

Include Basic CF Attributes

Recommendation:

We recommend that, at minimum, the following basic Climate and Forecast (CF) Convention attributes be included in future NASA Earth Science data products where applicable.

Recommendation Details : The Climate and Forecast (CF) [Conventions](#) are widely employed guidelines for Earth Science data and metadata storage. Included in the conventions is a comprehensive list of metadata attributes that are available for use by dataset producers. Because the list of metadata attributes is so extensive, dataset producers are constantly struggling with which metadata attributes to attach to a variable.

The following CF Convention attributes should be included in future NASA Earth Science data products where applicable – as they are necessary to describe any interoperable data file.

Attribute Name	Short Definition	Example	Notes
Conventions	CF version	"CF-1.6"	--
units	A string that represents the units of measurement.	"Kelvin"	A variable with no units attribute is assumed to be unitless.
long_name	A descriptive name that indicates a variable's content.	"Sea Surface Temperature"	--
standard_name	A standard name that references a description of a variable's content in the standard name table of CF conventions.	"latitude"	standard_name may not be applicable to many NASA HDF products, as some physical variable names of NASA satellites are not in the CF standard name table .
_FillValue	A value used to represent missing or undefined data.	-9999.0	Include _FillValue only if variable has missing values. Also _FillValue data type must equal the variable data type.
valid_min	Smallest valid value of a variable.	0	If applicable, must have either (valid_min, valid_max) or valid_range. According to the CF convention, the valid_min attribute should have the same type as the data variable. Thus, if the data variable is packed with scale_factor and add_offset, valid_min is also stored in packed form and must be unpacked: $\text{valid_min_value} = \text{scale_factor} \times \text{valid_min} + \text{add_offset}$
valid_max	Largest valid value of a variable.	1	If applicable, must have either (valid_min, valid_max) or valid_range. According to the CF convention, the valid_max attribute should have the same type as the data variable. Thus, if the data variable is packed with scale_factor and add_offset, valid_max is also stored in packed form and must be unpacked: $\text{valid_max_value} = \text{scale_factor} \times \text{valid_max} + \text{add_offset}$
valid_range	Smallest and largest valid values of a variable.	(0, 1)	If applicable, must have either (valid_min, valid_max) or valid_range. According to the CF convention, the valid_range attribute should have the same type as the data variable. Thus, if the data variable is packed with scale_factor and add_offset, valid_max is also stored in packed form and must be unpacked: $\text{valid_min_value} = \text{scale_factor} \times \text{valid_range}[0] + \text{add_offset}$ $\text{valid_max_value} = \text{scale_factor} \times \text{valid_range}[1] + \text{add_offset}$
scale_factor	If present for a variable, the data are to be multiplied by this factor after the data are read by an application.	0.1	The unpacked final value is, per netCDF convention: $\text{Final_data_value} = \text{scale_factor} \times \text{Raw_data_value} + \text{add_offset}$ See also Recommendation DIWG-R6 When to Employ Packing Attributes .
add_offset	If present for a variable, this number is to be added to the data after it is read by an application. If both scale_factor and add_offset attributes are present, the data are first scaled before the offset is added.	300	The unpacked final value is, per netCDF convention: $\text{Final_data_value} = \text{scale_factor} \times \text{Raw_data_value} + \text{add_offset}$ See also Recommendation DIWG-R6 When to Employ Packing Attributes .
coordinates	Identifies a variable's coordinates.	"time latitude longitude"	Recommended when using multidimensional coordinate variables or a one-dimensional coordinate variable with a name that differs from its dimension's name. This helps geospatial tools identify spatio-temporal coordinates unambiguously for a variable. Makes the bounds attribute more useful. See also Recommendation DIWG-R3 Use CF "bounds" attributes .

Because CF has special requirements for dimensional units and some coordinate values, when applicable, the units attribute values listed below should be used:

Coordinate Variable	Unit Value	Examples
latitude	"degrees_north"	--
longitude	"degrees_east"	--

pressure	"Pa" or "hPa"	--
height (depth)	"meter" ("m") or "kilometer" ("km")	--
time	Seconds, minutes, hours, days, etc., since a specific starting point in time, often (but not always) representing a canonical time (e.g., 1 Jan 1970, TAI93, start of mission, etc.). Time is in ISO-8601 format.	seconds since 1992-10-08T15:15:42.5-6:00 days since 1970-01-01T00:00:00Z