mm/hr
Date of last calibration: 04/01

Campbell Scientific Temperature and Relative Humidity
Model # HMP45AC
Range of –40 to 60°C; 0 to 100% non-condensing
Accuracy is +/- 0.2°C @ 20°C; @ 20°C +/- 2% RH (0 – 90% RH), +/- 3% RH (90 – 100% RH)
Date of last calibration: 02/12/01

LiCor Pyranometer Quantum Sensor.
Model # LI190SB
Range: 1% up to 10,000 µmoles s-1m-2, 400-700 nm
Accuracy: 5 µA per 1000 µmoles s-1m-2, with a stability of <+/- 2% change per year
Date of last calibration: 01/18/01

R.M. Young Wind Sentry set (anemometer and sine vane)
Model # 03001
Range: 0-50 m/s (0-112 mph); 360° mechanical, 355° electrical (5° open)
Accuracy: 0.8 m/s at 10 degree displacement, and 1.8 m/s at 5 degree displacement
Date of last calibration: 04/01

Vaisala Barometric Pressure
Model # PTB101B
Range: 600-1060 mb
Accuracy: +/- 0.45 mb
Date of last calibration: 07/12/00

Campbell Scientific CR10X Wiring Panel. Has 128K of flash memory (EEPROM), in which it stores the operating system and it's program (that it uses to run the weather station). Additionally, there are 128K of SRAM, which it uses to run the program and store its measurements and for final data storage.

10. Coded variable indicator and variable code definitions

NOC – North Carolina	rel hum – relative humidity
RC – Research Creek	°C – degrees Celsius
temp – temperature	mb - millibars
m/s – meters per second	V – volt
par – photosynthetic active radiation	ppt – parts per thousand
µA – microamps	µmoles - micromoles

11. Data anomalies and 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.

Data from 01/01/01 to 06/30/01 may be suspect. The weather station sensors had not been calibrated within the time period recommended by the probe manufacturers. All data were retained unless otherwise indicated.

January 2001

Relative humidity changed by greater than 25% within a 15-minute period of time on the following date and time. Data may be anomalous. No other parameters in this time frame support this rapid change in relative humidity.

Array	Date	Day	Time
150	7	07	12:45

Wind speed recorded at less than 0.5 m/s from January 14 1700 through 15 0900. This is either indicative of the real weather condition or the build-up of grit and sand, resulting in a less sensitive wind speed sensor and therefore erroneous data.

February 2001

Relative humidity changed by greater than 25% within a 15 minute period of time. Based on other parameters during the same time frame, the data could be indicative of a real weather event, or they may be anomalous.

Array	Date	Day	Time
150	41	10	23:30-2345
150	52	21	12:15-1230
150	57	26	21:00-2115

Wind speed recorded at less than 0.5 m/s from February 7-9 and 13-16. This is either indicative of the real weather condition or the build-up of grit and sand, resulting in a less sensitive wind speed sensor and therefore erroneous data.

Barometric pressure was less than 980 mb, most likely due to a low pressure system that had moved into the area.

Array	Date	Day	Time
150	42-46	11-15	02:00-10:15

Barometric pressure changes in a 15-minute period were greater than 5 mb several times throughout the month of February, primarily surrounding the low pressure system mentioned above.

Wind direction of (-.1906) recorded on February 22 2000.

March 2001

Air temperature increased greater than 3.0 C in 15 minutes. Generally the day was overcast. The sun breaking through the clouds for a short burst may have caused the sudden increase in temperature.

Array	Date	Day	Time
150	63	4	16:30-1645

Relative humidity changed greater than 25% in a 15 minute period.

Array	Date	Day	Time
150	73	14	13:30-1345
150	82	23	16:15-1630

Precipitation was greater than 5mm in 15 minutes due to a major rainstorm on the following date.

Array	Date	Day	Time
151	79	20	20:00 - 20:45

Wind speed recorded at less than 0.5 m/s from March 16-17. This is either indicative of the real weather condition or the build-up of grit and sand, resulting in a less sensitive wind speed sensor and therefore erroneous data.

Wind direction of (-.09522) recorded on March 26 0900.

April 2001

Data corrections:
Programming changes to the CR10X were made on April 20, which caused the datalogger to reset and record incorrect hourly averages, daily averages, daily max and min values. Therefore, for the following dates and times, all 24-hour data were deleted and replaced with 55555 since the program reload to the CWS resulted in a loss of 5 second data.

ArrayID	Day	Date	Time	Error Message
241	20	110	2400	Technician changed 241 Array from 20 (110) 2400
242	20	110	2400	Technician changed 242 Array from 20 (110) 2400
243	20	110	2400	Technician changed 243 Array data from 20 (110) 2400
244	20	110	2400	Technician changed 244 Array data from 20 (110) 2400

Anomalous data:
Air temperature changed more than 3.0 C in fifteen minutes on the following dates and times. Based on other parameters (solar radiation, precipitation, wind speed and direction, relative humidity) during these dates, these temperature changes are likely indicative of real weather events.

Array	Date	Day	Time
150	91	1	16:45 -1700
150	97	7	12:30 -1245
150	99	9	10:00 -1015
150	107	17	13:45 -1400
150	107	17	14:00 -1415

Relative humidity changed by more than 25% within a fifteen-minute period on the following dates and times. Based on other parameters (solar radiation, precipitation, wind speed and direction, temperature) during the same time frame, the data could be indicative of a real weather event.

Array	Date	Day	Time
150	107	17	13:45 -1400
150	110	20	09:45 -1000
150	118	28	12:00 -1215

Precipitation difference in a fifteen minute period was greater than 5 mm on the following dates and times. On this day there was a substantial rain storm which was very heavy at times.

Array	Date	Day	Time
151	91	1	13:30-1345
151	91	1	13:45-1400

Wind speed recorded at less than 0.5 m/s numerous times throughout the month (at least once per day with the exception of April 2, 7, 8, 9, 10, 12, 13, 28, 29). This is either indicative of the real weather condition or the build-up of grit and sand, resulting in a less sensitive wind speed sensor and therefore erroneous data.

A low pressure system moved in causing the barometric pressure to drop below 980 mb

Array	Date	Day	Time
150	100-107	10-17	23:45-13:15

Numerous changes in barometric pressure that were greater than 5 mb in a 15 minute period. Primarily associated with the low pressure system noted above.

May 2001

Programming changes to the CR10X were made on May 3, 4, 8, 9, 10, and 16 which caused the datalogger to reset and record incorrect hourly averages (101 and 102), daily averages (241 and 242), daily max (243) and min (244) values. Therefore, for those dates and times, all 24-hour data were deleted and replaced with 55555 since the program reload to the CWS resulted in a loss of 5 second data. Note, it could not be determined at what time the program was reloaded on May 16, therefore only the daily averages, max and min were deleted on that day.

Data corrections:
The temperature and relative humidity sensor's data were erroneous from 5/3/01 1515-05/17/01 1430 due to CR10X programming problems. Temperature data was deleted and replaced with 55555 during the following date and times:

ArrayID	Day	Date	Time	Error Message
150	7	127	1000	Technician changed 150 Array data from 7 (127) 1000 to 8 (128) 1400
101	7	127	1000	Technician changed 101 Array data from 7 (127) 1000 to 8 (128) 1400
241	7	127	2400	Technician changed 241 Array from 7 (127) 2400 to 8 (128)

2400
243 7 127 2400 Technician changed 243 Array from 7 (127) 2400 to 8 (128)
2400
244 7 127 2400 Technician changed 244 Array from 7 (127) 2400 to 8 (128)
2400

Relative humidity data was deleted and replaced with 55555 during the following date and times:

ArrayID	Day	Date	Time	Error Message
150	3	123	1515	Technician changed 150 Array data from 3 (123) 1515 to 8 (128) 1400
101	3	123	1600	Technician changed 101 Array data from 3 (123) 1600 to 8 (128) 1400
241	3	123	2400	Technician changed 241 Array from 3 (123) 2400 to 8 (128) 2400
243	3	123	2400	Technician changed 243 Array data from 3 (123) 2400 to 8 (128) 2400
244	3	123	2400	Technician changed 244 Array data from 3 (123) 2400 to 8 (128) 2400

The barometric sensor did not collect data due to wiring discrepancies from 05/03/01 1515-05/17/01. The data were deleted and replaced with 55555.

ArrayID	Day	Date	Time	Error Message
150	3	123	1515	Technician changed 150 Array data from 3 (123) 1515 to 17 (137) 1430
101	3	123	1600	Technician changed 101 Array data from 3 (123) 1600 to 17 (137) 1400
241	3	123	2400	Technician changed 241 Array from 3 (123) 2400 to 8 (128) 2400
241	10	130	2400	Technician changed 241 Array from 10 (130) 2400 to 16 (136) 2400
243	3	123	2400	Technician changed 243 Array data from 3 (123) 2400 to 8 (128) 2400
243	10	130	2400	Technician changed 243 Array data from 10 (130) 2400 to 16 (136) 2400
244	3	123	2400	Technician changed 244 Array data from 3 (123) 2400 to 8 (128) 2400
244	10	130	2400	Technician changed 244 Array data from 10 (130) 2400 to 16 (136) 2400

The rain gauge was not collecting valid data from 05/03/01 15:15 - 05/25/01 due to wiring discrepancies. Any rain events were changed to 55555.

ArrayID	Day	Date	Time	Error Message
151	3	123	1515	Technician changed 151 Array at 3 (123) 1515
151	4	124	1400	Technician changed 151 Array at 4 (124) 1400
151	7	127	1430	Technician changed 151 Array at 7 (127) 1430
151	17	137	1445	Technician changed 151 Array at 17 (137) 1445

On 05/30/01, the rain gauge was tested by pouring water into the funnel. The data recorded was not indicative of a real rain event so the data was changed to 0.0mm.

Anomalous data:

Wind speed was recorded at below 0.5 m/s numerous times in May, both before and after the new wind sentry sensor was installed. Data prior to May 3 may be indicative of actual wind events or the sensor may have lost sensitivity due to salt and sand build-up. Data after May 3 were most likely representative of real wind (or lack of) events.

The following anomalous events were also recorded and believed to be correct:

ArrayID	Day	Date	Time	Error Message
150	19	139	1345	Air temp difference from 19 (139) 1345 (33.49) to 19 (139) 1400 (29.274) is greater than 3.0 degrees C
150	28	148	1200	Air temp difference from 28 (148) 1200 (26.003) to 28 (148) 1215 (22.26) is greater than 3.0 degrees C
150	15	135	1445	Rel hum difference from 15 (135) 1445 (49.419) to 15 (135) 1500 (77.275) is greater than 25%
150	3	123	1245	Pressure difference from 3 (123) 1245 (1027.8) to 17 (137) 1445 (1013.6) is greater than 5 mb

Suspect program reload/changes occurred on May 17 and 30.

June 2001

Data corrections:
The weather station lost power from 1215-1300 on June 1, 1100 on June 6 and 1000 on June 26, causing the CR10X to reset and record incorrect hourly averages, daily averages, daily max and min values. Therefore, for the following dates and times, all 24-hour data were deleted and replaced with 55555 since the power loss to the CWS resulted in a loss of 5 second data.

ArrayID	Day	Date	Time	Error Message
241	1	152	2400	Technician changed 241 Array from 1 (152) 2400
241	6	157	2400	Technician changed 241 Array from 6 (157) 2400
241	26	177	2400	Technician changed 241 Array from 26 (177) 2400
242	1	152	2400	Technician changed 242 Array from 1 (152) 2400
242	6	157	2400	Technician changed 242 Array from 6 (157) 2400
242	26	177	2400	Technician changed 242 Array from 26 (177) 2400
243	1	152	2400	Technician changed 243 Array data from 1 (152) 2400
243	6	157	2400	Technician changed 243 Array data from 6 (157) 2400
243	26	177	2400	Technician changed 243 Array data from 26 (177) 2400
244	1	152	2400	Technician changed 244 Array data from 1 (152) 2400
244	6	157	2400	Technician changed 244 Array data from 6 (157) 2400
244	26	177	2400	Technician changed 244 Array data from 26 (177) 2400

Anomalous data:
Change in air temperature was greater than 3.0 C in a 15-minute period, and change in relative humidity was greater than 25% in a 15-minute period. Based on data from other parameters, (solar radiation and precipitation), the change in temperature and relative humidity were in response to a real weather event for the following dates.

Array	Date	Day	Time	Parameter
150	156	5	1400-1415	temp and rel hum
150	156	5	1430-1445	temp
150	158	7	1715-1730	temp and rel hum

Wind speed was less than 0.5 m/s several times throughout the month. Since the wind sensor was newly calibrated, the wind speeds were accurately monitored.

July 2001

During routine maintenance the Relative Humidity/Temperature probe tip became inadvertently unplugged from the base of sensor, causing erroneous data to be reported. These data, at the following dates and times, generated an error report indicating "air temperature difference greater than 3°C" errors and "relative humidity difference greater than 25%" errors in the error report therefore, the following temperature and relative humidity data was deleted and replaced with 55555:

ArrayID	Day	Date	Time	Error Message
101	9	190	1500	Technician changed 101 Array data from 9 (190) 1500 to 10 (191) 900
150	9	190	1400	Technician changed 150 Array data from 9 (190) 1400 to 10 (191) 815
241	9	190	2400	Technician changed 241 Array from 9 (190) 2400 to 10 (191) 2400
243	9	190	2400	Technician changed 243 Array data from 9 (190) 2400 to 10 (191) 2400
244	9	190	2400	Technician changed 244 Array data from 9 (190) 2400 to 10 (191) 2400

The following data appear to be correct:

ArrayID	Day	Date	Time	Error Message
150	2	183	1245	Air temp difference from 2 (183) 1245 (32.356) to 2 (183) 1300 (27.135) is greater than 3.0 degrees C
150	2	183	1330	Air temp difference from 2 (183) 1330 (26.405) to 2 (183) 1345 (23.333) is greater than 3.0 degrees C
150	11	192	1715	Air temp difference from 11 (192) 1715 (30.689) to 11 (192) 1730 (27.212) is greater than 3.0 degrees C
150	23	204	1000	Air temp difference from 23 (204) 1000 (28.759) to 23 (204) 1015 (25.206) is greater than 3.0 degrees C
150	23	204	1600	Air temp difference from 23 (204) 1600 (28.162) to 23 (204) 1615 (24.68) is greater than 3.0 degrees C
151	2	183	1615	Precip difference from 2 (183) 1615 (.762) to 2 (183) 1630 (8.89) is greater than 5 mm
151	2	183	1630	Precip difference from 2 (183) 1630 (8.89) to 2 (183) 1645 (.254) is greater than 5 mm
151	6	187	1330	Precip difference from 6 (187) 1330 (3.302) to 6 (187) 1345 (11.176) is greater than 5 mm
151	6	187	1345	Precip difference from 6 (187) 1345 (11.176) to 6 (187) 1400 (2.794) is greater than 5 mm
151	11	192	1830	Precip difference from 11 (192) 1830 (2.032) to 11 (192) 1845 (17.526) is greater than 5 mm
151	11	192	1845	Precip difference from 11 (192) 1845 (17.526) to 11 (192) 1900 (6.604) is greater than 5 mm
151	19	200	1600	Precip difference from 19 (200) 1600 (.254) to 19 (200) 1615 (8.89) is greater than 5 mm

August 2001

The following data appear to be correct:

ArrayID	Day	Date	Time	Error Message
150	18	230	1530	Air temp difference from 18 (230) 1530 (29.366) to 18 (230) 1545 (25.416) is greater than 3.0 degrees C
150	19	231	2115	Air temp difference from 19 (231) 2115 (27.638) to 19 (231) 2130 (23.285) is greater than 3.0 degrees C
151	8	220	100	Precip difference from 8 (220) 100 (2.54) to 8 (220) 115 (8.636) is greater than 5 mm
151	8	220	115	Precip difference from 8 (220) 115 (8.636) to 8 (220) 130 (.254) is greater than 5 mm
151	14	226	830	Precip difference from 14 (226) 830 (1.778) to 14 (226) 845 (16.764) is greater than 5 mm
151	14	226	845	Precip difference from 14 (226) 845 (16.764) to 14 (226) 900 (9.906) is greater than 5 mm
151	14	226	900	Precip difference from 14 (226) 900 (9.906) to 14 (226) 915 (.508) is greater than 5 mm
151	18	230	1745	Precip difference from 18 (230) 1745 (1.778) to 18 (230) 1800 (8.89) is greater than 5 mm
151	18	230	1800	Precip difference from 18 (230) 1800 (8.89) to 18 (230) 1815 (1.27) is greater than 5 mm
151	30	242	1215	Precip difference from 30 (242) 1215 (4.318) to 30 (242) 1230 (14.986) is greater than 5 mm
151	30	242	1245	Precip difference from 30 (242) 1245 (14.224) to 30 (242) 1300 (1.016) is greater than 5 mm

September 2001

The following data appear to be correct:

ArrayID	Day	Date	Time	Error Message
151	4	247	1415	Precip difference from 4 (247) 1415 (6.858) to 4 (247) 1430 (20.574) is greater than 5 mm
151	4	247	1445	Precip difference from 4 (247) 1445 (24.384) to 4 (247) 1500 (1.27) is greater than 5 mm
151	21	264	1300	Precip difference from 21 (264) 1300 (.762) to 21 (264) 1315 (7.874) is greater than 5 mm
151	24	267	1400	Precip difference from 24 (267) 1400 (.762) to 24 (267) 1415 (7.112) is greater than 5 mm

October 2001

The following data appear to be correct. The drop in humidity was confirmed at an external source.

ArrayID	Day	Date	Time	Error Message
150	16	289	2115	Rel hum difference from 16 (289) 2115 (77.463) to 16 (289) 2130 (49.718) is greater than 25%

November 2001

The weather station lost power from 0115 – 0915 and 1315-1330 on day 26, causing the CR10X to reset and record incorrect hourly averages, daily averages, daily max and min values. Therefore, for the following dates and times, all 24-hour data were deleted and replaced with 55555 since the power loss to the CWS resulted in a loss of 5 second data.

ArrayID	Day	Date	Time	Error Message
101	26	330	1000	Technician changed 101 Array data from 26 (330) 1000
101	26	330	1400	Technician changed 101 Array data from 26 (330) 1400
102	26	330	1000	Technician changed 102 Array from 26 (330) 1000
102	26	330	1400	Technician changed 102 Array from 26 (330) 1400
241	26	330	2400	Technician changed 241 Array from 26 (330) 2400
242	26	330	2400	Technician changed 242 Array from 26 (330) 2400
243	26	330	2400	Technician changed 243 Array data from 26 (330) 2400
244	26	330	2400	Technician changed 244 Array data from 26 (330) 2400

December 2001

The weather station had to be shutdown for fifteen minutes on 1545 on day 4, 1315 on day 5, and 1230 on day 6 for maintenance causing the CR10X to reset and record incorrect hourly averages, daily averages, daily max and min values. Therefore, for the following dates and times, all 24-hour data were deleted and replaced with 55555 since the power loss to the CWS resulted in a loss of 5 second data.

ArrayID	Day	Date	Time	Error Message
101	4	338	1600	Technician changed 101 Array data from 4 (338) 1600
101	5	339	1400	Technician changed 101 Array data from 5 (339) 1400
101	6	340	1300	Technician changed 101 Array data from 6 (340) 1300
102	4	338	1600	Technician changed 102 Array from 4 (338) 1600
102	5	339	1400	Technician changed 102 Array from 5 (339) 1400
102	6	340	1300	Technician changed 102 Array from 6 (340) 1300
241	4	338	2400	Technician changed 241 Array from 4 (338) 2400 to 6 (340) 2400
242	4	338	2400	Technician changed 242 Array from 4 (338) 2400 to 6 (340) 2400
243	4	338	2400	Technician changed 243 Array data from 4 (338) 2400 to 6 (340) 2400
244	4	338	2400	Technician changed 244 Array data from 4 (338) 2400 to 6 (340) 2400

The following data appear to be correct:

Array	Day	Date	Time	Error Message
150	23	357	715	Air temp difference from 23 (357) 715 (7.4496) to 23 (357) 730 (10.937) is greater than 3.0 degrees C

12. 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.

January 2001
Missing 15-minute data, most likely caused by an update to the CR10X program, which interfered with the collection of data at the following date and time.

Array	Date	Day	Time
150	11	11	16:15

February 2001
No missing data.

March 2001
No missing data.

April 2001
Missing 15 minute data due to datalogger clock being reset.

Array	Date	Day	Time
150	108	18	15:15+15:30

May 2001
The weather station sensors were replaced during this month with newly calibrated probes. During this time the weather station was not operating. For some sensors, the software program needed to be rewritten and the wiring needed to be reconfigured, and so there are extended periods of time where data weren't being collected.

On the following dates the weather station was powered down to mount and wire new sensors. No data were collected for any parameters.
05/03/01 13:00-15:00
05/04/01 13:30-13:45
05/08/01 14:15
05/09/01 11:15 - 05/10/01 08:45
05/10/01 13:15-15:15

June 2001
Missing 15-minute data (array 150). The weather station was powered down for maintenance during the following dates and times, so data was not collected. Additionally, the hourly averages were not computed due to the missing 15-minute data.

Array	Date	Day	Time
150	152	1	1215-1300
101	152	1	1300
102	152	1	1300
150	157	6	1100
101	157	6	1100
102	157	6	1100
150	177	6	1000
101	177	6	1000
102	177	6	1000

July 2001

The following data were missing due to the weather station being down:

Array	Day	Date	Time	Error Message
150	13	194	100	Missing 150 Array (15 minute data)
101	13	194	100	Missing 101 Array (Hourly Averages)
102	13	194	100	Missing 102 Array (Hourly Average Wind Parameters)

August 2001

The following data were missing:

Array	Day	Date	Time	Error Message
150	28	240	15	Missing 150 Array data (15 minute data) from 28 (240) 15 to 28 (240) 100
101	28	240	100	Missing 101 Array (Hourly Averages)
102	28	240	100	Missing 102 Array (Hourly Average Wind Parameters)

September 2001
None

October 2001

The following data were missing:

Array	Day	Date	Time	Error Message
150	20	293	100	Missing 150 Array (15 minute data)
101	20	293	100	Missing 101 Array (Hourly Averages)
102	20	293	100	Missing 102 Array (Hourly Average Wind Parameters)

November 2001

The following data were missing due to loss of power:

Array	Day	Date	Time	Error Message
150	26	330	115	Missing 150 Array data (15 minute data) from 26 (330) 115 to 26 (330) 915
150	26	330	1315	Missing 150 Array data (15 minute data) from 26 (330) 1315 to 26 (330) 1330
101	26	330	200	Missing 101 Array data (Hourly Averages) from

26 (330) 200 to 26 (330) 900
102 26 330 200 Missing 102 Array data (Hourly Average Wind Parameters) from 26 (330) 200 to 26 (330) 900

December 2001

The following data were missing due power shutdown for maintenance.

Array	Day	Date	Time	Error Message
150	4	338	1545	Missing 150 Array (15 minute data)
150	5	339	1315	Missing 150 Array (15 minute data)
150	6	340	1230	Missing 150 Array (15 minute data)

13. Other Remarks:

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 above it was noted that July data were missing even though the metadata mentioned suspect data for July. Archived monthly data from 2001 was used to replace those missing records.

In June 2009, in order to repopulate data tables, the Centralized Data Management Office removed all -99999 from SWMP weather data files and replaced them with -99.

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.

Rain Events:

Jan 2001

Calendar Day	Daily Precipitation Totals (mm)
8	2.794
12	4.572
13	.254
14	9.144
15	.254
19	1.778
20	6.096
30	2.286
Monthly Tot	27.2

Feb 2001

Calendar Day	Daily Precipitation Totals (mm)
8	.254
9	.254
10	1.270
12	9.652
2	.254
4	11.938
5	5.588
12	.254
13	7.620
14	.254
17	.254
19	7.366
22	6.350
24	.254
25	1.270
26	2.286
28	8.382
Monthly Tot	63.5

Mar 2001

Calendar Day	Daily Precipitation Totals (mm)
3	17.018
4	9.652
9	1.270
12	4.826
13	20.320
15	17.018
17	.254
20	69.850
21	1.778
25	3.302
26	.254
29	8.128
30	.508

Monthly Tot 154.2

Apr 2001

Calendar Day	Daily Precipitation Totals (mm)
1	8.890
17	2.286
20	.254
25	20.320

Monthly Tot 31.8

May 2001

Calendar Day	Daily Precipitation Totals (mm)
28	.254
31	.762

Monthly Tot 1.0

Jun 2001

Calendar Day	Daily Precipitation Totals (mm)
5	3.810
6	4.826
7	11.684
8	.254
13	7.112
14	1.016

15	7.112
16	14.224
22	6.096
23	1.524

Monthly Tot 57.7

Jul 2001

Calendar Day	Daily Precipitation Totals (mm)
2	16.002
3	.254
5	4.572
6	19.304
7	.254
8	4.826
11	27.940
12	.254
19	14.986
23	18.542
27	3.302
29	1.016
30	3.048

Monthly Tot 114.3

Aug 2001

Calendar Day	Daily Precipitation Totals (mm)
2	3.556
8	14.732
13	3.556
14	37.592
18	16.002
19	3.302
20	1.270
24	7.112
25	.254
29	1.524
30	71.120
31	8.890

Monthly Tot 168.9

Sep 2001

Calendar Day	Daily Precipitation Totals (mm)

1	4.064
3	.508
4	63.500
6	.762
8	1.524
9	4.064
11	.508
14	4.572
21	13.716
22	.508
24	10.160
25	.508

Monthly Tot 104.4

Oct 2001

Calendar Day	Daily Precipitation Totals (mm)
6	1.016
14	3.048
20	4.318
21	.254

Monthly Tot 8.6

Nov 2001

Calendar Day	Daily Precipitation Totals (mm)
1	.508
2	.254
20	3.556
23	8.128
24	9.144
25	4.318
28	.254
29	.254
30	.254

Monthly Tot 26.7

Dec 2001

Calendar Day	Daily Precipitation Totals (mm)
4	.508
5	.254
6	.254
9	.254

10	8.382
11	15.494
14	1.524
18	5.588

Monthly Tot 32.3