

National Climatic Data Center

DATA DOCUMENTATION

FOR

DATASET 3510 (DSI-3510)

Hourly Solar, Meteorological, and Precipitation Data

December 8, 2003

National Climatic Data Center
151 Patton Ave.
Asheville, NC 28801-5001 USA

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1. Abstract: This historical dataset (TD3510) was built by 'merging' the National Solar Radiation (TD3282) database with Hourly Precipitation Data (TD3240) for the same stations. The observations of hourly precipitation were taken by observers at principle (primary) stations, secondary stations and cooperative observer stations operated by the National Weather Service (NWS) and the Federal Aviation Agency (FAA).

Approximately 240 stations have recorded precipitation data through the period of record. NCDC only has data from 1961 to 1990. There are 8,760 or 8,784 (for leap years) hourly data records in each station-year.

Several recording (weighing) rain gauge instruments were used in measuring hourly precipitation, but by September 1963 many Fischer Porter precipitation gauge instruments with automated readout, recorded on paper tape, were phased in. By early 1965, about 200 of these were in operation and they became the primary recording instrument. Currently, there are approximately 2,000 Fischer Porter gauges in operation. The Universal Rain Gauge is the other primary instrument used to create the data. It has an automated readout recorded on paper charts. Station and dates of commissioning of weighing rain gauges are in the Station History Listings available at the NCDC in Asheville, NC.

2. Element Names and Definitions:

Header Elements in the TD3510 Format

Field Position	Element	Values	Definition
002-006	WBAN Number		Stations Weather Bureau Army Navy number.
008-029	City		City where the station is located (maximum of 22 characters)
031-032	State		State where the station is located (abbreviated to two letters).
034-036	Time Zone		Time zone is the number of hours by which the local standard time lags of leads Universal Time. For example, Mountain Standard Time is designated -7 because it lags Universal Time by 7 hours.
039-044	latitude		Latitude of the station
039			N=North of equator
040-041			Degrees
043-044			Minutes
047-053	Longitude		Longitude of the station
047			W=West, E=East
048-050			Degrees
052-053			Minutes
056-059	Elevation		Elevation of station in meters above sea level.
Data Elements in the TD3510 Format			
Time	Local Standard Time		
002-003	Year	61-90	Year of observation

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005-006	Month	1-12	Month of observation
008-009	Day	1-31	Day of month
011-012	Hour	1-24	Hour of day in local standard time
014-017	Extraterrestrial Horizontal Radiation	0-1415	Amount of solar radiation in Wh/m2 horizontal surface at the top of the atmosphere during the 60 minutes preceding the hour indicated.
019-022	Extraterrestrial Direct Normal Radiation	0-1415	Amount of solar radiation in Wh/m2 received on a surface normal to the sun at the top of the atmosphere during the 60 minutes proceeding the hour indicated.
024-027	Global Horizontal Radiation Data Value	0-1415	Total amount of direct and diffuse solar radiation in Wh/m2 on a horizontal surface during the 60 minutes preceding the hour indicated.
029-029	Flag for Data Source	A-H, ?	
030-030	Flag for Data uncertainty	0-9	9999 = missing data. See table below for Source Flag and Uncertainty Flag.
032-035	Direct Normal Radiation Data Value	0-1415	Amount of solar radiation in Wh/m2 received within a 5.7 deg. Field of view centered on the sun, during the 60 minutes preceding the hour indicated.
038-038	Flag for Data Uncertainty	0-9	9999 = missing data. See table below for Source Flag and Uncertainty Flag.
040-043	Data Value	0-1415	Amount of solar radiation in Wh/m2 received from the sky (excluding the solar disk) on a horizontal surface, during the 60 minutes preceding the hour indicated.
045-045	Flag for Data Source	A-H, ?	
046-046	Flag for Data Uncertainty	0-9	9999 = missing data.
048-049	Total Sky Cover	0-10	Amount of sky dome (in tenths) covered by clouds. 99 = missing data.
051-052	Opaque Sky Cover	0-10	Amount of sky dome (in tenths) covered by clouds that prevent observing the sky or higher cloud layers. 99 = missing data.
054-058	Dry Bulb Temp	-70.0 to 60.0	Dry bulb temperature in degrees C. 9999 = missing data.
060-064	Dew Point Temp	-70.0 to 60.0	Dew point temperature in degrees C. 9999 = missing data.
066-068	Relative Humidity	0 - 100	Relative humidity in percent. 999 = missing data.
070-073	Station Pressure	700 - 1100	Station pressure in millibars. 9999 = missing data.
075-077	Wind Direction	0 - 360	Wind direction in degrees.

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			(N = 0 or 360, E = 90, S = 180, W = 270) 999 = missing data
078-082	Wind Speed	0.0 - 99.0	Wind speed in m/s. 9999 or 99.0 = missing data.
083-088	Visibility	0.0 - 160.9	Horizontal visibility in kilometers. 777.7 = unlimited visibility. 99999 = missing data.
089-094	Ceiling Height	0-30450	Ceiling height in meters. 77777 = unlimited ceiling height. 88888 = cirroform. 999999 = missing data.
096-096	Observation Indicator	0 or 9	0 = Weather observation made. 9 = Weather observation not made or missing. If this field = 9 or if field 13 (wind speed) = missing (9999 or 99.0), then fields 6, 7, 8, 10, 11, 17, and 18 were all modeled and not actually observed.
097-105	Present Weather	See Table Below	Present weather conditions denoted by 9 indicators. See present weather table below.
106-109	Precipitable Water	0-100	Precipitable water in millimeters. 9999 = missing data.
110-115	Broadband Aerosol Optical Depth	0.0-0.900	Broadband aerosol optical depth (broadband turbidity) on the day indicated. 99999 = missing data.
116-119	Snow Depth	0-100	Snow depth in centimeters on the day indicated. 999 = missing data.
120-122	Days Since Last Snowfall	0-88	Number of days since last snowfall. 88 = 88 or greater days. 999 = missing data.
124-129	Hourly Precipitation	000000-099999	In inches and hundredths (see information below)
130-130	Hourly Precipitation Flag		

Notes: With the exception of solar radiation elements, broadband aerosol optical depth, snow depth, and days since last snowfall, all values were observed or modeled for the hour indicated. Daily values of broadband aerosol optical depth were estimated.

Present Weather Table

Position	Element	Values	Remarks
1	Occurrence of Thunder-storm, Tornado or Squall	0-2,4,6-9	0 = Thunderstorm - lightning and thunder+ wind gusts less than 25.7 m/s, hail (if any) < 1.9 cm diameter. 1 = Heavy or severe thunderstorm - frequent intense lightning and thunder, wind gusts > 25.7 m/s and hail, if any, 1.9 cm or greater in diameter. 2 = Report of tornado or waterspout.

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			<p>4 = Moderate squall - sudden increase of wind speed by at least 8.2 m/s, reaching 11.3 m/s or more and lasting for at least one minute.</p> <p>6 = Water spout (beginning January 1984).</p> <p>7 = Funnel cloud (beginning January 1984).</p> <p>8 = Tornado (beginning January 1984).</p> <p>9 = None if observation indicator element equals 0, else unknown or missing if observation indicator element equals 9.</p>
	Occurrence of Rain Showers or Freezing Rain	0-9	<p>0 = Light rain</p> <p>1 = Moderate rain</p> <p>2 = Heavy rain</p> <p>3 = Light rain showers</p> <p>4 = Moderate rain showers</p> <p>5 = Heavy rain showers</p> <p>6 = Light freezing rain</p> <p>7 = Moderate freezing rain</p> <p>8 = Heavy freezing rain</p> <p>9 = None if observation indicator element equals 0, else unknown or missing if observation indicator element equals 9.</p> <p>Notes: Light = up to 0.25 cm per hour. Moderate = 0.28 to 0.76 cm per hour. Heavy = greater than 0.76 cm per hour.</p>
	Occurrence of Rain Squalls, Drizzle or freezing Drizzle.	0, 1, 3-9	<p>0 = Light rain squalls</p> <p>1 = Moderate rain squalls</p> <p>2 = Heavy rain squalls</p> <p>3 = Light rain drizzle</p> <p>4 = Moderate rain drizzle</p> <p>5 = Heavy rain drizzle</p> <p>6 = Light freezing drizzle</p> <p>7 = Moderate freezing drizzle</p> <p>8 = Heavy freezing drizzle</p> <p>9 = None if observation indicator element equals 0, else unknown or missing if observation indicator element equals 9.</p> <p>Notes: When drizzle or freezing drizzle occurs with other weather phenomena: Light = up to 0.025 cm per hour. Moderate = 0.025 to 0.051 cm per hour. Heavy = greater than 0.051 cm per hour. When drizzle or freezing drizzle occurs alone: Light = visibility 1</p>

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			<p>km or greater. Moderate = visibility between 0.5 and 1 km. Heavy = visibility 0.5 km or less.</p>
	Occurrence of Snow, Snow pellets or Ice Crystals	0-9	<p>0 = Light snow 1 = Moderate snow 2 = Heavy snow 3 = Light snow pellets 4 = Moderate snow pellets 5 = Heavy snow pellets 6 = Light ice crystals 7 = Moderate ice crystals 8 = heavy ice crystals 9 = None if observation indicator element equals 0, else unknown or missing if observation indicator element equals 9.</p> <p>Notes: Beginning in April 1963, any occurrence of ice crystals in recorded as a 7.</p>
	Occurrence of Snow Showers or Snow Squalls	0-5, 9	<p>0 = Light snow showers 1 = Moderate snow showers 2 = Heavy snow showers 3 = Light snow squall 4 = Moderate snow squall 5 = Heavy snow squall 9 = None if observation indicator element equals 0, else unknown or missing if observation indicator element equals 9.</p>
	Occurrence of Sleet, Sleet Showers or Hail	0-2, 4, 9	<p>0 = Light ice pellet showers 1 = Moderate ice pellet showers 2 = Heavy ice pellet showers 4 = Hail 9 = None if observation indicator element equals 0, else unknown or missing if observation indicator element equals 9.</p> <p>Notes: Prior to April 1970, ice pellets were coded as sleet. Beginning in April 1970, sleet and small hail were redefined as ice pellets and are coded as 0, 1 or 2.</p>
	Occurrence of Fog, Blowing Dust or Blowing Sand	0-9	<p>0 = Fog 1 = Ice fog 2 = Ground fog 3 = Blowing dist 4 = Blowing sand 5 = Heavy fog 6 = Glaze (beginning 1984) 7 = Heavy ice fog (beginning 1984) 8 = heavy ground fog (beginning 1984) 9 = None if observation indicator</p>

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			<p>element equals 0, else unknown or missing if observation indicator element equals 9.</p> <p>Notes: These values recorded only when visibility is less than 11 km.</p>
	Occurrence of Smoke, Haze, Smoke and haze, Blowing Snow, Blowing Spray or Dust	0-7, 9	<p>0 = Smoke 1 = Haze 2 = Smoke and haze 3 = Dust 4 = Blowing snow 5 = Blowing spray 6 = Dust storm (beginning 1984) 7 = Volcanic ash 9 = None if observation indicator element equals 0, else unknown or missing if observation indicator element equals 9.</p> <p>Notes: These values recorded only when visibility is less than 11 km.</p>
	Occurrence of Ice Pellets	0-2, 9	<p>0 = Light ice pellets 1 = Moderate ice pellets 2 = Heavy ice pellets 9 = None if observation indicator element equals 0, else unknown or missing if observation indicator element equals 9.</p>

3. **Start Date:** 19610101

4. **Stop Date:** 19901231

5. **Coverage:**

- a. Southernmost Latitude: 15.0S
- b. Northernmost Latitude: 72.0N
- c. Westernmost Longitude: 170.0W
- d. Easternmost Longitude: -60.0E

6. **How to Order Data:**

Ask NCDC's Climate Services about the cost of obtaining this data set.
Phone: 828-271-4800
FAX: 828-271-4876
E-mail: NCDC.Orders@noaa.gov

7. **Archiving Data Center:**

Archive Branch
National Climatic Data Center
151 Patton Avenue
Asheville, NC 28801

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8. Technical Contact:

National Climatic Data Center
151 Patton Avenue
Asheville, NC 28801

9. Known Uncorrected Problems: None.

10. Quality Statement:

11. Essential Companion Datasets:

12. References:

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