

Hudson River (HUD) NERR Meteorological Metadata
January 2002 - December 2002
Latest Update: **August 23, 2024**

I. Data Set & Research Descriptors

1. Principal Investigator: William C. Nieder, Research Coordinator

Contact Persons:

William C. Nieder, Research Coordinator, email: wcnieder@gw.dec.state.ny.us
Erik Bedan, Research Assistant, email: esbedan@gw.dec.state.ny.us

Address:

Hudson River NERR
c/o Bard College Field Station
Annandale, NY 12504
Phone: 845-758-7010
Fax: 845-758-7033

2. Entry verification:

Person responsible for data verification: Erik Bedan, Research Assistant

a) Data Input Procedures:

The 15-minute, 1-hour average, and 24-hour data were downloaded from each instrument on the weather station to a Campbell Scientific CR10X datalogger. The CDMO Datalogger Program (hud30.csi) was loaded into the CR10X, which controls the sensors and the data collection schedule (see 2b of the Entry Verification section for the data collection schedule). For data storage, the CR10X stored the data, via cable, on a Campbell Scientific SM 192 storage module. The storage module was manually retrieved at the end of every month. Using the PC208W software supplied by Campbell Scientific, the data were uploaded from the storage module and stored on computer. All raw data files were archived at the CDMO and at the reserve on ditto tapes, and CD-ROM. Anomalous or missing data were either deleted or identified in sections 11 & 12.

After the data upload, the CDMO Weather Data Management Program (WDMP) was used to convert the data into 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 were three main tasks completed by the WDMP. 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 were investigated and were noted below in Anomalous Data section. Any data corrections that were performed were noted in the Data Correction section below. Most common errors from monthly reports were wind speeds below

the 0.5m/s criteria.

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:

The objective of this study is to monitor the meteorological conditions at the Tivoli Bays component site of the Hudson River National Estuarine Research Reserve. Measurements are taken all year long at one location in accordance with section 2b of the Entry Verification section. A water quality-monitoring program has been ongoing for ten years at this component site, and the meteorological data will help provide ancillary data to that program. In turn, this will help us to better understand the relationships between the atmospheric and aquatic environments at this site.

4. Research methods:

For data collection, the CR10X datalogger is programmed at intervals that are in accordance with section 2b of the Entry Verification section. Data are retrieved and stored from the datalogger via the Campbell Scientific storage module at the end of each month. The data are analyzed using only the Weather Data Management Program (WDMP). The program creates a database and error report for each month of raw data. The error reports are used to aid in the QA/QC of the data, along with the guidelines in section 2c. Any errors are reported and corrected (if necessary) in sections 11 & 12. For routine maintenance, sensors are investigated at least once a week to ensure there is no damage or blockage to the sensors. According to Campbell Scientific, for proper data collection, sensors are to be calibrated every two 2 years. After that time, the sensors are removed from the tower, and shipped to their respective manufacturer. The calibration methods are performed by the manufacturers for proper and professional calibration. In order to avoid missing data, a second set of sensors will be calibrated and available to be installed on the tower to continue data collection.

5. Site location and character:

The Hudson River National Estuarine Research Reserve (HUDNERR) is a multi-component site composed of approximately 5,000 acres of tidal wetland, open water, and adjacent upland buffer habitat. The four component sites of the Reserve are located on the Hudson River in New York State by river miles (RM) proceeding north from the southern tip of Manhattan. These include: Stockport Flats (RM 124)(42°02'30"N 73°46'00"W), Columbia County; Tivoli Bays (RM 98)(42°02'15"N 73°55'10"W), Dutchess County; and Iona Island (RM 45)(41°18'15"N 73°58'45"W) and Piermont Marsh (RM 24)(41°02'30"N 73°54'15"W), Rockland County. These four components are located along 100 river miles of the Hudson River and are representative of the diverse plant and animal communities that occupy the salinity gradient within the Hudson estuary. Development within the watersheds of Hudson River NERR component sites ranges from predominantly urban/suburban to forested/agricultural.

The weather station (FS) is located at the Tivoli Bays component site in Annandale, NY (42°01'05.46"N 73°55'01.13"W). A 30 foot, aluminum tower is used to elevate some of the weather monitoring equipment. The tower is on the deck of the office building, on the west side, 9 feet off the ground. The wind anemometer, wind speed, and light sensors are all located at the top of the tower, 39 feet off the ground. Both the datalogger and barometric pressure sensor are enclosed within a fiberglass case attached to the tower, 12 feet off the ground. A heated rain gauge is next to the tower, attached to the building, 16 feet off the ground. The temperature/humidity sensor is next to the tower, attached to the deck handrail, 12 feet off the ground. Although trees surround the area, the tree line begins approximately 60 feet from the tower in most directions. The trees are at similar heights to the tower, but the sensors are not shaded at that location. The tower is approximately 1.2 miles Southeast of the TS water quality monitoring station, 2.3 miles Southeast of the TN water

quality monitoring station, and 0.2 miles Northwest of the SK water quality monitoring station.

6. Data collection period:

The first data were recorded on January 14, 2002 at 16:45 hours EST, and ended on December 31, 2002 at 2400 hours EST.

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:

The Hudson River NERR water quality-monitoring program examines the physical and chemical constituents of the tributary waters and the tidal waters discharging into the HUDNERR marshes and marsh waters. Measurements include seston, dissolved oxygen (DO), alkalinity, pH, temperature, salinity, and conductivity. In addition, samples are analyzed for nutrient concentrations of nitrate, phosphate, sulphate, and chloride.

Associated researchers with work at Tivoli Bays include: scientists from the Institute of Ecosystem Studies, Millbrook, NY; Yale School of Forestry and Environmental Studies, New Haven, CT; and Rensselaer Polytechnic Institute,

Troy, NY.

II. Physical Structure Descriptors

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

Sensors in use from July 2001-June 2002:

Li-Cor Quantum Sensor

Model # LI190SB

Stability: $<\pm 2\%$ change over 1 yr

Operating Temperature: -40 to 65°C

Sensitivity: typically $5\ \mu\text{A}$ per $1000\ \mu\text{moles s}^{-1}\text{ m}^{-2}$

Light spectrum wavelength: $400\text{--}700\ \text{nm}$

Date of last calibration: December 2000

Wind Sentry

Model # 03001

Operating Range: $0\text{--}50\ \text{m/s}$; 360° mechanical

Date of last calibration: December 2000

Temperature and Relative Humidity

Model #: HMP35C

Operating Range: -35 to 50°C

Temperature Accuracy: $\pm 0.2^{\circ}\text{C}$ @ 20°C

Relative Humidity Measurement Range: $0\text{--}100\%$ non-condensing

RH Accuracy: $\pm 2\%$ RH ($0\text{--}90\%$) and $\pm 3\%$ ($90\text{--}100\%$)

Uncertainty of calibration: $\pm 1.2\%$ RH

Date of Last calibration: December 2000

Barometric Pressure Sensor

Model # CS105

Operating Range: 600 to $1060\ \text{mb}$

Operating Temperature: -40 to 60°C

Humidity: non-condensing

Accuracy: ± 0.5 to $6.0\ \text{mb}$ ($+20$ to 60°C)

Stability: $\pm 0.1\ \text{mb}$ per year

Date of Last calibration: December 2000

Tipping Bucket Rain and Snow Gauge

Model #: 375-L

Operating Range: -20°C to 50°C ; $0\text{--}100\%$ RH

Sensitivity: 0.1mm

Accuracy: $\pm 0.5\%$ at $<1.25/\text{hr}$

Date of Last calibration: December 2000

The following sensors in use from July 2002-February 2003:

Li-Cor Quantum Sensor

Model # LI190SB

Stability: $<\pm 2\%$ change over 1 yr

Operating Temperature: -40 to 65°C

Sensitivity: typically 5 mV per 1000 micromoles $\text{s}^{-1} \text{m}^{-2}$

Light spectrum wavelength: 400-700 nm

Date of last calibration: May 2002

Wind Sentry

Model # 03001

Operating Range: 0-50 m/s; 360° mechanical

Date of last calibration: May 2002

Temperature and Relative Humidity

Model #: HMP45C

Operating Range: -35°C to 50°C

Temperature Accuracy: $\pm 0.2^{\circ}\text{C}$ @ 20°C

Relative Humidity Measurement Range: 0-100% non-condensing

RH Accuracy: $\pm 2\%$ RH (0-90%) and $\pm 3\%$ (90-100%)

Uncertainty of calibration: $\pm 1.2\%$ RH

Date of Last calibration: May 2002

Barometric Pressure Sensor

Model # CS105

Operating Range: 600-1060 mb

Operating Temperature: -40°C to 60°C

Humidity: non-condensing

Accuracy: ± 0.5 to 6.0 mb ($+20^{\circ}\text{C}$ to 60°C)

Stability: ± 0.1 mb per year

Date of Last calibration: May 2002

Tipping Bucket Rain and Snow Gauge

Model #: 375-L

Operating Range: -20°C to 50°C ; 0-100% RH

Sensitivity: 0.1mm

Accuracy: $\pm 0.5\%$ at $<1.25/\text{hr}$

Date of Last calibration: May 2002

10. Coded variable indicator and variable code definitions:

FS - Field Station at Tivoli Bays

11. Data anomalies:

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.

PAR flagging update August 2024:

During SWMP data synthesis work it was noted that PAR values were anomalously high beginning in 2001 and returned to more expected values following the sensor swap on June 3, 2002. PAR data flagging was changed by the CDMO to suspect from January 10, 2001 15:15 through June 3, 2002 07:45.

January 2002

At this site, wintery weather requires us to utilize a heating tipping bucket for precipitation data. The heater may not have been functioning this month, precipitation data are suspect.

Array	Day	Julian	Time	Error
102	14	14	1700	Wind speed is less than 0.5 m/s from 14 (14)
			1700 to 15 (15)	800
102	19	19	1700	Wind speed is less than 0.5 m/s from 19 (19)
			1700 to 20 (20)	900
102	30	30	2300	Wind speed is less than 0.5 m/s from 30 (30)
			2300 to 31 (31)	2400

February 2002

The following error occurred because the "1 hour data" is averaged from 5-second readings taken during that hour while the "15 minute data" (in this case the 15 minute maximum) is not averaged, and only recorded at 15-minute intervals. The data were left in.

Array	Julian	Day	Time	Error
101	44	13	1500	Air temp average in 1 hour data (.02) is greater than 15 minute maximum (-.00712)

Array	Day	Julian	Time	Error
102	1	32	100	Wind speed is less than 0.5 m/s from 1 (32)
			100 to 1 (32)	1300
102	6	37	2200	Wind speed is less than 0.5 m/s from 6 (37)
			2200 to 7 (38)	1000
102	11	42	1900	Wind speed is less than 0.5 m/s from 11 (42)
			1900 to 12 (43)	800
102	16	47	1600	Wind speed is less than 0.5 m/s from 16 (47)
			1600 to 17 (48)	700

March 2002

Data points were reviewed before and after the following errors. There was a notable change, but the data were consistent. It was most likely an event. The data were left in.

Array	Julian	Day	Time	Error
150	62	3	1800	Air temp difference from 3 (62) 1800 (13.667) to 3 (62) 1815 (10.559) is greater than 3.0 degrees C
150	68	9	1315	Air temp difference from 9 (68) 1315 (14.308) to 9 (68) 1330 (17.684) is greater than 3.0 degrees C
150	80	21	1915	Air temp difference from 21 (80) 1915 (9.735) to 21 (80) 1930 (5.9559) is greater than 3.0 degrees C

Data points were reviewed before and after the following error. There was a notable change, but the data were consistent. It was most likely an event. The data were left in.

Array	Julian	Day	Time	Error
150	62	3	2030	Rel hum difference from 3 (62) 2030 (46.337) to 3 (62) 2045 (73.16) is greater than 25%

Array	Day	Julian	Time	Error
102	12	71	1800	Wind speed is less than 0.5 m/s from 12 (71) 1800 to 13 (72) 1000
102	13	72	1600	Wind speed is less than 0.5 m/s from 13 (72) 1600 to 14 (73) 900
102	14	73	1800	Wind speed is less than 0.5 m/s from 14 (73) 1800 to 15 (74) 600
102	17	76	1700	Wind speed is less than 0.5 m/s from 17 (76) 1700 to 18 (77) 1500
102	18	77	1700	Wind speed is less than 0.5 m/s from 18 (77) 1700 to 19 (78) 800
102	19	78	1700	Wind speed is less than 0.5 m/s from 19 (78) 1700 to 21 (80) 1100

April 2002

Data points were reviewed before and after the following errors. There was a notable change, but the data were consistent. It was most likely an event. The data were left in.

Array	Julian	Day	Time	Error
150	107	17	1015	Air temp difference from 17 (107) 1015 (26.043) to 17 (107) 1030 (29.052) is greater than 3.0 degrees C
150	109	19	1200	Air temp difference from 19 (109) 1200 (29.947) to 19 (109) 1215 (26.558) is greater than 3.0 degrees C
150	109	19	1215	Air temp difference from 19 (109) 1215 (26.558) to

19 (109) 1230 (19.046) is greater than 3.0 degrees C

Data points were reviewed before and after the following error. There was a notable change, and some fluctuation in temperature data occurred. Ultimately, the cause is unknown, and the data were left in.

Array	Julian	Day	Time	Error
150	107	17	1430	Air temp difference from 17 (107) 1430 (33.519) to 17 (107) 1445 (36.609) is greater than 3.0 degrees C

Data points were reviewed before and after the following error. There was a notable change, but the data were consistent. It was most likely an event. The data were left in.

Array	Julian	Day	Time	Error
150	109	19	1215	Rel hum difference from 19 (109) 1215 (56.917) to 19 (109) 1230 (95.75) is greater than 25%

Array	Day	Julian	Time	Error
102	10	100	1900	Wind speed is less than 0.5 m/s from 10 (100) 1900 to 11 (101) 700
102	15	105	1800	Wind speed is less than 0.5 m/s from 15 (105) 1800 to 16 (106) 800
102	16	106	1900	Wind speed is less than 0.5 m/s from 16 (106) 1900 to 17 (107) 800
102	18	108	1800	Wind speed is less than 0.5 m/s from 18 (108) 1800 to 19 (109) 700
102	21	111	1900	Wind speed is less than 0.5 m/s from 21 (111) 1900 to 22 (112) 2000
102	25	115	1900	Wind speed is less than 0.5 m/s from 25 (115) 1900 to 26 (116) 700
102	27	117	1700	Wind speed is less than 0.5 m/s from 27 (117) 1700 to 29 (119) 800

May 2002

Data points were reviewed before and after the following errors. There was a notable change, but the data were consistent. It was most likely an event. The data were left in.

Array	Julian	Day	Time	Error
150	151	31	1315	Air temp difference from 31 (151) 1315 (24.429) to 31 (151) 1330 (20.242) is greater than 3.0 degrees C
150	151	31	1715	Air temp difference from 31 (151) 1715 (20.772) to 31 (151) 1730 (17.752) is greater than 3.0 degrees C

Data points were reviewed before and after the following errors. The cause is

unknown, and it was most likely an event. The data were left in.

Array	Julian	Day	Time	Error
150	141	21	1315	Rel hum difference from 21 (141) 1315 (58.12) to 21 (141) 1330 (85.336) is greater than 25%
150	141	21	1330	Rel hum difference from 21 (141) 1330 (85.336) to 21 (141) 1345 (60.198) is greater than 25%
150	141	21	1415	Rel hum difference from 21 (141) 1415 (51.014) to 21 (141) 1430 (76.353) is greater than 25%
150	141	21	1445	Rel hum difference from 21 (141) 1445 (91.838) to 21 (141) 1500 (64.019) is greater than 25%

Data points were reviewed before and after the following errors. There was a notable change, and it was most likely an event. The data were left in.

Array	Julian	Day	Time	Error
151	122	2	1930	Precip difference from 31 (122) 1930 (.508) to 31 (122) 1945 (5.588) is greater than 5 mm
151	122	2	1945	Precip difference from 31 (122) 1945 (5.588) to 31 (122) 2000 (.508) is greater than 5 mm

Array	Day	Julian	Time	Error
102	1	121	1800	Wind speed is less than 0.5 m/s from 1 (121) 1800 to 2 (122) 900
102	4	124	1800	Wind speed is less than 0.5 m/s from 4 (124) 1800 to 5 (125) 800
102	5	125	1800	Wind speed is less than 0.5 m/s from 5 (125) 1800 to 6 (126) 700
102	8	128	1800	Wind speed is less than 0.5 m/s from 8 (128) 1800 to 9 (129) 900
102	11	131	1800	Wind speed is less than 0.5 m/s from 11 (131) 1800 to 13 (133) 2300
102	19	139	2000	Wind speed is less than 0.5 m/s from 19 (139) 2000 to 20 (140) 800
102	22	142	1900	Wind speed is less than 0.5 m/s from 22 (142) 1900 to 23 (143) 800
102	26	146	1800	Wind speed is less than 0.5 m/s from 26 (146) 1800 to 27 (147) 1100
102	27	147	1800	Wind speed is less than 0.5 m/s from 27 (147) 1800 to 28 (148) 1400
102	28	148	1600	Wind speed is less than 0.5 m/s from 28 (148) 1600 to 29 (149) 1100

The following hourly and daily data were deleted on May 3 due to loss of 5 second data resulting from station maintenance from 1400-1430.

Array	Day	Julian	Time	Error
101	3	123	1500	Technician changed 101 Array data from 3 (123) 1500
102	3	123	1500	Technician changed 102 Array from 3 (123) 1500

241	3	123	2400	Technician changed 241 Array from 3 (123) 2400
242	3	123	2400	Technician changed 242 Array from 3 (123) 2400
243	3	123	2400	Technician changed 243 Array data from 3 (123) 2400
244	3	123	2400	Technician changed 244 Array data from 3 (123) 2400

Pressure sensor errors (-99999) were recorded on May 20 @ 1900 in array 150 and @ 2400 in array 244. Reason unknown.

June 2002

The station was not collecting data due to equipment maintenance on 06/03/02 from 800-1400. The following data were removed:

Array	Day	Julian	Time	Error
101	3	154	800	Technician changed 101 Array data from 3 (154) 800 to 3 (154) 1300
102	3	154	800	Technician changed 102 Array from 3 (154) 800 to 3 (154) 1300
241	3	154	2400	Technician changed 241 Array from 3 (154) 2400 to 3 (154) 2400
242	3	154	2400	Technician changed 242 Array from 3 (154) 2400 to 3 (154) 2400
243	3	154	2400	Technician changed 243 Array data from 3 (154) 2400 to 3 (154) 2400
244	3	154	2400	Technician changed 244 Array data from 3 (154) 2400 to 3 (154) 2400

Anomalous criteria for wind speed (i.e. "wind speed is less than 0.5m/s") were listed many times in the WDMP error report for this month as possible errors. We are certain the sensor was operating properly, most likely there was simply no wind. The data were left in.

Data points were reviewed before and after the following errors. Other parameters changed along with the air temperature, it was most likely an event. The data were left in.

Array	Day	Julian	Time	Error
150	22	173	1315	Air temp difference from 22 (173) 1315 (28.418) to 22 (173) 1330 (25.071) is greater than 3.0 degrees C
150	23	174	1900	Air temp difference from 23 (174) 1900 (28.496) to 23 (174) 1915 (25.283) is greater than 3.0 degrees C
150	26	177	1415	Air temp difference from 26 (177) 1415 (31.8) to 26 (177) 1430 (22.773) is greater than 3.0 degrees C

The data were left in.

Array	Day	Julian	Time	Error
150	26	177	1415	Rel hum difference from 26 (177) 1415 (59.822) to 26 (177) 1430 (91.751) is greater than 25%

An error message of "Pressure is greater than 1040 or less than 980" occurred

for all 15 minute data from 06/03/02 1400 - 06/30/02 2400. This was due to improper installation of the barometric pressure sensor (the jumper was not installed). These data were removed.

Array	Day	Julian	Time	Error
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150	3	154	1400	Technician changed 150 Array data at 3 (154) 1400 to 30 (181) 2400
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101	3	154	1400	Technician changed 101 Array data at 3 (154) 1400 to 30 (181) 2400
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241	3	154	2400	Technician changed 241 Array data at 3 (154) 2400 to 30 (181) 2400
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243	3	154	2400	Technician changed 243 Array data at 3 (154) 2400 to 30 (181) 2400
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244	3	154	2400	Technician changed 244 Array data at 3 (154) 2400 to 30 (181) 2400
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Array	Day	Julian	Time	Error
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151	5	156	2145	Precip difference from 5 (156) 2145 (6.096) to 5 (156) 2200 (1.016) is greater than 5 mm
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151	26	177	1430	Precip difference from 26 (177) 1430 (5.588) to 26 (177) 1445 (.254) is greater than 5 mm
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July 2002

Anomalous criteria for wind speed (i.e. "wind speed is less than 0.5m/s") were listed many times in the WDMP error report for this month as possible errors. We are certain the sensor was operating properly, most likely there was simply no wind. The data were left in.

An error message of "Pressure is greater than 1040 or less than 980" occurred for all 15 minute data from 07/01/02 0000 - 07/31/02 2400. This was due to improper installation of the barometric pressure sensor (the jumper was not installed). These data were removed.

Array	Day	Julian	Time	Error
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101	1	182	100	Technician changed 101 Array data at 1 (182) 100 to 31 (212) 2400
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150	1	182	15	Technician changed 150 Array data at 1 (182) 15 to 31 (212) 2400
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241	1	182	2400	Technician changed 241 Array data at 1 (182) 2400 to 31 (212) 2400
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243	1	182	2400	Technician changed 243 Array data at 1 (182) 2400 to 31 (212) 2400
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244	1	182	2400	Technician changed 244 Array data at 1 (182) 2400 to 31 (212) 2400
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Data points were reviewed before and after the following error. Other parameters changed along with the air temperature, it was most likely an event. The data

were left in.

Array	Day	Julian	Time	Error
150	23	204	1300	Air temp difference from 23 (204) 1300 (32.746) to 23 (204) 1315 (23.848)

Data points were reviewed before and after the following error. Other parameters changed along with the relative humidity, it was most likely an event. The data were left in.

Array	Day	Julian	Time	Error
150	23	204	1300	Rel hum difference from 23 (204) 1300 (57.488) to 23 (204) 1315 (89.882) is greater than 25%

August 2002

Anomalous criteria for wind speed (i.e. "wind speed is less than 0.5m/s") were listed many times in the WDMP error report for this month as possible errors. We are certain the sensor was operating properly, most likely there was simply no wind. The data were left in.

An error message of "Pressure is greater than 1040 or less than 980" occurred for all 15 minute data from 08/01/02 0000 - 08/30/02 2400. This was due to improper installation of the barometric pressure sensor (the jumper was not installed). These data were removed.

Array	Day	Julian	Time	Error
101	1	213	100	Technician changed 101 Array data at 1 (213) 100 to 31 (243) 2400
150	1	213	15	Technician changed 150 Array data at 1 (213) 15 to 31 (243) 2400
241	1	213	2400	Technician changed 241 Array data at 1 (213) 2400 to 31 (243) 2400
243	1	213	2400	Technician changed 243 Array data at 1 (213) 2400 to 31 (243) 2400
244	1	213	2400	Technician changed 244 Array data at 1 (213) 2400 to 31 (243) 2400

Data points were reviewed before and after the following errors. Many parameters exhibited a sudden change while errors were recorded, it was most likely an event. All the following the data were left in.

Array	Day	Julian	Time	Error
150	2	214	1715	Air temp difference from 2 (214) 1715 (23.44) to 2 (214) 1730 (20.224) is greater than 3.0 degrees C
150	16	228	1400	Air temp difference from 16 (228) 1400 (33.881) to 16 (228) 1415 (25.248) is greater than 3.0 degrees C
150	18	230	1530	Air temp difference from 18 (230) 1530 (33.41) to 18 (230) 1545 (27.523) is greater than 3.0 degrees C

Array ID	Calendar Date	Julian Day	Time	Error Message
150	16	228	1400	Rel hum difference from 16 (228) 1400 (44.636) to 16 (228) 1415 (84.588) is greater than 25%

150 18 230 1530 Rel hum difference from 18 (230) 1530 (44.635) to 18 (230) 1545 (76.156) is greater than 25%

Array Day Julian Time Error

151 2 214 1715 Precip difference from 2 (214) 1715 (.254) to 2 (214) 1730 (7.366) is greater than 5 mm

151 2 214 1730 Precip difference from 2 (214) 1730 (7.366) to 2 (214) 1745 (.254) is greater than 5 mm

September 2002

Anomalous criteria for wind speed (i.e. "wind speed is less than 0.5m/s") were listed many times in the WDMP error report for this month as possible errors. We are certain the sensor was operating properly, most likely there was simply no wind. The data were left in.

An error message of "Pressure is greater than 1040 or less than 980" occurred for all 15 minute data from 09/01/02 0000 - 09/30/02 2400. This was due to improper installation of the barometric pressure sensor (the jumper was not installed). These data were removed.

Array Day Julian Time Error

101 1 244 100 Technician changed 101 Array data at 1 (244) 100 to 30 (273) 2400

150 1 244 15 Technician changed 150 Array data at 1 (244) 15 to 30 (273) 2400

241 1 244 2400 Technician changed 241 Array data at 1 (244) 2400 to 30 (273) 2400

243 1 244 2400 Technician changed 243 Array data at 1 (244) 2400 to 30 (273) 2400"

244 1 244 2400 Technician changed 244 Array data at 1 (244) 2400 to 30 (273) 2400

Data points were reviewed before and after the following errors. The relative humidity was near 100%, it was most likely a rain event. The data were left in.

Array Day Julian Time Error

151 27 270 2130 Precip difference from 27 (270) 2130 (1.27) to 27 (270) 2145 (9.906) is gr

151 27 270 2145 Precip difference from 27 (270) 2145 (9.906) to 27 (270) 2200 (4.318) is g

October 2002

Anomalous criteria for wind speed (i.e. "wind speed is less than 0.5m/s") were listed many times in the WDMP error report for this month as possible errors. We are certain the sensor was operating properly, most likely there was simply no wind. The data were left in.

An error message of "Pressure is greater than 1040 or less than 980" occurred for all 15 minute data from 10/01/02 0000 - 10/31/02 2400. This was due to improper installation of the barometric pressure sensor (the jumper was not

installed). These data were removed.

Array	Day	Julian	Time	Error
101	1	274	100	Technician changed 101 Array data at 1 (274) 100 to 31 (304) 2400
150	1	274	15	Technician changed 150 Array data at 1 (274) 15 to 31 (304) 2400
241	1	274	2400	Technician changed 241 Array data at 1 (274) 2400 to 31 (304) 2400
243	1	274	2400	Technician changed 243 Array data at 1 (274) 2400 to 31 (304) 2400
244	1	274	2400	Technician changed 244 Array data at 1 (274) 2400 to 31 (304) 2400

Data points were reviewed before and after the following error. There was a change in the readings, but the cause is unknown. The data were suspect, but left in.

Array	Day	Julian	Time	Error
150	27	300	500	Air temp difference from 27 (300) 500 (4.5636) to 27 (300) 515 (7.5838) is greater than 3.0 degrees C

November 2002

Anomalous criteria for wind speed (i.e. "wind speed is less than 0.5m/s") were listed many times in the WDMP error report for this month as possible errors. We are certain the sensor was operating properly, most likely there was simply no wind. The data were left in.

An error message of "Pressure is greater than 1040 or less than 980" occurred for all 15 minute data from 11/01/02 0000 - 11/07/02 1030. This was due to improper installation of the barometric pressure sensor (the jumper was not installed). These data were removed.

Array	Day	Julian	Time	Error
101	1	305	100	Technician changed 101 Array data from 1 (305) 100 to 7 (311) 1100
150	1	305	15	Technician changed 150 Array data from 1 (305) 15 to 7 (311) 1030
241	1	305	2400	Technician changed 241 Array from 1 (305) 2400 to 6 (310) 2400
243	1	305	2400	Technician changed 243 Array data from 1 (305) 2400 to 6 (310) 2400
244	1	305	2400	Technician changed 244 Array data from 1 (305) 2400 to 7 (311) 2400

Data points were reviewed before and after the following error. The data appears consistent, and it was likely an event. The data were left in.

Array	Day	Julian	Time	Error
150	11	315	1330	Air temp difference from 11 (315) 1330 (21.162) to 11 (315) 1345 (18.081) is greater than 3.0 degrees C

The following error occurred because the "1 hour data" is averaged from 5-second readings taken during that hour while the "15 minute data" (in this case the 15 minute maximum) is not averaged, and only recorded at 15-minute intervals. The data were left in.

Array	Day	Julian	Time	Error
101	16	320	1300	Air temp average in 1 hour data (-.4325) is less than 15 minute minimum (-.38942) by at least 10%
101	16	320	1500	Air temp average in 1 hour data (-.22167) is less than 15 minute minimum (-.18801) by at least 10%
101	27	331	400	Air temp average in 1 hour data (.02151) is greater than 15 minute maximum (.00669) by at least 10%

December 2002

Data points were reviewed before and after the following error. The data appears consistent, and it was likely an event. The data were left in.

Array	Day	Julian	Time	Error
150	19	353	1100	Air temp difference from 19 (353) 1100 (-1.3718) to 19 (353) 1115 (3.3897) is greater than 3.0 degrees C

Anomalous criteria for wind speed (i.e. "wind speed is less than 0.5m/s") were listed a few times in the WDMP error report for this month as possible errors. We are certain the sensor was operating properly, most likely there was simply no wind. The data were left in.

Array	Day	Julian	Time	Error
102	4	338	2000	Wind speed is less than 0.5 m/s from 4 (338) 2000 to 5 (339) 1200
102	5	339	1400	Wind speed is less than 0.5 m/s from 5 (339) 1400 to 6 (340) 1800
102	10	344	1500	Wind speed is less than 0.5 m/s from 10 (344) 1500 to 11 (345) 1000
102	12	346	1300	Wind speed is less than 0.5 m/s from 12 (346) 1300 to 14 (348) 600
102	15	349	1800	Wind speed is less than 0.5 m/s from 15 (349) 1800 to 16 (350) 900
102	19	353	2400	Wind speed is less than 0.5 m/s from 19 (353) 2400 to 20 (354) 1300
102	24	358	1600	Wind speed is less than 0.5 m/s from 24 (358) 1600 to 25 (359) 700
102	27	361	1400	Wind speed is less than 0.5 m/s from 27 (361) 1400 to 28 (362) 1000
102	28	362	1600	Wind speed is less than 0.5 m/s from 28 (362) 1600 to 29 (363) 1200

The following error occurred because the "1 hour data" is averaged from 5-second readings taken during that hour while the "15 minute data" (in this case the 15 minute maximum) is not averaged, and only recorded at 15-minute intervals. The

data were left in.

Array	Day	Julian	Time	Error
101	7	341	1800	Air temp average in 1 hour data (-.02553) is greater than 15 minute maximum (-.05381) by at least 10%
101	20	354	2400	Air temp average in 1 hour data (.53791) is greater than 15 minute maximum (.47657) by at least 10%

Deleted erroneous daily minimum barometric pressure value on December 20 from array 244.

Array	Day	Julian	Time	Error
244	20	354	2400	Technician changed 244 Array data from 20 (354) 2400

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.

Data are missing due to equipment failure, or no probes deployed, or maintenance of equipment. To find out more details about missing data, contact the Research Coordinator at the site submitting the data.

January 2002

The equipment was under repair from 01/03/02 1300 - 01/14/02 1630. Data is missing for this time period.

Array	Julian	Day	Time	Error
150	3	3	1315	Missing 150 Array data (15 minute data) from 3 (3) 1315 to 14 (14) 1615
101	3	3	1400	Missing 101 Array data (Hourly Averages) from 3 (3) 1400 to 14 (14) 1600
102	3	3	1400	Missing 102 Array data (Hourly Average Wind Parameters) from 3 (3) 1400 to 14 (14) 1600
241	3	3	2400	Missing 241 data (Daily Averages) from 3 (3) 2400 to 13 (13) 2400
242	3	3	2400	Missing 242 data (Daily Average Wind Parameters) from 3 (3) 2400 to 13 (13) 2400
243	3	3	2400	Missing 243 data (Daily Max/Time Values) from 3 (3) 2400 to 13 (13) 2400

244 3 3 2400 Missing 244 data (Daily Min/Time Values) from
3 (3) 2400 to 13 (13) 2400

May 2002

Data was missing May 3 1415-1430 due to maintenance on the station.

Array	Julian	Day	Time	Error
150	123	3	1415	Missing 150 Array data (15 minute data) from 3 (123) 1415 to 3 (123) 1430

June 2002

Array	Day	Julian	Time	Error
150	3	154	800	Missing 150 Array data (15 minute data) from 3 (154) 800 to 3 (154) 1345
101	3	154	700	Missing 101 Array data (Hourly Averages) from 3 (154) 900 to 3 (154) 2300
102	3	154	700	Missing 102 Array data (Hourly Average Wind Parameters) from 3 (154) 900 to 3 (154) 2300

13. Other Remarks/notes:

On 10/10/2023 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 the fall of 2022.

PAR flagging update August 2024:

During SWMP data synthesis work it was noted that PAR values were anomalously high beginning in 2001 and returned to more expected values following the sensor swap on June 3, 2002. PAR data flagging was changed by the CDMO to suspect from January 10, 2001 15:15 through June 3, 2002 07:45.

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.

All sensors were replaced with newly calibrated sensors on 06/03/02 1400.

The following data are Daily Totals for Precipitation: (Note that there are no monthly totals during months where there was missing data).

Jan	2002
Calendar Day	Daily Precipitation Totals (mm)
17	4.064
20	1.270
21	.254
22	4.572
23	.762
24	.508
30	2.794
31	3.810

Feb 2002

Calendar Day	Daily Precipitation Totals (mm)
--------------	---------------------------------

1	7.620
10	7.874
11	2.032
17	3.048
20	1.524
22	.254
27	1.524

Monthly Tot 23.9

Mar 2002

Calendar Day	Daily Precipitation Totals (mm)
--------------	---------------------------------

2	2.540
3	15.748
9	.254
10	3.556
16	8.636
18	4.318
20	18.542
26	20.574
27	1.270
30	4.318
31	2.794

"Monthly Total"82.5

Apr 2002

Calendar Day	Daily Precipitation Totals (mm)
--------------	---------------------------------

1	2.540
3	7.874
9	.762
12	.508
13	4.318
14	3.810
15	5.334
19	3.302
20	.762
22	2.540
25	13.716
28	33.528
29	2.286
30	1.016

"Monthly Total"82.3

May 2002

Calendar Day	Daily Precipitation Totals (mm)
--------------	---------------------------------

2	19.558
---	--------

3	.254
7	.508
9	.508
12	9.144
13	33.274
14	4.318
17	.254
18	23.622
21	1.016
24	.254
26	3.048
28	1.270
31	13.208

Jun 2002

Calendar Day	Daily Precipitation Totals (mm)
5	12.192
6	23.622
7	10.922
12	.508
14	13.462
15	12.446
16	1.778
18	1.016
22	8.636
23	1.524
24	.254
26	6.604
27	1.778

Jul 2002

Calendar Day	Daily Precipitation Totals (mm)
9	2.794
18	.254
19	6.604
20	.254
23	9.144
24	.254
27	.254
28	.508

"Monthly Total"20.1

Aug 2002

Calendar Day	Daily Precipitation Totals (mm)
1	3.810
2	9.398
3	.254
5	9.906

16	1.270
18	.508
20	12.446
24	4.572
25	.254
28	.254
29	34.798

Monthly Total 77.5

Sep 2002

Calendar Day	Daily Precipitation Totals (mm)
1	.254
4	6.096
15	21.336
16	18.288
17	.254
22	4.826
26	8.382
27	38.354
28	.508

Monthly Total 98.3

Oct 2002

Calendar Day	Daily Precipitation Totals (mm)
2	1.016
4	4.064
5	2.032
7	.508
10	2.794
11	39.624
12	38.862
13	1.524
16	27.432
17	1.270
19	.508
25	3.556
26	17.018

Monthly Total 140.2

Nov 2002

Calendar Day	Daily Precipitation Totals (mm)
4	.254
5	3.302
6	14.986
11	2.032
12	17.272
13	.762

16	19.558
17	24.638
18	7.620
19	.508
21	2.032
22	14.986
23	.254
26	.254
27	2.794

Monthly Total 111.3

Dec 2002

Calendar Day	Daily Precipitation Totals (mm)
--------------	---------------------------------

5	5.588
11	8.128
12	30.480
13	6.350
14	10.668
16	.254
20	16.002
25	14.224
26	12.954
30	.254
31	2.032

Monthly Total 106.9