

# README FILE FOR THE GLOBAL HISTORICAL CLIMATOLOGY NETWORK hourly (GHCNh) Version 1.0.0

For general questions about GHCNh data access, please email [info@ncei.noaa.gov](mailto:info@ncei.noaa.gov).  
For technical questions not covered in this documentation, please email [ncei.ghcnh@noaa.gov](mailto:ncei.ghcnh@noaa.gov).

General information on the GHCNh dataset can be found here:  
<https://www.ncei.noaa.gov/products/global-historical-climatology-network-hourly> and  
<https://www.ncei.noaa.gov/metadata/geoportal/rest/metadata/item/gov.noaa.ncdc:C01688/html#>

This README file can be accessed at  
[https://www.ncei.noaa.gov/oa/global-historical-climatology-network/hourly/doc/ghcnh\\_DOCUMENTATION.pdf](https://www.ncei.noaa.gov/oa/global-historical-climatology-network/hourly/doc/ghcnh_DOCUMENTATION.pdf) with other GHCNh documentation at  
<https://www.ncei.noaa.gov/oa/global-historical-climatology-network/index.html#hourly/doc/>.  
Descriptions of the documentation are below.

## I. DOWNLOAD QUICK START

Bulk GHCNh station data download access is available in three ways:

1. Period of record station files (data for all years and variables for a particular station)
2. Station/year files (one year of data for a particular station)
3. A tar file of all stations with data in a particular year (see below)

<b>Data Access Locations</b>	<ul style="list-style-type: none"><li>• HTTPS WAF:<ol style="list-style-type: none"><li>1. <a href="https://www.ncei.noaa.gov/oa/global-historical-climatology-network/index.html#hourly/access/by-station/GHCNh_&lt;station&gt;_por.psv">https://www.ncei.noaa.gov/oa/global-historical-climatology-network/index.html#hourly/access/by-station/GHCNh_&lt;station&gt;_por.psv</a></li><li>2. <a href="https://www.ncei.noaa.gov/oa/global-historical-climatology-network/index.html#hourly/access/by-year/&lt;YYYY&gt;/GHCNh_&lt;station&gt;_&lt;YYYY&gt;.psv">https://www.ncei.noaa.gov/oa/global-historical-climatology-network/index.html#hourly/access/by-year/&lt;YYYY&gt;/GHCNh_&lt;station&gt;_&lt;YYYY&gt;.psv</a></li><li>3. <a href="https://www.ncei.noaa.gov/oa/global-historical-climatology-network/index.html#hourly/archive/&lt;archived files&gt;">https://www.ncei.noaa.gov/oa/global-historical-climatology-network/index.html#hourly/archive/&lt;archived files&gt;</a></li></ol>Where &lt;station&gt; refers to the GHCN identifier</li><li>• Example file URL:<ul style="list-style-type: none"><li>• <a href="https://www.ncei.noaa.gov/oa/global-historical-climatology-network/hourly/access/by-year/2023/psv/GHCNh_USW00003812_2023.psv">https://www.ncei.noaa.gov/oa/global-historical-climatology-network/hourly/access/by-year/2023/psv/GHCNh_USW00003812_2023.psv</a></li></ul></li></ul>
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For the tar files containing all stations with data for a particular year under the /archive directory, the naming convention is as follows:

<b>File Name Pattern</b>	ghcn-hourly_v1.a.b_dYYYY_cYYYYMMDD.tar.gz
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<b>File Name Field Definitions</b>	ghcn-hourly = ProductShortName d = data date (i.e., the year provided in the file) c = creation date v1.<a.b> = version number YYYYMMDD = date tar = tar file gz = zipped
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The tar file can be untarred and uncompressed by using, e.g., the following Linux command:

```
tar xzvf ghcn-hourly_v1.a.b_dYYYY_cYYYYMMDD.tar.gz
```

ALTERNATIVELY, if you need data for only one or a few specific stations you can:

- Find the station name and identifier in the "ghcnh-station-list" file (e.g., PHOENIX AP [Airport] is "USW00023183"); and
- Then download the data file (i.e., the ".psv" file) for that GHCNh station identifier (e.g., "GHCNh\_USW00023183\_por.psv" has the data for the whole period of record for the PHOENIX AP) in the /access folder:  
<https://www.ncei.noaa.gov/oa/global-historical-climatology-network/index.html#hourly/access/>

Within the

<https://www.ncei.noaa.gov/oa/global-historical-climatology-network/index.html#hourly/access/b-y-year/<year>> directory there are psv and Parquet directories for the station-year data files. See section III on data file formats.

Within the

<https://www.ncei.noaa.gov/oa/global-historical-climatology-network/index.html#hourly/access/b-y-year/<year>> directory there are psv and Parquet directories for the station-year data files. See section III on data file formats.

On the main access link,

<https://www.ncei.noaa.gov/oa/global-historical-climatology-network/index.html#hourly/>, along with the /access, /archive and /doc folders, there is an /inventory folder which contains JSON-formatted station inventory files. These are metadata files used by NCEI access tools that facilitate searching by aggregating the minimum and maximum dates for elements within each GHCNh file. These files will likely not be useful for public use.

To view a list of GHCNh station names and geographic coordinates, download the "ghcnh-station-list.txt" or "ghcnh-station-list.csv" from this /doc folder:

<https://www.ncei.noaa.gov/oa/global-historical-climatology-network/index.html#hourly/doc/<files>>

The names and coordinates come from dataset inventories provided by the data source providers. See section II for details. In addition to the ghcnh station list file, the

“ghcnh-inventory.txt” file provides the total number of records by month for the period of record associated with each GHCN station.

## II. FORMAT OF “ghcnh-station-list” FILES

The [ghcnh-station-list.txt](#) (and csv) files provide an inventory of the GHCN identifiers and coordinates. The same information is provided in NCEI's [Historical Observing Metadata Repository](#) (HOMR) database.

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Variable, Columns (for fixed format), Type  
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ID, 1-11, Character  
LATITUDE, 13-20, Real  
LONGITUDE, 22-30, Real  
ELEVATION, 32-37, Real  
STATE, 39-40, Character  
NAME, 42-71, Character  
GSN FLAG, 73-75, Character  
HCN/CRN FLAG, 77-79, Character  
WMO ID, 81-85, Character  
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These variables have the following definitions:

ID=the station identification code. Note that the first two characters denote the FIPS country code, the third character is a network code that identifies the station numbering system used, and the remaining eight characters contain the actual station ID.

See [ghcn-countries.txt](#) file for a complete list of country codes.

See [ghcn-states.txt](#) file for a list of state/province/territory codes.

The network code has the following potential values:

A = Retired WMO Identifier used by the USAF 14th Weather Squadron

U = unspecified (station identified by up to eight alphanumeric characters)

C = U.S. Cooperative Network identification number (last six characters of the GHCN ID)

I = International Civil Aviation Organization (ICAO) identifier

M = World Meteorological Organization ID (last five characters of the GHCN ID)

N = Identification number used by a National Meteorological or Hydrological Center partner

L = U.S. National Weather Service Location Identifier (NWSLI)

W = WBAN identification number (last five characters of the GHCN ID)

LATITUDE= latitude of the station (in decimal degrees). North (+); South (-)

LONGITUDE=the longitude of the station (in decimal degrees). East (+); West (-)

ELEVATION=the elevation of the station (in meters, missing = -999.9).

STATE=the U.S. postal code for the state (for U.S. stations only).

NAME=the name of the station.

GSN FLAG=a flag that indicates whether the station is part of the GCOS Surface Network (GSN). The flag is assigned by cross-referencing the number in the WMO ID field with the official list of GSN stations. There are two possible values:

Blank = non-GSN station or WMO Station number not available  
GSN = GSN station

HCN/=a flag that indicates whether the station is part of the U.S.

CRN FLAG=Historical Climatology Network (HCN) or U.S. Climate Reference Network (CRN). There are three possible values:

Blank = Not a member of the U.S. Historical Climatology  
or U.S. Climate Reference Networks  
HCN = U.S. Historical Climatology Network station  
CRN = U.S. Climate Reference Network or U.S. Regional Climate  
Network Station

WMO ID=the World Meteorological Organization (WMO) number for the station. If the station has no WMO number (or one has not yet been matched to this station), then the field is blank.

### **III. FORMAT OF THE DATA FILES**

#### **(A) Pipe-Separated Value (.psv) Data Files**

Each station “psv” file is made up of a unique identifier and time step followed by 38 variable fields, each with 5 associated metadata/attribute fields (see below for further details). All fields are “pipe” separated (pipe = “|”). Each of the variables and metadata fields are described with explicit names in a header line at the beginning of each station file. Note that the header length is quite long and is also pipe delimited.

Pipe-separated (.psv) files can easily be viewed with spreadsheet programs (e.g. Excel) by specifying the delimiter as a pipe "|".

The variable names and attribute fields are described below:

First, each station record is indexed to a single GHCN Station\_ID and accompanying Station\_name, Latitude, Longitude and Elevation, which were extracted from metadata provided by one or more data sources. Each observation is also indexed to a single Year, Month, Day, Hour and Minute in Coordinated Universal Time (UTC). Following the identifier, coordinates and time stamp for the observation, there are 38 sets of observations for 38 variables and their accompanying metadata/attributes as follows:

*variable* (see section IV, Table 1)

*variable\_Measurement\_Code* (see section V, Table 2)

*variable\_Quality\_Code* (see section VI, Table 3)

*variable\_Report\_Type* (see section VII, Table 4)

*variable\_Source\_Code* (see section IX, Table 6)

*variable\_Source\_Station\_ID* (original identifier provided in the data source)

Where *variable* refers to the list of variables in Table 1 and their units. A list of potential Measurement\_Codes by variable type is provided in Table 2. The list of Quality\_Codes is provided in Table 3. Table 4 provides the list of possible report types. A comprehensive list of column names are provided in Appendix A.

## **(B) Parquet Format Data Files**

Parquet is an open-source file format with easily-indexed columns designed for efficient data storage and retrieval. These files can be read easily using Python.

<https://arrow.apache.org/docs/python/parquet.html>

## **IV. List of elements/variable**

### **Table 1: Elements/Variables**

*temperature* = 2 meter (circa) Above Ground Level Air (dry bulb) Temperature (°C to tenths)

*dew\_point\_temperature* = Dew Point Temperature (°C to tenths)

*station\_level\_pressure* = the pressure that is observed at a specific elevation and is the true barometric pressure of a location. It is the pressure exerted by the atmosphere at a point

as a result of gravity acting upon the "column" of air that lies directly above the point.  
(hPa)

*sea\_level\_pressure* = reduction estimates the pressure that would exist at sea level at a point directly below the station using a temperature profile based on temperatures that actually exist at the station (hPa)

*wind\_direction* = Wind Direction from true north using compass directions (e.g. 360 = true north, 180 = south, 270 = west, etc.). Note: A direction of "000" is given for calm winds.(whole degrees)

*wind\_speed* = Wind Speed (meters per second)

*wind\_gust* = Peak short duration (usually < 20 seconds) wind speed (meters per second) that exceeds the wind\_speed average

*precipitation* = total liquid precipitation (rain or melted snow). Totals are nominally for the hour, but may include intermediate reports within the hour. Please refer to **Appendix B** for important details on precipitation totals; a "T" in the measurement code column indicates a trace amount of precipitation (millimeters)

*relative\_humidity* = Depending on the source, relative humidity is either measured directly or calculated from air (dry bulb) temperature and dew point temperature (whole percent)

*wet\_bulb\_temperature* = Depending on the source, wet bulb temperature is either measured directly or calculated from air (dry bulb) temperature, dew point temperature, and station pressure (°C to tenths)

*pres\_wx\_MW1* = Present weather observation; MW1 - MW3 is sourced from manual reports; up to 3 observations per report (code)

*pres\_wx\_MW2* = see above

*pres\_wx\_MW3* = see above

*pres\_wx\_AU1* = Present weather observation; AU1 - AU3 is sourced from automated ASOS/AWOS sensors; up to 3 observations per report (code)

*pres\_wx\_AU2* = see above

*pres\_wx\_AU3* = see above

*pres\_wx\_AW1* = Present weather observation; AW1 - AW3 is sourced from automated sensors; up to 3 observations per report (code)

*pres\_wx\_AW2* = see above

*pres\_wx\_AW3* = see above

*snow\_depth* = depth of snowpack on the ground (millimeters)

*visibility* = horizontal distance at which an object can be seen and identified (kilometers)

*altimeter* = the pressure "reduced" to mean sea level using the temperature profile of the "standard" atmosphere, which is representative of average conditions over the United States at 40 degrees north latitude (millibars/hPa)

*pressure\_3hr\_change* = change in atmospheric pressure measured at the beginning and end of a three hour period; accompanied by tendency code in measurement code field (millibars/hPa)

*sky\_cover\_1* = Fraction of total celestial dome with sky coverage; defines a layer in oktas (i.e. eights) or tenths of sky covered by cloud; up to 3 observations (code); see Table 2 for sky cover code definitions

*sky\_cover\_2* = see above

*sky\_cover\_3* = see above

Note: Since up to 3 cloud layers can be reported, the full state of the sky can best be determined by the last layer's value. In other words if three layers are reported and the third layer uses BKN then the total state of sky is BKN which is similar in definition to "mostly cloudy." OVC is similar to "cloudy" or overcast and FEW or SCT is similar to "partly cloudy." In cases where there are more than 3 cloud layers, the highest layers will not be reported.

Values in oktas:

CLR:00 None, SKC or CLR

FEW:01 One okta - 1/10 or less but not zero

FEW:02 Two oktas - 2/10 - 3/10, or FEW

SCT:03 Three oktas - 4/10

SCT:04 Four oktas - 5/10, or SCT

BKN:05 Five oktas - 6/10

BKN:06 Six oktas - 7/10 - 8/10

BKN:07 Seven oktas - 9/10 or more but not 10/10, or BKN

OVC:08 Eight oktas - 10/10, or OVC

VV:09 Sky obscured, or cloud amount cannot be estimated

X:10 Partial obscuration

*sky\_cover\_baseht\_1* = Discrete cloud base heights at lowest point of layer; up to 3 vertical layers can be reported; clear skies reported as a single layer (meters)

*sky\_cover\_baseht\_2* = see above

*sky\_cover\_baseht\_3* = see above

*precipitation\_3\_hour* = 3-hour total liquid precipitation (rain or melted snow) accumulation from FM12/SYNOP reports; a "T" in the measurement code column indicates a trace amount of precipitation (millimeters); accumulations can be reported over 3, 6, 9, 12, 15, 18, 21 and 24 hours.

*precipitation\_6\_hour* = see above  
*precipitation\_9\_hour* = see above  
*precipitation\_12\_hour* = see above  
*precipitation\_15\_hour* = see above  
*precipitation\_18\_hour* = see above  
*precipitation\_21\_hour* = see above  
*precipitation\_24\_hour* = see above

*remarks* = Hourly Remarks present the raw surface observation data in the original format encoded into ICAO-standardized METAR (FM15) or FM12 (SYNOP), FM16 (SPECI) etc format for global dissemination. Further information on decoding these observations can be found in the Federal Meteorological Handbook (FMH) No. 1, Surface Weather Observations & Reports.

## V. List of Measurement Codes

### **Table 2: Element Measurement Codes (where applicable)**

**Note:** In some cases, the measurement code is shown as '9-Missing'. This simply means that there was no measurement code provided by the data source and can be interpreted as a blank field. In future versions of GHCNh, '9-Missing' will be replaced with a blank field for all sources.

#### **Wind Speed / Wind Direction:**

A-Abr-Beauf  
B-Beaufort  
C-Calm  
H-5min-avg-spd  
N-Normal  
R-60min-avg-spd  
Q-Squall  
T-180min-avg-spd  
V-Variable  
9-Missing

#### **Atmospheric Pressure Tendency (3-hour pressure change):**

Note: in general a 0 through 3 here indicates an increase in pressure over the previous 3 hours and a 5 through 8 indicates a decrease over the previous 3 hours and 4 indicates no change during the previous 3 hours).

0-Incr-then-decr;-atm-pres-same-or-higher-than-3-hrs-ago  
1-Incr-then-steady;-or-incr.-then-incr-more-slowly;-atm-pres-now-higher-than-3-hrs-ago  
2-Incr-(steadily-or-unsteadily);-atm-pres-now-higher-than-3-hrs-ago  
3-Decr-or-steady,-then-incr;-or-incr,-then-incr-more-rapidly;-atm-pres-now-higher-than-3-hrs-ago  
4-Steady;-atm-pres-the-same-as-3-hrs-ago



5-Decr,-then-incr;-atm-pres-the-same-or-lower-than-3-hrs-ago  
6-Decr,-then-steady;-or-decr,-then-decr-more-slowly;-atm-pres-now-lower-than-3-hrs-ago  
7-Decr-(steadily-or-unsteadily);-atm-pres-now-lower-than-3-hrs-ago  
8-Steady-or-incr,-then-decr;-or-decr,-then-decr-more-rapidly;-atm-pres-now-lower-than-3-hrs-ago  
9-Missing

**Visibility** (code varies by source)

Sources 220, 221, 222, 223, 347, 348

A-Aircraft-horiz-vis

L-Aircraft-slant-rng-vis

M-Max

N-Min

P-Prevailing

S-Sector

9-Missing

Sources: 313, 314, 315, 322, 335, 343, 344, 345, 346

N-Not-variable

V-Variable

9-Missing

**Precipitation** (code varies by source)

Sources: 313, 314, 315, 335, 343, 344, 345, 346, 322

0-None

1-Measurement-impossible-or-inaccurate

2-Trace

3-Measurable

9-Missing

Sources: 220, 221, 222, 223, 347, 348

1-Measurement-impossible-or-inaccurate

2-Trace

3-Begin-accumulated-period-(precipitation-amount-missing-until-end-of-accumulated-period)

4-End-accumulated-period

5-Begin-deleted-period-(precipitation-amount-missing-due-to-data-problem)

6-End-deleted-period

7-Begin-missing-period

8-End-missing-period

E-Estimated-data-value-(eg-from-nearby-station)

I-Incomplete-precipitation-amount,-excludes-one-or-more-missing-reports,-such-as-one-or-more-15-minute-reports-not-included-in-the-1-hour-precipitation-total

J-Incomplete-precipitation-amount,-excludes-one-or-more-erroneous-reports,-such-as-one-or-more-1-hour-precipitation-amounts-excluded-from-the-24-hour-total

## 9-Missing

Source: 382

Blank = no measurement information applicable

XX-hr-accum = where XX is the number of hours for the precipitation accumulation period.

g = a carry-over measurement flag from the DSI-3240 dataset which was used only on the very first hour of the month if there was zero precipitation during that hour. The purpose of this flag was mainly to indicate that the station was functional and reporting during the month. Normally in DSI-3240, zero precipitation amounts were not included in the data file in order to save space. This HPD dataset does include zero precipitation totals, both those assumed from the DSI-3240 dataset and those determined from the digital recordings of bucket level data.

Z = represents an "assumed" zero precipitation total. Usually these are values from the DSI-3240 dataset. The rule in that dataset was to "assume" a zero total for any hour where nothing else was reported or indicated for that hour as long as the very first hour of the month had a non-zero amount or a zero amount with the "g" measurement flag. Zero amounts were omitted from the DSI-3240 dataset in order to save disk space. We are not concerned with that anymore.

E = Evaporation may have occurred. Data may or may not be reliable. This flag was used during the period 1984-1993.

T = trace of precipitation

### **Sky cover:**

00-None,SKC-or-CLR

01-One-okta-1/10-or-less-but-not-zero

02-Two-oktas-2/10-3/10-or-FEW

03-Three-oktas-4/10

04-Four-oktas-5/10,-or-SCT

05-Five-oktas-6/10

06-Six-oktas-7/10-8/10

07-Seven-oktas-9/10-or-more-but-not-10/10,-or-BKN

08-Eight-oktas-10/10,-or-OVC

09-Sky-obscured,-or-cloud-amount-cannot-be-estimated or sky obscured by fog and/or other meteorological phenomena

10-Partial-obscuration

99-Missing

**Snow depth** (code varies by source):

Sources: 220, 221, 222, 223, 347, 348

0-None

1-Unmeasurable

2-Snow-cover-not-continuous

3-Measurable

9-Missing

Sources: 313, 314, 315, 322, 335, 343, 344, 346

1-Measurement-impossible-or-inaccurate

2-Snow-cover-not-continuous

3-Trace

4-End-accumulated-period-(data-include-more-than-one-day)

5-End-deleted-period-(data-eliminated-due-to-quality-problems)

6-End-missing-period

E-Estimated-data-value-(eg,-from-nearby-station)

9-Missing

### **Relative humidity**

Sources: 220, 221, 222, 223, 313, 314, 315, 322, 335, 343, 344, 346, 347, 348

D-Derived (values were calculated using air (dry bulb) temperature and dew point temperature)

### **Wet-bulb temperature**

Sources: 220, 221, 222, 223, 313, 314, 315, 322, 335, 343, 344, 346, 347, 348

D-Derived (values were calculated using air (dry bulb) temperature, dew point temperature, and station pressure)

## **VI. List of Quality Check codes**

### **Table 3: QC (code varies by source)**

A general set of quality control checks is applied to a subset of variables after all sources are integrated into a set of unique period of record station files. These checks are based on those described in Dunn et al. (2016) (<https://qi.copernicus.org/preprints/qi-2016-9/qi-2016-9.pdf>). In addition, GHCNh preserves the Quality Control information of its component (legacy) sources. The set of general flags that apply to the integrated set of sources and the variables *temperature*, *dew\_point\_temperature*, *station\_level\_pressure*, *sea\_level\_pressure*, *wind\_direction*, and *wind\_speed*

**Note:** In some cases, the quality code is shown as '9-Missing'. This simply means that there was no quality code provided by the data source and can be interpreted as a blank field. In future versions of GHCNh, '9-Missing' will be replaced with a blank field for all sources.

The list of codes include:

"L" : "0", # failed Logical consistency

"o" : "1," , # **o**utlier check  
 "F" : "2," , # **F**requent value check  
 "U" : "3," , # di**U**rnal inconsistency check  
 "D" : "4," , # **D**istribution 1  
 "d" : "5," , # **d**istribution 2  
 "W" : "6," , # **W**orld records exceedance  
 "K" : "7," , # Strea**K** check  
 "C" : "8," , # **C**limatological outlier  
 "T" : "9," , # **T**imestamp issue  
 "S" : "10," , # **S**pike check  
 "h" : "11," , # **h**umidity  
 "V" : "12," , # **V**ariance  
 "w" : "13," , # **w**inds  
 "N" : "14," , # **N**eighbor comparison outlier  
 "E" : "15," , # cl**E**an up  
 "p" : "16," , # pressure  
 "H" : "17," , # High flag rate

The Legacy Codes for Sources 313, 314, 315, 322, 335, 343, 344, 346 include

0 = Passed gross limits check

1 = Passed all quality control checks

2 = Suspect

3 = Erroneous

4 = Passed gross limits check, data originate from an NCEI data source

5 = Passed all quality control checks, data originate from an NCEI data source

6 = Suspect, data originate from an NCEI data source

7 = Erroneous, data originate from an NCEI data source

9 = Passed gross limits check if element is present

A – Data value flagged as suspect, but accepted as good value.

U – Data value replaced with edited value.

P – Data value not originally flagged as suspect, but replaced by validator.

I – Data value not originally in data, but inserted by validator.

M – Manual change made to value based on information provided by NWS or FAA.

C – Temperature and dew point received from Automated Weather Observing Systems (AWOS) are reported in whole degrees Celsius. Automated QC flags these values, but they are accepted as valid.

R – Data value replaced with value computed by NCEI software.

And Legacy Codes for Sources: 220, 221, 222, 223, 347, 348 include

0 Not Checked

1 Good

2 Suspect

3 Erroneous

4 Calculated

5 Removed

9 Missing

Sources: 220, 221, 222, 223, 313, 314, 315, 322, 335, 343, 344, 346, 347, 348

For these sources, relative humidity and wet-bulb temperature are not directly measured, and instead, are derived from other measured variables. These can have the following QC flags:

o - Out of range (relative humidity only - with values < 1 or > 100)

f - Suspect or Error flags for 1 or more of the input measurements

Legacy Codes for Source 382 for precipitation (as given in [C-HPD documentation](#))

Blank = did not fail any quality assurance check

X = failed global extreme exceedance check

N = failed negative precipitation check

Y = failed state extreme exceedance check (performed on daily totals)

K = failed streak/frequent-value check

G = failed gap check

O = failed climatological outlier check

Z = flagged as a result of an official Datzilla investigation

A = The value is not an hourly precipitation total but rather an accumulation total for a period greater than an hour in duration and lasting through the end of this hour. (See measurement flags "a" and "." for the beginning time of the accumulation period and times during the accumulation period, respectively.) Accumulations across multiple hours exist only from the legacy DSI-3240 data source.

M = represents the associated value at this observation time is missing in the DSI-3240 dataset and no alternate data source is available. This is a carry-over indicator from DSI-3240 to allow the user to distinguish between missing and deleted data in that older system. (See the "D" quality flag.) However, the most consistent way to identify hours of missing data across the entire dataset is to test if the precipitation value is equal to the special missing value of -9999.

D = represents the associated value at this time was deleted by the DSI-3240 processing system. Usually this was done manually by a trained meteorological technician who made the decision using ancillary information and experience.

Q = a carry-over quality flag the legacy DSI-3240 data source. Prior to 1996: Indicates value failed an extreme value test (value will be present); data are to be used with caution. Extremes tests were:  
1) If the value was not an accumulated precipitation total, the value failed the one-hour statewide 100-year return

period precipitation.

2) If the value was an accumulated precipitation total, the value failed the 24-hour statewide extreme precipitation total. This flag was assigned during a 1997 NCDC rehabilitation of the 1900-1995 DSI-3240 archive.

Since January 1996: A single erroneous datum (value will be present). Lowest data resolution is hourly. This flag is rarely used in DSI-3240 since 1996.

- q = a carry-over quality flag the legacy DSI-3240 data source.  
Used since January 1996. An hourly value excludes one or more 15 minute periods. Lowest data resolution is 15 minutes.
- R = a carry-over quality flag the legacy DSI-3240 data source.  
Used since January 1996. Indicates data values are suspect with regard to the times or period of occurrence.

Legacy Codes for Source 345 (for relative humidity and wind speed only):

0-Good

1-Issue (field-length overflow)

3-Error (erroneous data)

## VII. List of report type and source flag codes

For some sources, the report\_type columns for each element are truncated to 10 characters. They combine the report type code and an abbreviated source flag code with an underscore (“\_”) in between. For example, the report\_type “AUTO\_4-USA” refers to the report type code “AUTO” and the source flag code “4-USAf-sfc-hrly”.

### **Table 4: Report type codes**

AERO:AERO-Aerological

AUST:AUST-Australia

AUTO:AUTO

BOGUS:BOGUS

BRAZ:BRAZ-Brazil

COOPD:COOPD-USCOOP-SOD

COOPS:COOPS-USCOOP-soiltemp

CRB:CRB-Clim-Ref-Book-from-CDMP

CRN05:CRN05-CRN5min

CRN15:CRN15-CRN15min

FM-12:FM12-SYNOP-fixed-land-stn

FM-13:FM13-SHIP-sea-stn

FM-14:FM14-SYNOP-MOBIL-mobile-land-stn

FM-15:FM15-METAR-Aviation-routine-wx

FM-16:FM16-SPECI-Aviation-selected-special-wx

FM-18:FM18-BUOY  
 GREEN:GREEN-Greenland  
 MESOH:MESOH-Hydro-MESONET-civ-govt  
 MESOS:MESOS-MESONET-civ-govt  
 MESOW:MESOW-Snow-MESONET-civ-govt  
 MEXIC:MEXIC-Mexico  
 NSRDB:NSRDB-Natl-Sol-Rad-Data-Base  
 PCP15:PCP15-US-15-min-precip-network  
 PCP60:PCP60-US-60-min-precip-network  
 S-S-A:SAA-Synoptic-airways-auto-merged  
 SA-AU:SAAU-Airways-auto-merged  
 SAO:SAO-Airways-incl-record-specials  
 SAOSP:SAOSP-Airways-special-excl-record-specials  
 SHEF:SHEF-Std-Hydro-Exch-Frmt  
 SMARS:SMARS-Supp-airways-stn  
 SOD:SOD-ASOS-AWOS  
 SOM:SOM-ASOS-AWOS  
 SURF:SURF-Surf-Rad-Net  
 SY-AE:SYAE-Synop-and-aero-merged  
 SY-AU:SYAU-Synop-and-auto-merged  
 SY-MT:SYMT-Synop-and-METAR-merged  
 SY-SA:SYSA-Synop-and-airways-merged  
 WBO:WBO  
 WNO:WNO-WashNavObs  
 99999:999999-Missing

Report type codes for Source 382 hourly C-HPD precipitation  
 4-DSI-3240 - historic  
 H-derived-HPD-C-high-res

**Table 4(a): Source flag codes**

1-USAF-not-merged-w-NCEI-failed-element-cross-checks  
 2-NCEI-sfc-hrly-not-merged-w-USAF-failed-element-cross-checks  
 3-USAF-sfc-hrly-NCEI-sfc-hrly-merged  
 4-USAF-sfc-hrly  
 5-NCEI-sfc-hrly  
 6-ASOS-AWOS-from-NCEI  
 7-ASOS-AWOS-merged-w-USAF  
 8-MAPSO-NCEI  
 A-USAF-sfc-hrly-NCEI-hrly-precip-candidate-not-merged-w-NCEI-sfc-hrly-failed-element-cross-c  
 checks  
 B-NCEI-sfc-hrly-NCEI-hrly-precip-candidate-not-merged-w-USAF-sfc-hrly-failed-element-cross-c  
 checks

C-USAF-sfc-hrly-NCEI-sfc-hrly-NCEI-hrly-precip-merged  
 D-USAF-sfc-hrly-NCEI-hrly-precip-merged  
 E-NCEI-sfc-hrly-NCEI-hrly-precip-merged  
 F-Form-OMR-1001-Wx-Bur-city-office-keyed  
 G-SAO-pre-1949-keyed  
 H-SAO-1965-1981-format-period-keyed  
 I-CRN  
 J-COOP  
 K-Rad-net  
 L-CDMP  
 M-NREL  
 N-NCAR-NCEI-coop-effort-var-ntl-datasets  
 O-Summary-obs-created-by-NCEI-using-hrly-obs-that-may-not-share-same-data-source-flag  
 9-Missing

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## VIII. Present weather code descriptors

### **Table 5(a-c): Present Weather Element and Measurement Codes**

Weather codes (AU / AW / MW) describe precipitation or obstructions to vision occurring at the time of observation. It is not uncommon for one type of element to be reported without another. In other words, it is possible to have an AU element without an AW element or MW element. Depending on equipment used at the location, some automated stations report AW codes either with or instead of AU codes. Manually augmented stations report MW codes either with or instead of AU and AW codes. Definitions of element and measurement codes:

#### **Table 5(a) – pres\_wx\_MW1[2][3] (sourced from manual reports)**

00-Cloud  
 01-Clouds  
 02-State  
 03-Clouds  
 FU:04-Visibility-reduced-by-smoke,-e.g.-veldt-or-forest-fires,-industrial-smoke-or-volcanic-ashes  
 HZ:05-Haze  
 DU:06-Widespread-dust-in-suspension-in-the-air,-not-raised-by-wind-at-or-near-the-station-at-the-time-of-observation  
 DU:07-Dust-or-sand-raised-by-wind-at-or-near-the-station-at-the-time-of-observation-but-no-well-developed-dust-whirl(s)-or-sand-whirl(s),-and-no-duststorm-or-sandstorm-seen-or,-in-the-case-of-ships,-blowing-spray-at-the-station  
 DU:08-Well-developed-dust-whirl(s)-or-sand-whirl(s)-seen-at-or-near-the-station-during-the-preceding-hour-or-at-the-time-of-observation,-but-no-duststorm-or-sandstorm



DU:09-Duststorm-or-sandstorm-within-sight-at-the-time-of-observation,-or-at-the-station-during-the-preceding-hour

FG:11-Patches-of-shallow-fog-or-ice-fog-at-the-station,-whether-on-land-or-sea,-not-deeper-than-about-2-meters-on-land-or-10-meters-at-sea

FG:12-More-or-less-continuous-shallow-fog-or-ice-fog-at-the-station,-whether-on-land-or-sea,-not-deeper-than-about-2-meters-on-land-or-10-meters-at-sea

13-Lightning-visible,-no-thunder-heard

14-Precipitation-within-sight,-not-reaching-the-ground-or-the-surface-of-the-sea

15-Precipitation-within-sight,-reaching-the-ground-or-the-surface-of-the-sea,-but-distant,-i.e.,-estimated-to-be-more-than-5-km-from-the-station

16-Precipitation-within-sight,-reaching-the-ground-or-the-surface-of-the-sea,-near-to,-but-not-at-the-station

TS:17-Thunderstorm,-but-no-precipitation-at-the-time-of-observation

SQ:18-Squalls-at-or-within-sight-of-the-station-during-the-preceding-hour-or-at-the-time-of-observation

FC:19-Funnel-cloud(s)-(Tornado-cloud-or-waterspout)-at-or-within-sight-of-the-station-during-the-preceding-hour-or-at-the-time-of-observation

20-Drizzle-(not-freezing)-or-snow-grains-not-falling-as-shower(s)-(during-the-preceding-hour-but-not-at-the-time-of-observation)

21-Rain-(not-freezing)-not-falling-as-shower(s)-(during-the-preceding-hour-but-not-at-the-time-of-observation)

22-Snow-not-falling-as-shower(s)-(during-the-preceding-hour-but-not-at-the-time-of-observation)

23-Rain-and-snow-or-ice-pellets-not-falling-as-shower(s)-(during-the-preceding-hour-but-not-at-the-time-of-observation)

24-Freezing-drizzle-or-freezing-rain-not-falling-as-shower(s)-(during-the-preceding-hour-but-not-at-the-time-of-observation)

25-Shower(s)-of-rain-(during-the-preceding-hour-but-not-at-the-time-of-observation)

26-Shower(s)-of-snow-or-of-rain-and-snow-(during-the-preceding-hour-but-not-at-the-time-of-observation)

27-Shower(s)-of-hail-(Hail,-small-hail,-snow-pellets),-or-rain-and-hail-(during-the-preceding-hour-but-not-at-the-time-of-observation)

28-Fog-or-ice-fog-(during-the-preceding-hour-but-not-at-the-time-of-observation)

29-Thunderstorm-(with-or-without-precipitation)-(during-the-preceding-hour-but-not-at-the-time-of-observation)

DU:30-Slight-or-moderate-duststorm-or-sandstorm-has-decreased-during-the-preceding-hour

DU:31-Slight-or-moderate-duststorm-or-sandstorm-no-appreciable-change-during-the-preceding-hour

DU:32-Slight-or-moderate-duststorm-or-sandstorm-has-begun-or-has-increased-during-the-preceding-hour

DU:33-Severe-duststorm-or-sandstorm-has-decreased-during-the-preceding-hour

DU:34-Severe-duststorm-or-sandstorm-no-appreciable-change-during-the-preceding-hour

DU:35-Severe-duststorm-or-sandstorm-has-begun-or-has-increased-during-the-preceding-hour

DRSN:36-Slight-or-moderate-drifting-snow-generally-low-(below-eye-level)

DRSN:37-Heavy-drifting-snow-generally-low-(below-eye-level)

BLSN:38-Slight-or-moderate-blowing-snow-generally-high-(above-eye-level)  
BLSN:39-Heavy-blowing-snow-generally-high-(above-eye-level)  
FG:40-Fog-or-ice-fog-at-a-distance-at-the-time-of-observation,-but-not-at-the-station-during-the-  
preceding-hour,-the-fog-or-ice-fog-extending-to-a-level-above-that-of-the-observer  
FG:41-Fog-or-ice-fog-in-patches  
FG:42-Fog-or-ice-fog,-sky-visible,-has-become-thinner-during-the-preceding-hour  
FG:43-Fog-or-ice-fog,-sky-invisible,-has-become-thinner-during-the-preceding-hour  
FG:44-Fog-or-ice-fog,-sky-visible,-no-appreciable-change-during-the-preceding-hour  
FG:45-Fog-or-ice-fog,-sky-invisible,-no-appreciable-change-during-the-preceding-hour  
FG:46-Fog-or-ice-fog,-sky-visible,-has-begun-or-has-become-thicker-during-the-preceding-hour  
FG:47-Fog-or-ice-fog,-sky-invisible,-has-begun-or-has-become-thicker-during-the-preceding-hour  
ur  
FG:48-Fog,-depositing-rime,-sky-visible  
FG:49-Fog,-depositing-rime,-sky-invisible  
DZ:50-Drizzle,-not-freezing,-intermittent,-slight-at-time-of-observation  
DZ:51-Drizzle,-not-freezing,-continuous,-slight-at-time-of-observation  
DZ:52-Drizzle,-not-freezing,-intermittent,-moderate-at-time-of-observation  
DZ:53-Drizzle,-not-freezing,-continuous,-moderate-at-time-of-observation  
DZ:54-Drizzle,-not-freezing,-intermittent,-heavy-(dense)-at-time-of-observation  
DZ:55-Drizzle,-not-freezing,-continuous,-heavy-(dense)-at-time-of-observation  
FZDZ:56-Drizzle,-freezing,-slight  
FZDZ:57-Drizzle,-freezing,-moderate-or-heavy-(dense)  
DZ:58-Drizzle-and-rain,-slight  
DZ:59-Drizzle-and-rain,-moderate-or-heavy  
RA:60-Rain,-not-freezing,-intermittent,-slight-at-time-of-observation  
RA:61-Rain,-not-freezing,-continuous,-slight-at-time-of-observation  
RA:62-Rain,-not-freezing,-intermittent,-moderate-at-time-of-observation  
RA:63-Rain,-not-freezing,-continuous,-moderate-at-time-of-observation  
RA:64-Rain,-not-freezing,-intermittent,-heavy-at-time-of-observation  
RA:65-Rain,-not-freezing,-continuous,-heavy-at-time-of-observation  
FZRA:66-Rain,-freezing,-slight  
FZRA:67-Rain,-freezing,-moderate-or-heavy  
RA:68-Rain-or-drizzle-and-snow,-slight  
RA:69-Rain-or-drizzle-and-snow,-moderate-or-heavy  
SN:70-Intermittent-fall-of-snowflakes,-slight-at-time-of-observation  
SN:71-Continuous-fall-of-snowflakes,-slight-at-time-of-observation  
SN:72-Intermittent-fall-of-snowflakes,-moderate-at-time-of-observation  
SN:73-Continuous-fall-of-snowflakes,-moderate-at-time-of-observation  
SN:74-Intermittent-fall-of-snowflakes,-heavy-at-time-of-observation  
SN:75-Continuous-fall-of-snowflakes,-heavy-at-time-of-observation  
76-Diamond-dust-(with-or-without-fog)  
SG:77-Snow-grains-(with-or-without-fog)  
SN:78-Isolated-star-like-snow-crystals-(with-or-without-fog)  
PL:79-Ice-pellets

SHRA:80-Rain-shower(s),-slight  
 SHRA:81-Rain-shower(s),-moderate-or-heavy  
 SHRA:82-Rain-shower(s),-violent  
 SHRASN:83-Shower(s)-of-rain-and-snow-mixed,-slight  
 SHRASN:84-Shower(s)-of-rain-and-snow-mixed,-moderate-or-heavy  
 SHSN:85-Show-shower(s),-slight  
 SHSN:86-Snow-shower(s),-moderate-or-heavy  
 SH:87-Shower(s)-of-snow-pellets-or-small-hail,-with-or-without-rain-or-rain-and-snow-mixed,-slight  
 SH:88-Shower(s)-of-snow-pellets-or-small-hail,-with-or-without-rain-or-rain-and-snow-mixed,-moderate-or-heavy  
 SH:89-Shower(s)-of-hail-(hail,-small-hail,-snow-pellets),-with-or-without-rain-or-rain-and-snow-mixed,-not-associated-with-thunder,-slight  
 SH:90-Shower(s)-of-hail-(hail,-small-hail,-snow-pellets),-with-or-without-rain-or-rain-and-snow-mixed,-not-associated-with-thunder,-moderate-or-heavy  
 RA:91-Slight-rain-at-time-of-observation,-thunderstorm-during-the-preceding-hour-but-not-at-time-of-observation  
 RA:92-Moderate-or-heavy-rain-at-time-of-observation,-thunderstorm-during-the-preceding-hour-but-not-at-time-of-observation  
 93-Slight-snow,-or-rain-and-snow-mixed-or-hail-(Hail,-small-hail,-snow-pellets),-at-time-of-observation,-thunderstorm-during-the-preceding-hour-but-not-at-time-of-observation  
 94-Moderate-or-heavy-snow,-or-rain-and-snow-mixed-or-hail-(Hail,-small-hail,-snow-pellets)-at-time-of-observation,-thunderstorm-during-the-preceding-hour-but-not-at-time-of-observation  
 TS:95-Thunderstorm,-slight-or-moderate,-without-hail-(Hail,-small-hail,-snow-pellets),-but-with-rain-and/or-snow-at-time-of-observation,-thunderstorm-at-time-of-observation  
 TS:96-Thunderstorm,-slight-or-moderate,-with-hail-(hail,-small-hail,-snow-pellets)-at-time-of-observation,-thunderstorm-at-time-of-observation  
 TS:97-Thunderstorm,-heavy,-without-hail-(Hail,-small-hail,-snow-pellets),-but-with-rain-and/or-snow-at-time-of-observation,-thunderstorm-at-time-of-observation  
 TS:98-Thunderstorm-combined-with-duststorm-or-sandstorm-at-time-of-observation,-thunderstorm-at-time-of-observation  
 TS:99-Thunderstorm,-heavy,-with-hail-(Hail,-small-hail,-snow-pellets)-at-time-of-observation,-thunderstorm-at-time-of-observation

**Table 5(b) pres\_wx\_AW1[2][3] (sourced from automated sensors)**

**Note:** Codes 20-26 are used to report precipitation, fog, thunderstorm at the station during the preceding hour, but not at the time of observation

00-No-significant-weather-observed  
 01-Clouds-generally-dissolving-or-becoming-less-developed  
 02-State-of-sky-on-the-whole-unchanged-during-the-past-hr  
 03-Clouds-generally-forming-or-developing-during-the-past-hr  
 HZ:04-Haze,-smoke,-or-dust-in-suspension-in-the-air,-visibility-equal-to-or-greater-than-1km

FU:05

DU:07-Dust-or-sand-raised-by-wind-at-or-near-the-station-at-the-time-of-observation,-but-no-well-developed-dust-whirl(s)-or-sand-whirl(s),-and-no-duststorm-or-sandstorm-seen-or,-in-the-case-of-ships,-blowing-sprayed-at-the-station

BR:10-Mist

11-Diamond-dust

12-Distant-lightning

SQ:18-Squalls

20-Fog-(during-preceding-hour-but-not-at-time-of-observation)

21-Precipitation-(during-preceding-hour-but-not-at-time-of-observation)

22-Drizzle-(not-freezing)-or-snow-grains-(during-preceding-hour-but-not-at-time-of-observation)

23-Rain-(not-freezing)--(during-preceding-hour-but-not-at-time-of-observation)

24-Snow-(during-preceding-hour-but-not-at-time-of-observation)

25-Freezing-drizzle-or-freezing-rain-(during-preceding-hour-but-not-at-time-of-observation)

26-Thunderstorm-(with-or-without-precipitation)-(during-preceding-hour-but-not-at-time-of-observation)(during-preceding-hour-but-not-at-time-of-observation)

27-Blowing-or-drifting-snow-or-sand

28-Blowing-or-drifting-snow-or-sand,-visibility-equal-to-or-greater-than-1-km

29-Blowing-or-drifting-snow-or-sand,-visibility-less-than-1-km

FG:30-Fog

FG:31-Fog-or-ice-fog-in-patches

FG:32-Fog-or-ice-fog,-has-become-thinner-during-the-past-hour

FG:33-Fog-or-ice-fog,-no-appreciable-change-during-the-past-hour

FG:34-Fog-or-ice-fog,-has-begun-or-become-thicker-during-the-past-hour

FG:35-Fog,-depositing-rime

40-Precipitation

41-Precipitation,-slight-or-moderate

42-Precipitation,-heavy

43-Liquid-precipitation,-slight-or-moderate

44-Liquid-precipitation,-heavy

45-Solid-precipitation,-slight-or-moderate

46-Solid-precipitation,-heavy

47-Freezing-precipitation,-slight-or-moderate

48-Freezing-precipitation,-heavy

DZ:50-Drizzle

DZ:51-Drizzle,-not-freezing,-slight

DZ:52-Drizzle,-not-freezing,-moderate

DZ:53-Drizzle,-not-freezing,-heavy

FZDZ:54-Drizzle,-freezing,-slight

FZDZ:55-Drizzle,-freezing,-moderate

FZDZ:56-Drizzle,-freezing,-heavy

DZ:57-Drizzle-and-rain,-slight

DZ:58-Drizzle-and-rain,-moderate-or-heavy

RA:60-Rain  
 RA:61-Rain,-not-freezing,-slight  
 RA:62-Rain,-not-freezing,-moderate  
 RA:63-Rain,-not-freezing,-heavy  
 FZRA:64-Rain,-freezing,-slight  
 FZRA:65-Rain,-freezing,-moderate  
 FZRA:66-Rain,-freezing,-heavy  
 RA:67-Rain-or-drizzle-and-snow,-slight  
 RA:68-Rain-or-drizzle-and-snow,-moderate-or-heavy  
 SN:70-Snow  
 SN:71-Snow,-slight  
 SN:72-Snow,-moderate  
 SN:73-Snow,-heavy  
 PL:74-Ice-pellets,-slight  
 PL:75-Ice-pellets,-moderate  
 PL:76-Ice-pellets,-heavy  
 SG:77-Snow-grains  
 IC:78-Ice-crystals  
 80-Showers-or-intermittent-precipitation  
 SHRA:81-Rain-showers-or-intermittent-rain,-slight  
 SHRA:82-Rain-showers-or-intermittent-rain,-moderate  
 SHRA:83-Rain-showers-or-intermittent-rain,-heavy  
 SHRA:84-Rain-showers-or-intermittent-rain,-violent  
 SHSN:85-Snow-showers-or-intermittent-snow,-slight  
 SHSN:86-Snow-showers-or-intermittent-snow,-moderate  
 SHSN:87-Snow-showers-or-intermittent-snow,-heavy  
 89-Hail  
 TS:90-Thunderstorm  
 TS:91-Thunderstorm,-slight-or-moderate,-with-no-precipitation  
 TS:92-Thunderstorm,-slight-or-moderate,-with-rain-showers-and/or-snow-showers  
 TS-HAIL:93-Thunderstorm,-slight-or-moderate,-with-hail  
 TS:94-Thunderstorm,-heavy,-with-no-precipitation  
 TS:95-Thunderstorm,-heavy,-with-rain-showers-and/or-snow  
 TS+HAIL:96-Thunderstorm,-heavy,-with-hail  
 +FC:99-Tornado

**Table 5(c) pres\_wx\_AU1[2][3] (sourced from automated ASOS/AWOS sensors)**

Codes can be a sequential order/combination of several sub-codes for weather intensity, descriptor, precipitation, obscuration and other:

**Intensity**

1:- (light)  
 3:+ (heavy)

4:VC (vicinity-(apparent-but-not-at-point-of-observation))

Descriptor

MI = shallow

PR = partial

BC = patches

DR = low-drifting

BL = blowing

SH = showers

TS = thunderstorm

FZ = freezing

Precipitation

DZ:01-Drizzle

RA:02-Rain

SN:03-Snow

SG:04-Snow-Grains

IC:05-Ice-Crystals

PL:06-Ice-Pellets

GR:07-Hail

GS:08-Small-Hail-and/or-Snow-Pellets

UP:09-Unknown-Precipitation

Obscuration

BR:1-Mist

FG:2-Fog

FU:3-Smoke

VA:4-Volcanic-Ash

DU:5-Widespread-Dust

SA:6-Sand

HZ:7-Haze

PY:8-Spray

Other weather:

PO:1-Well-developed-dust/sand-whirls

SQ:2-Squalls

FC:3-Funnel-Cloud,-Waterspout-or-Tornado

SS:4-Sandstorm

DS:5-Duststorm

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## **IX. List of Data Source Codes and attributes**

**Table 6: Data Source Codes**

Source code	Source Data Policy	Dataset name	source_name	domain	First year	Last year
83	Open Access	Deutscher Wetterdienst	Deutscher Wetterdienst subdaily	Germany		
88	Creative Commons Attribution	unden_UERRA_algeria	Bulletin Meteorologique de Algerie—Contact: Per Unden	Algeria	1879	1968
158	Creative Commons Attribution 4.0	Met Eirann	Met Eirann Synoptic	Ireland		
171	Open Access	meteo_godisnjak_UERRA_europe	Meteoroloski godisnjak 1 BulteniAvailable through NOAA CDMP	Europe	1877	2012
172	Open Access	kaspar_UERRA_europe	Cyprus Meteorological Returns Norwegian Meteorological InstituteContact: Cristian Lussana cristianl@met.no and Provi	Europe	1881	1922
173	Open Access	unden_UERRA_europe	Rocenka Contact: Per Unden Per.Unden@smhi.se	Europe	1948	1968

174	Open Access	egypt_daily_weather_UERRA_africa	Egypt Daily Weather Report	Africa	1948	1957
175	Open Access	romainian_met_UERRA_africa/europeG176	Romanian National Meteorological Administration Bulteni Available through NOAA CDMP	Africa/Europe	1950	1977
176	Open Access	dwd_UERRA_europe	UERRA_Deutscher Wetterdienst	Europe	1958	1978
177	Open Access	lussana_UERRA_europe	Instituto Nacional de Meteorología Banco de Datos Contact: Cristian Lussana cristianl@met.no	Europe	1959	1984
179	Open Access	slovenia_met_UERRA_europe	Slovenian Environmental Agency Available through NOAA CDMP	Europe	1950	1977
180	Open Access	yillik_UERRA_europe	UERRA_Yillik	Europe	1950	1971
220	WMO Resolution 40	USAF/14th Weather Squadron Surface Weather Observation database	Stations indexed to World Meteorological Organization (WMO) Identifier	Global		
221	WMO Resolution 40	USAF/14th Weather Squadron Surface Weather Observation database	Stations indexed to former World Meteorological Organization (WMO) Identifiers (termed "AFWA" id's)	Global		
222	WMO Resolution 40	USAF/14th Weather Squadron Surface Weather Observation database	NOAA Coastal -Marine Automated Network (C-MAN) stations	North America		



223	WMO Resolution 40	USAF/14th Weather Squadron Surface Weather Observation database	Stations indexed to an International Civil Aviation Organization (ICAO) Identifier	Global		
246	WMO resolution 40	ISPD_International Surface Pressure databank_Federal Climate Com	International Surface Pressure databank_Federal Climate Complex Integrated Surface Data	Global	1928	1948
247	Open Access	ISPD_International Surface Pressure databank_CDMP SAO/1001 For	International Surface Pressure databank_CDMP SAO/1001 Forms USA	Global	1849	2000
248	Open Access	ISPD_International Surface Pressure databank_Russian Empire Station	International Surface Pressure databank_Russian Empire Stations	Global	1901	1973
249	Mixed data policy	ISPD_International Surface Pressure databank_Air Weather Service T	International Surface Pressure databank_Air Weather Service TD13 USA	Global	1833	2017
250	Open Access	ISPD_International Surface Pressure databank_Hadley Center UK_su	International Surface Pressure databank_Hadley Center UK	Global	1800	1980
251	WMO resolution 40	ISPD_International Surface Pressure databank_CDMP-International c	International Surface Pressure databank_CDMP-International collection	Global	1947	2007

252	Open Access	ISPD_International Surface Pressure databank_READER Antarctic&So	International Surface Pressure databank_READER Antarctic&Southern Hemisphere	Global	1911	2006
253	Creative Commons Attri	ISPD_International Surface Pressure databank_KNMI Holland_sub_d	International Surface Pressure databank_KNMI Holland	Global	1816	1932
254	Open Access	ISPD_International Surface Pressure databank_US Army Signal Service	International Surface Pressure databank_US Army Signal Service and other 19th Century Voluntary Obs	Global	1784	1961
255	Open Access	ISPD_International Surface Pressure databank_internatio nal stations	International Surface Pressure databank_international stations recovered by Atmospheric Circulation Reconstructions o	Global	1848	1915
256	Open Access	ISPD_International Surface Pressure databank_Early Arctic observation	International Surface Pressure databank_Early Arctic observations	Global	1877	1978
257	Open Access	ISPD_International Surface Pressure databank_EURO4M/ MEDARE/C3	International Surface Pressure databank_EURO4M/MED ARE/C3 hourly SLP observations for North African stations	Global	1843	1914

258	Open Access	ISPD_International Surface Pressure databank_International stations	International Surface Pressure databank_International stations, University of South Carolina Historical Climate Lab	Global		
259	WMO resolution 40	ISPD_International Surface Pressure databank_Meteo_France_sub_d	International Surface Pressure databank_Meteo_France	Global	1822	1956
260	WMO resolution 40	ISPD_International Surface Pressure databank_University of Giessen	International Surface Pressure databank_University of Giessen worldwide early data	Global	1871	1996
261	WMO resolution 40	ISPD_International Surface Pressure databank_WASA Stations Obser	International Surface Pressure databank_WASA Stations Observations SLP	Global	1842	2004
262	Open Access	ISPD_International Surface Pressure databank_Environment Canada	International Surface Pressure databank_Environment Canada Pressure Obs	Global	1850	1980
263	Open Access	ISPD_International Surface Pressure databank_West African Synoptic	International Surface Pressure databank_West African Synoptic observations digitized by MeteoFrance	Global	1900	1956

264	WMO resolution 40	ISPD_International Surface Pressure databank_The Australian Bureau of Meteorology	International Surface Pressure databank_The Australian Bureau of Meteorology Station Pressure Dataset	Global	1803	1999
265	WMO resolution 40	ISPD_International Surface Pressure databank_Northern Italian Pressure data	International Surface Pressure databank_Northern Italian Pressure Observations	Global	1951	1980
266	Open Access	ISPD_International Surface Pressure databank_Hourly Surface observations	International Surface Pressure databank_Hourly Surface Observations for Brazile	Global	1850	2003
267	Open Access	ISPD_International Surface Pressure databank_Spanish Hourly Press	International Surface Pressure databank_Spanish Hourly Pressure Observations	Global	1876	2000
268	Open Access	ISPD_International Surface Pressure databank_German climate observations	International Surface Pressure databank_German climate observations	Global	1872	2002
269	Open Access	ISPD_International Surface Pressure databank_ZAMG Austrian station obs	International Surface Pressure databank_ZAMG Austrian station observations	Global	1964	2002

270	Open Access	ISPD_International Surface Pressure databank_Meteoswiss station collection	International Surface Pressure databank_Meteoswiss station collection	Global	1850	2003
271	Open Access	ISPD_International Surface Pressure databank_South African Weather Service	International Surface Pressure databank_South African Weather Service Meteorological collection	Global	1863	2007
272	Creative Commons Attribution	ISPD_International Surface Pressure databank_National Norwegian	International Surface Pressure databank_National Norwegian meteorological database	Global	1858	2005
273	WMO resolution 40	ISPD_International Surface Pressure databank_Croatian Meteorological Service	International Surface Pressure databank_Croatian Meteorological and Hydrological Service land stations	Global	1860	2006
274	Open Access	ISPD_International Surface Pressure databank_Signatures of environmental change in the observations of the Geophysical Institute	International Surface Pressure databank_Signatures of environmental change in the observations of the Geophysical Institute	Global	1815	1941

275	WMO resolution 40	ISPD_International Surface Pressure databank_French hourly SLP fro	International Surface Pressure databank_French hourly SLP from Meteo-France	Global	1788	1848
276	WMO resolution 40	ISPD_International Surface Pressure databank_Australia historical su	International Surface Pressure databank_Australia historical surface pressure	Global	1937	1999
277	Open Access	ISPD_International Surface Pressure databank_ACRE-Pacif ic: NIWA a	International Surface Pressure databank_ACRE-Pacific: NIWA and NZMet Service	Global	1920	1972
278	WMO resolution 40	ISPD_International Surface Pressure databank_Spanish Met Office st	International Surface Pressure databank_Spanish Met Office stations	Global	1755	1861
279	Mixed data policy	ISPD_International Surface Pressure databank_EMULATE Daily MSLP	International Surface Pressure databank_EMULATE Daily MSLP station data	Global	1951	2005
280	WMO resolution 40	ISPD_International Surface Pressure databank_Mozambiq ue station	International Surface Pressure databank_Mozambique station pressure	Global	1913	1938

281	Open Access	ISPD_International Surface Pressure databank_Japan Agency for Marine Science and Technology (JAMSTEC) archive	International Surface Pressure databank_Japan Agency for Marine-earth Science and Technology (JAMSTEC) archive	Global	1899	1962
282	WMO resolution 40	ISPD_International Surface Pressure databank_African SLP from Met	International Surface Pressure databank_African SLP from Meteo France	Global	1972	2005
283	WMO resolution 40	ISPD_International Surface Pressure databank_Tanzania station pres	International Surface Pressure databank_Tanzania station pressure	Global	1950	2004
284	WMO resolution 40	ISPD_International Surface Pressure databank_Hourly pressure from	International Surface Pressure databank_Hourly pressure from China	Global	1965	2010
285	Open Access	ISPD_International Surface Pressure databank_All-Russia Research I	International Surface Pressure databank_All-Russia Research Institute of Hydrometeorological Information - World Data	Global	2004	2012
286	Open Access	ISPD_International Surface Pressure databank_Data from Russian Hydromet	International Surface Pressure databank_Data from Russian Hydrometcentre	Global	1835	1840

287	Open Access	ISPD_International Surface Pressure databank_Early Russian Empire	International Surface Pressure databank_Early Russian Empire Stations, , digitized in LDEO from Kupffers Annuaire	Global	1879	1900
288	WMO resolution 40	ISPD_International Surface Pressure databank_Australian Meteorolo	International Surface Pressure databank_Australian Meteorological Association, Todd Project team	Global	1798	1869
289	Open Access	ISPD_International Surface Pressure databank_Canadian Volunteer	International Surface Pressure databank_Canadian Volunteer Climate Data Rescue project	Global	1867	2011
290	Open Access	ISPD_International Surface Pressure databank_University of Aberde	International Surface Pressure databank_University of Aberdeen historical pressure observations	Global	1845	1873
291	WMO resolution 40	ISPD_International Surface Pressure databank_Icelandic Meteorolog	International Surface Pressure databank_Icelandic Meteorological Office (IMO) Sea Level Pressure	Global	1915	1946



292	Open Access	ISPD_International Surface Pressure databank_ERA-CLIM FFCUL_sub	International Surface Pressure databank_ERA-CLIM FFCUL	Global	1992	2013
293	WMO resolution 40	ISPD_International Surface Pressure databank_Australian Bureau of	International Surface Pressure databank_Australian Bureau of Meteorology—Australian Baseline Sea Level Monitoring	Global	1722	1865
294	Open Access	ISPD_International Surface Pressure databank_Project IMPROVE_su	International Surface Pressure databank_Project IMPROVE	Global	1811	1820
295	WMO resolution 40	ISPD_International Surface Pressure databank_University of Barcelo	International Surface Pressure databank_University of Barcelona	Global	1796	1863
296	Open Access	ISPD_International Surface Pressure databank_University of Bern_su	International Surface Pressure databank_University of Bern	Global	1756	2012
297	creative Commons Attri	ISPD_International Surface Pressure databank_Stockholm University	International Surface Pressure databank_Stockholm University	Global	1815	1817
298	Open access	ISPD_International Surface Pressure databank_University of East An	International Surface Pressure databank_University of East Anglia	Global	1815	1817

299	WMO resolution 40	ISPD_International Surface Pressure databank_University of Gdansk	International Surface Pressure databank_University of Gdansk	Global	1929	2010
300	Open Access	ISPD_International Surface Pressure databank_ACRE-Pacif ic: Cook Isl	International Surface Pressure databank_ACRE-Pacific: Cook Island Met Services	Global	1929	1950
301	Open Access	ISPD_International Surface Pressure databank_ACRE-Pacif ic: Pacific I	International Surface Pressure databank_ACRE-Pacific: Pacific Island Met Services	Global	1885	2011
302	WMO resolution 40	ISPD_International Surface Pressure databank_Hong Kong Hourly Pr	International Surface Pressure databank_Hong Kong Hourly Pressure Observations	Global	1866	1944
303	WMO resolution 40	ISPD_International Surface Pressure databank_Jakarta/Ba tavia Press	International Surface Pressure databank_Jakarta/Batavia Pressure Observations	Global	1768	1793
304	Open Access	ISPD_International Surface Pressure databank_William Hutchinson p	International Surface Pressure databank_William Hutchinson pressure, Liverpool	Global	1859	1913
305	Open Access	ISPD_International Surface Pressure databank_Jersey, Channel Islan	International Surface Pressure databank_Jersey, Channel Island Pressure Obs	Global	1841	1913

306	Open access	ISPD_International Surface Pressure databank_CMDP-US NO_sub_dai	International Surface Pressure databank_CMDP-USNO	Global	1843	1867
307	Open access	ISPD_International Surface Pressure databank_Russian Sitka Sea Lev	International Surface Pressure databank_Russian Sitka Sea Level Pressure, University of South Carolina Climate Lab	Global	1924	1924
308	Open access	ISPD_International Surface Pressure databank_University of Toronto	International Surface Pressure databank_University of Toronto British Everest Expedition meteorological observation co	Global	1814	1817
309	WMO resolution 40	ISPD_International Surface Pressure databank_University of Extrema	International Surface Pressure databank_University of Extremadura	Global	1800	1838
310	Open Access	ISPD_International Surface Pressure databank_University of Helsinki	International Surface Pressure databank_University of Helsinki	Global	1899	1941
311	Open Access	ISPD_International Surface Pressure databank_Antarctic Expeditions	International Surface Pressure databank_Antarctic Expeditions	Global	1882	1883
312	Open Access	ISPD_International Surface Pressure databank_Canadian Arctic Fort	International Surface Pressure databank_Canadian Arctic Fort Rae SLP	Global		

313	Open Access	NOAA CDMP_sub_daily_US	The Climate Database Modernization Program (CDMP) DSI 3850	USA	1892	1948
314	Open Access	NOAA CDMP_sub_daily_US	The Climate Database Modernization Program (CDMP) DSI 3851	USA	1928	1948
315	Open Access	NOAA CDMP_sub_daily_US	The Climate Database Modernization Program (CDMP) DSI 3853	USA	1948	1997
316	Open Access	DWRUK_sub_daily_e urope	The UK Met Office Daily Weather Reports	Europe	1899	1910
317	WMO resolution 40	NCAR_sub_daily_gre enland_iceland	NCAR's Greenland/Iceland dataset	Greenland/Ic eland	1976	1999
318	WMO resolution 40	BAM_sub_daily_braz il	Brazilian Air Ministry/Brazil. 1994 (NCAR/RDA)	Brazil	1951	1981
319	WMO resolution 40	ASODSO_sub_daily_ australia	Australia Summary of Day and Surface Observations (NCAR/RDA)	Australia	1799	2020
320	Open Access	NMB_UKMO_CCSP_ China_ACRE	Nanking Meteorological Bulletins -[pending	China	1930	1931
321	Open Access	DWD_overseas data_China_Pacific_T ogo	german meteorological service deutscher wetterdienst DWD	China, Sth Pacific	1890	1914
322	WMO resolution 40	Mexico_ISD	Mexico_ISD NCEI datasets	Mexico	1973	1999
323	Open Access	UNI_GIESSEN_India_ sbdy	Digitisation and QC funded by the University of Giessen, ( India_sbdy)	India	1874	1890
324	Open Access	CHIMES	University of Bern	Switzerland	1708	1873
325	WMO resolution 40	Austrian pressure data	The Central Institution for Meteorology and Geodynamics (ZAMG)	Austria	1874	2002

326	Open Access	C3S_south_africa_data_rescue_Uni_Witwatersrand	University of Witwatersrand	South Africa	1819	1903
327	Open Access	MeteoCat_UERRA_sub_daily_spain	Meteorological Service of Catalonia	Spain	1988	2015
328	Open Access	Bulletin_Climatologique_UERRA_sub_daily_lebanon	Bulletin Climatologique, Lebanon	Lebanon	1930	1939
329	Open Access	Rocenka-annuaire_UERRA_sub_daily_czech	Rocenka-annuaire	Czech republic	1949	1984
330	Open Access	Bulletin_Meteoorologique_du_maroc_UERRA_sub_daily_Morocco	Bulletin Meteoorologique du Maroc	Morocco	1953	1968
331	Creative Commons Attribution	Met_No_UERRA_sub_daily_Norway	Met Norway	Norway	1959	2016
332	Creative Commons Attribution	Uerra_SMHI_sub_daily_sweden	SMHI, the Swedish Meteorological and Hydrological Institute	Sweden	1947	2015
333	WMO resolution 40??	Chile_Met_Service_hourly_data_chile	Chile Meteorological Directorate	Chile	1950	2020
334	Open Access	UNI_GIESSEN_Australia_sbdy	Digitisation and QC funded by the University of Giessen, (Australia-Adelaide_sbdy)	Australia	1876	1897
335	Open Access	NCEI DSI-3280	NOAA/NCEI			
336	Open Access	CMA_sub_Daily_china	National_Climate_Centre_CMA_ISPD3043	China	1902	1953
337	Open Access	CCSP_China_India_sbdy	CCSP_China_India	India /Sri Lanka	1934	1935

338	Open Access	ACRE_African_stations_late19thC_sbdy	ACRE_African_stations_late19thC_sbdy	Africa	1892	1907
339	Open Access	Metoe_lux_sbdy	Meteo Lux	Luxembourg	2011	2020
340	Open Access	ACRE_Solomon_Islands_sbdy	ACRE_Solomon_Islands	Solomon Islands	1909	1940
341	Open Access	ECC_Canada_hourly	Environment & Climate Change Canada	Canada	1953	ongoing
342	Open Access?	INMET_Brazil_Hourly_Daily	INMET brazilian met service	Brazil	1904	2021
343	Open Access	NCEI/ASOS/AWOS (NOAA Surface Weather Observations)	NOAA's National Centers for Environmental Information (NCEI) NCEI/ASOS/AWOS	USA	2004	ongoing
344	Open Access	NCEI/MAPSO	NOAA's National Centers for Environmental Information (NCEI) NCEI/MAPSO	USA	2004	ongoing
345	Open Access	NCEI/US CRN	NOAA's National Centers for Environmental Information (NCEI) NCEI/US CRN	USA	2001	ongoing
346	Open Access	NCEI/SURFRAD	NOAA's National Centers for Environmental Information (NCEI) NCEI/SURFRAD	USA	2004	ongoing
347	Open Access	NCEI/FAA	NOAA's National Centers for Environmental Information (NCEI)NCEI/FAA	USA		ongoing
348	Open Access	NCEI/CANA	NOAA's National Centers for Environmental Information (NCEI) NCEI/CANA	USA		ongoing
349	Open Access	DWD Overseas Data	DWD Overseas Data	Canada (New Foundland/ Labrador)	1882	1939

350	Open Access	DWD Overseas Data	DWD	Cameroon	1885	1939
356	Open Access	Japan Met Service	JMA	Japan	1975	2008
357	CC-BY-NC	University of Bern	University of Bern	Europe	1781	1792
382	Open Access	Coop HPD	U.S. Coop Hourly Precipitation (HPD), Version 2 and NOAA/NCEI DSI 3240 and 3260	USA		ongoing

## Appendix A

### **Columns/Headers in PSV files**

Note: the station-year files in the /by-year directory have a different date format. Rather than columns for Year, Month, Day, Hour, Minute, they have a single column “DATE” with the datetime in ISO format (example: 2024-01-01T02:00:00) and have a total column count of 234. Starting in early 2025, the columns across all PSV files will be consistent with DATE, Year, Month, Day, Hour, Minute columns.

Col#	Header
1	Station_ID
2	Station_name
3	Year
4	Month
5	Day
6	Hour
7	Minute
8	Latitude
9	Longitude
10	Elevation
11	temperature
12	temperature_Measurement_Code
13	temperature_Quality_Code
14	temperature_Report_Type
15	temperature_Source_Code
16	temperature_Source_Station_ID
17	dew_point_temperature
18	dew_point_temperature_Measurement_Code
19	dew_point_temperature_Quality_Code
20	dew_point_temperature_Report_Type
21	dew_point_temperature_Source_Code
22	dew_point_temperature_Source_Station_ID
23	station_level_pressure
24	station_level_pressure_Measurement_Code
25	station_level_pressure_Quality_Code
26	station_level_pressure_Report_Type
27	station_level_pressure_Source_Code
28	station_level_pressure_Source_Station_ID
29	sea_level_pressure
30	sea_level_pressure_Measurement_Code
31	sea_level_pressure_Quality_Code
32	sea_level_pressure_Report_Type
33	sea_level_pressure_Source_Code
34	sea_level_pressure_Source_Station_ID
35	wind_direction



36	wind_direction_Measurement_Code
37	wind_direction_Quality_Code
38	wind_direction_Report_Type
39	wind_direction_Source_Code
40	wind_direction_Source_Station_ID
41	wind_speed
42	wind_speed_Measurement_Code
43	wind_speed_Quality_Code
44	wind_speed_Report_Type
45	wind_speed_Source_Code
46	wind_speed_Source_Station_ID
47	wind_gust
48	wind_gust_Measurement_Code
49	wind_gust_Quality_Code
50	wind_gust_Report_Type
51	wind_gust_Source_Code
52	wind_gust_Source_Station_ID
53	precipitation
54	precipitation_Measurement_Code
55	precipitation_Quality_Code
56	precipitation_Report_Type
57	precipitation_Source_Code
58	precipitation_Source_Station_ID
59	relative_humidity
60	relative_humidity_Measurement_Code
61	relative_humidity_Quality_Code
62	relative_humidity_Report_Type
63	relative_humidity_Source_Code
64	relative_humidity_Source_Station_ID
65	wet_bulb_temperature
66	wet_bulb_temperature_Measurement_Code
67	wet_bulb_temperature_Quality_Code
68	wet_bulb_temperature_Report_Type
69	wet_bulb_temperature_Source_Code
70	wet_bulb_temperature_Source_Station_ID
71	pres_wx_MW1
72	pres_wx_MW1_Measurement_Code
73	pres_wx_MW1_Quality_Code
74	pres_wx_MW1_Report_Type
75	pres_wx_MW1_Source_Code
76	pres_wx_MW1_Source_Station_ID
77	pres_wx_MW2
78	pres_wx_MW2_Measurement_Code
79	pres_wx_MW2_Quality_Code

80 pres\_wx\_MW2\_Report\_Type  
81 pres\_wx\_MW2\_Source\_Code  
82 pres\_wx\_MW2\_Source\_Station\_ID  
83 pres\_wx\_MW3  
84 pres\_wx\_MW3\_Measurement\_Code  
85 pres\_wx\_MW3\_Quality\_Code  
86 pres\_wx\_MW3\_Report\_Type  
87 pres\_wx\_MW3\_Source\_Code  
88 pres\_wx\_MW3\_Source\_Station\_ID  
89 pres\_wx\_AU1  
90 pres\_wx\_AU1\_Measurement\_Code  
91 pres\_wx\_AU1\_Quality\_Code  
92 pres\_wx\_AU1\_Report\_Type  
93 pres\_wx\_AU1\_Source\_Code  
94 pres\_wx\_AU1\_Source\_Station\_ID  
95 pres\_wx\_AU2  
96 pres\_wx\_AU2\_Measurement\_Code  
97 pres\_wx\_AU2\_Quality\_Code  
98 pres\_wx\_AU2\_Report\_Type  
99 pres\_wx\_AU2\_Source\_Code  
100 pres\_wx\_AU2\_Source\_Station\_ID  
101 pres\_wx\_AU3  
102 pres\_wx\_AU3\_Measurement\_Code  
103 pres\_wx\_AU3\_Quality\_Code  
104 pres\_wx\_AU3\_Report\_Type  
105 pres\_wx\_AU3\_Source\_Code  
106 pres\_wx\_AU3\_Source\_Station\_ID  
107 pres\_wx\_AW1  
108 pres\_wx\_AW1\_Measurement\_Code  
109 pres\_wx\_AW1\_Quality\_Code  
110 pres\_wx\_AW1\_Report\_Type  
111 pres\_wx\_AW1\_Source\_Code  
112 pres\_wx\_AW1\_Source\_Station\_ID  
113 pres\_wx\_AW2  
114 pres\_wx\_AW2\_Measurement\_Code  
115 pres\_wx\_AW2\_Quality\_Code  
116 pres\_wx\_AW2\_Report\_Type  
117 pres\_wx\_AW2\_Source\_Code  
118 pres\_wx\_AW2\_Source\_Station\_ID  
119 pres\_wx\_AW3  
120 pres\_wx\_AW3\_Measurement\_Code  
121 pres\_wx\_AW3\_Quality\_Code  
122 pres\_wx\_AW3\_Report\_Type  
123 pres\_wx\_AW3\_Source\_Code

124 pres\_wx\_AW3\_Source\_Station\_ID  
125 snow\_depth  
126 snow\_depth\_Measurement\_Code  
127 snow\_depth\_Quality\_Code  
128 snow\_depth\_Report\_Type  
129 snow\_depth\_Source\_Code  
130 snow\_depth\_Source\_Station\_ID  
131 visibility  
132 visibility\_Measurement\_Code  
133 visibility\_Quality\_Code  
134 visibility\_Report\_Type  
135 visibility\_Source\_Code  
136 visibility\_Source\_Station\_ID  
137 altimeter  
138 altimeter\_Measurement\_Code  
139 altimeter\_Quality\_Code  
140 altimeter\_Report\_Type  
141 altimeter\_Source\_Code  
142 altimeter\_Source\_Station\_ID  
143 pressure\_3hr\_change  
144 pressure\_3hr\_change\_Measurement\_Code  
145 pressure\_3hr\_change\_Quality\_Code  
146 pressure\_3hr\_change\_Report\_Type  
147 pressure\_3hr\_change\_Source\_Code  
148 pressure\_3hr\_change\_Source\_Station\_ID  
149 sky\_cover\_1  
150 sky\_cover\_1\_Measurement\_Code  
151 sky\_cover\_1\_Quality\_Code  
152 sky\_cover\_1\_Report\_Type  
153 sky\_cover\_1\_Source\_Code  
154 sky\_cover\_1\_Source\_Station\_ID  
155 sky\_cover\_baseht\_1  
156 sky\_cover\_baseht\_1\_Measurement\_Code  
157 sky\_cover\_baseht\_1\_Quality\_Code  
158 sky\_cover\_baseht\_1\_Report\_Type  
159 sky\_cover\_baseht\_1\_Source\_Code  
160 sky\_cover\_baseht\_1\_Source\_Station\_ID  
161 sky\_cover\_2  
162 sky\_cover\_2\_Measurement\_Code  
163 sky\_cover\_2\_Quality\_Code  
164 sky\_cover\_2\_Report\_Type  
165 sky\_cover\_2\_Source\_Code  
166 sky\_cover\_2\_Source\_Station\_ID  
167 sky\_cover\_baseht\_2

168 sky\_cover\_baseht\_2\_Measurement\_Code  
169 sky\_cover\_baseht\_2\_Quality\_Code  
170 sky\_cover\_baseht\_2\_Report\_Type  
171 sky\_cover\_baseht\_2\_Source\_Code  
172 sky\_cover\_baseht\_2\_Source\_Station\_ID  
173 sky\_cover\_3  
174 sky\_cover\_3\_Measurement\_Code  
175 sky\_cover\_3\_Quality\_Code  
176 sky\_cover\_3\_Report\_Type  
177 sky\_cover\_3\_Source\_Code  
178 sky\_cover\_3\_Source\_Station\_ID  
179 sky\_cover\_baseht\_3  
180 sky\_cover\_baseht\_3\_Measurement\_Code  
181 sky\_cover\_baseht\_3\_Quality\_Code  
182 sky\_cover\_baseht\_3\_Report\_Type  
183 sky\_cover\_baseht\_3\_Source\_Code  
184 sky\_cover\_baseht\_3\_Source\_Station\_ID  
185 precipitation\_3\_hour  
186 precipitation\_3\_hour\_Measurement\_Code  
187 precipitation\_3\_hour\_Quality\_Code  
188 precipitation\_3\_hour\_Report\_Type  
189 precipitation\_3\_hour\_Source\_Code  
190 precipitation\_3\_hour\_Source\_Station\_ID  
191 precipitation\_6\_hour  
192 precipitation\_6\_hour\_Measurement\_Code  
193 precipitation\_6\_hour\_Quality\_Code  
194 precipitation\_6\_hour\_Report\_Type  
195 precipitation\_6\_hour\_Source\_Code  
196 precipitation\_6\_hour\_Source\_Station\_ID  
197 precipitation\_9\_hour  
198 precipitation\_9\_hour\_Measurement\_Code  
199 precipitation\_9\_hour\_Quality\_Code  
200 precipitation\_9\_hour\_Report\_Type  
201 precipitation\_9\_hour\_Source\_Code  
202 precipitation\_9\_hour\_Source\_Station\_ID  
203 precipitation\_12\_hour  
204 precipitation\_12\_hour\_Measurement\_Code  
205 precipitation\_12\_hour\_Quality\_Code  
206 precipitation\_12\_hour\_Report\_Type  
207 precipitation\_12\_hour\_Source\_Code  
208 precipitation\_12\_hour\_Source\_Station\_ID  
209 precipitation\_15\_hour  
210 precipitation\_15\_hour\_Measurement\_Code  
211 precipitation\_15\_hour\_Quality\_Code

212	precipitation_15_hour_Report_Type
213	precipitation_15_hour_Source_Code
214	precipitation_15_hour_Source_Station_ID
215	precipitation_18_hour
216	precipitation_18_hour_Measurement_Code
217	precipitation_18_hour_Quality_Code
218	precipitation_18_hour_Report_Type
219	precipitation_18_hour_Source_Code
220	precipitation_18_hour_Source_Station_ID
221	precipitation_21_hour
222	precipitation_21_hour_Measurement_Code
223	precipitation_21_hour_Quality_Code
224	precipitation_21_hour_Report_Type
225	precipitation_21_hour_Source_Code
226	precipitation_21_hour_Source_Station_ID
227	precipitation_24_hour
228	precipitation_24_hour_Measurement_Code
229	precipitation_24_hour_Quality_Code
230	precipitation_24_hour_Report_Type
231	precipitation_24_hour_Source_Code
232	precipitation_24_hour_Source_Station_ID
233	remarks
234	remarks_Measurement_Code
235	remarks_Quality_Code
236	remarks_Report_Type
237	remarks_Source_Code
238	remarks_Source_Station_ID

## Appendix B - “Hourly” Precipitation Measurements

For the precipitation totals coming from METARs (Meteorological Aerodrome Reports) from AWOS/ASOS reports, there are usually routine FM-15 messages that are transmitted at a standard time (at the end of the hour: at or after minute 45) for a particular station. In many cases, the report is hourly and in general is no longer than hourly. For the standard hourly reports, there can be METAR SPECI (FM-16) reports transmitted at other (non-standard) times, when conditions change that can affect aviation during the hour between the routine messages. Some airport sites routinely report more frequently than once per hour (e.g, at 20 minute intervals), even when conditions are not changing. When multiple observations are transmitted within the hour, the precipitation totals represent a running total for that hour. To extract the total precipitation for a particular hour, the last report should be used.

An example of routine (FM-15) and interim/special reports (FM-16) is provided below.

METAR KBYY 251255Z 01007KT 7SM -RA BKN020 OVC050 22/21 A2976 RMK A02 T02320216;  
METAR KBYY 251315Z 30008G28KT 3/4SM -RA OVC009 21/20 A2984 RMK A02 P0065 T02230214;  
METAR KBYY 251335Z 35013G18KT 1/2SM +RA BKN005 OVC008 19/19 A2986 RMK A02 P0170  
T01980197;  
METAR KBYY 251355Z 01008KT 4SM RA SCT007 BKN048 OVC060 18/18 A2984 RMK A02 P0186  
T01920192

In this case there are two METAR SPECIs after the for hour 13 after the 12:55 UTC routine message. Rainfall amounts are noted by the P groups highlighted above. Precipitation totals are:

P0065 in the 13:15 report means 0.65 inches of rain (16.5 mm) since the last routine METAR (likely since 12:55 UTC)

P0170 in the 13:35 report means 1.70 inches of rain (43.2 mm) since the last routine METAR

P0186 in the 13:55 report means 1.86 inches of rain (47.2 mm) since the last routine METAR

For the intermediate reports:

P0170 at 13:35 UTC indicates that an additional 1.05 inches/26.7 mm (1.70" - 0.65") of rain fell between 13:15 UTC and 13:35 UTC.

P0186 at 13:55 UTC indicates that an additional 0.16 inches/4.1 mm (1.86" - 1.70") of rain fell between 13:35 UTC and 13:55 UTC.

The most straightforward way to extract the hourly total for stations with METAR reports like this one is to take the last report for the hour. The standard reporting time varies somewhat from station to station, but is obvious as the most common minute closest to the end of the hour.

There are multiple sources that contain METAR observations. For the USA these include 343, 335, 220, 221, 223. Prior to 1996, SA (Surface Airways) and SAO reports were used prior to METAR adoption in North America and globally before around 1981. These reports have similar rules to METAR. The precipitation\_Report\_Type indicates what report the observation came from.

Information on ASOS/AWOS can be found here:

<https://www.ncei.noaa.gov/products/land-based-station/automated-surface-weather-observing-systems>.

For more information on the meteorological report types refer to the Federal Meteorological Handbook (FMH) No. 1, Surface Weather Observations & Reports.

[https://www.icams-portal.gov/resources/ofcm/fmh/FMH1/fmh1\\_2019.pdf](https://www.icams-portal.gov/resources/ofcm/fmh/FMH1/fmh1_2019.pdf)