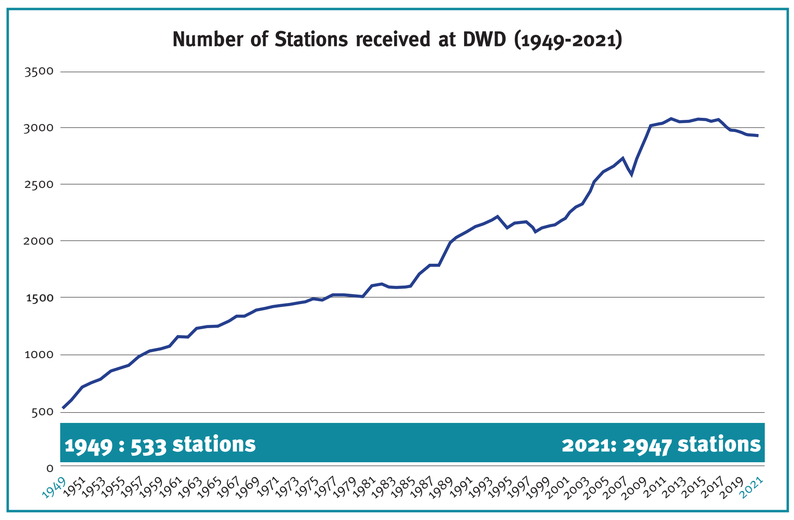
Exchanging worldwide daily data together with its quality information: a new WMO Initiative

History and actual context: the CLIMAT message

In 1935 it was agreed within the International Meteorological Organization (IMO), former WMO, that mean monthly values of the main climatological elements at certain stations around the world should be exchanged between Meteorological Services.



Known as the CLIMAT message (FM-71), such exchange really started in 1949 with monthly extremes, means and Normals data.

In 1951 and 1957, WMO confirmed the relevant resolutions of IMO.

1935 — **1949** — **1951 & 1957**

Nowadays, The content of CLIMAT is also encoded in FM94 BUFR with template 3 07 073

Why a DAYCLI message?

The development of the principal measure of the state of the climate - the global temperature record - has extensively depended on monthly CLIMAT data provided by National Meteorological and Hydrological Services (NMHSs). Over the last 20 years, there has been a growing demand for indices and measures of the climate that also consider extremes.

For many extreme measures, monthly data are insufficient and there is a need for operationally exchanged daily climate data. This need is not just for timeliness, but principally for data that is compatible with long historical daily series developed, controlled and made available by NMHSs.

Attempts have been made to use SYNOP* (FM-12 Surface Synoptic observation) for this purpose but there are serious data issues such as max and min temperatures that differ from the true 24-hour climatological extremes and overall quality and completeness that is less than the daily time-series managed within NMHS climatological departments (see* van den Besselaar et al., DOI:10.1029/2011JD1688).

There is also a demand for validation of modeling data by surface station observations.

DAYCLI message

Exchanging quality-controlled values of temperature, rain and snow parameters all around the world for better climate services.

Daily Minimum Mean and Maximum temperatures

Daily total accumulated precipitation

Daily total snow depth & Daily depth of fresh snow

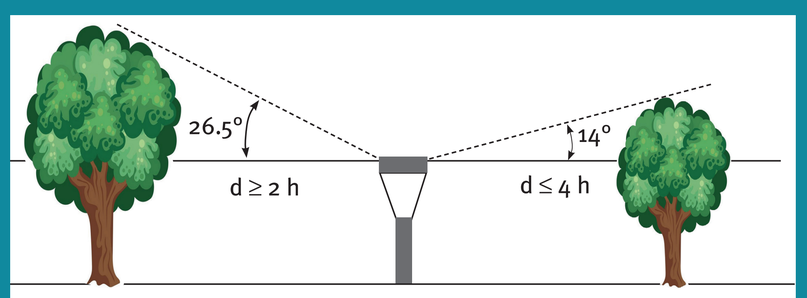
You expect quality ?

Siting Classification

It gives an estimation of how well the siting of an instrument meets the WMO siting requirements.

Users, such as climate researchers using the data, get a quick idea of how representative the data may be of the region. They also get an idea of the history of the station.

The siting classification proposes 5 classes. A class 1 represents the full compliancy with WMO requirements (highest representativeness), a class 5 an inappropriate environment for a meteorological measurement.



Class 1 Raingauge requirement example
ISO/WMO standard 19289:2015 (E)
WMO Guide to Instruments and Methods of Observation (WMO-No. 8)

Measurement Quality Classification

An assessment of instrument quality, maintenance and calibration state.

It evolves with time due to internal and external factors affecting the measuring system

Classifications from A to D

- **A** Aligned with WMO Requirements Goal (highest quality)
- **B** Aligned with WMO Requirements Breakthrough
- **C** Aligned with WMO Requirements Threshold
- **D** Greater than the uncertainty for Class C or no information is available

Measurand	Class A Goal	Class B Breakthrough	Class C Threshold	Class D
Air temperature	0,2 K	0,6 K	1,0K	› Class C or unknown
Liquid precipitation amount (daily accumulated)	› 1 mm	› 3 mm	› 5 mm	› Class C or unknown

Criteria for measurement quality classification
(WMO OSCAR/Requirements & WMO-No. 8)

Data Quality- Control information

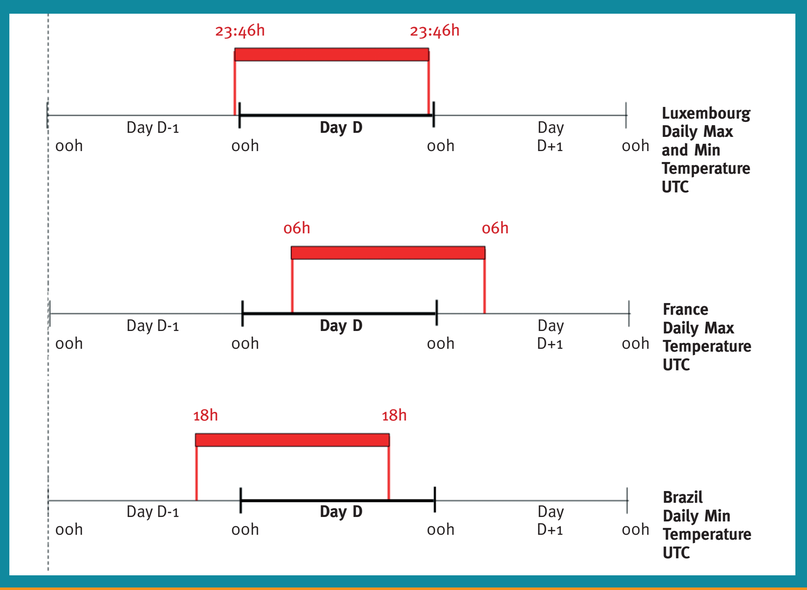
Each data value is assigned with an information on whether or not the data has been quality controlled and if some special events has affected the measurement like overflowing raingauges, accumulated rain on several days...

0	Data checked and declared good
1	Data checked and declared suspect
2	Data checked and declared aggregated
3	Data checked and declared out of instrument range
4	Data checked, declared aggregated, and out of instrument range
5	Parameter is not measured at the station
6	Daily value not provided
7	Data unchecked

Code Table 031 021 Associated field significance, FM 94 BUFR, Manual on Codes, International Codes, Volume I.2 (WMO-No. 306 updated in 2022)

Time period for the extremes and accumulations

Due to different practices the DAYCLI gives the exact time period of each concerned daily data value.



Computation Method

Method of computation of the mean of temperature used by NMHSs

Code figure

- **0** Average of maximum and minimum values: Tm = (Tx + Tn)/2 (see Note)
- **1** Average of the 8 observations taken every three hours
- **2** Average of the 24 hourly observations
- **3** Weighted average of 3 observations: Tm = (aT1 + bT2 + cT3) (see Note)
- **4** Weighted average of 3 observations and also maximum and minimum values: Tm = (aT1 + bT2 + cT3 + dTx + eTn) (see Note)
- **5** Automatic weather station complete integration from minute data
- **6** Average of the 4 observations taken every six hours

Code Table 0 08 094 Method used to calculate the average daily temperature, FM 94 BUFR, Manual on Codes

DAYCLI message format: BUFR

BUFR is the WMO Binary Universal Form for the Representation of meteorological data. BUFR belongs to the category of table-driven code forms, where the meaning of data elements is determined by referring to a set of tables that are kept and maintained separately from the message itself.

The DAYCLI message corresponds to the BUFR template 3 07 075. Such a template integrates the capacity to exchange: high accuracy latitude and longitude, the height of the station ground above mean sea level and the height of the sensor above local ground.

The DAYCLI message is transmitted through the WMO Information System (WIS) that connects all National Meteorological and Hydrological Services and regions together for data exchange, management and processing.

Specifications and Tests

These NMHSs have contributed to the specifications and the production of the DAYCLI message:

ALGERIA, ARGENTINA, BRAZIL, CHILE, ESTONIA, FINLAND, FRANCE, GERMANY, INDIA, INDONESIA, IRELAND, JAPAN, LIBYA, LUXEMBOURG, MOROCCO, PARAGUAY, PERU, SPAIN, SWITZERLAND, URUGUAY and UNITED STATES OF AMERICA

October 2022 – World Meteorological Organization – Expert Team on Data Requirements for Climate Services (SERCOM) & Expert Team on Data Standards (INFCOM) with the contributions of the German Meteorological Service (DWD) as Global Climate Monitoring Center and NOAA's National Centers for Environmental Information (NCEI)

Designed and edited by Météo-France

GCOS KEEPING WATCH OVER OUR CLIMATE

WORLD METEOROLOGICAL ORGANIZATION

EUMETSAT

RÉPUBLIQUE FRANÇAISE
Liberté Égalité Fraternité

METEO FRANCE