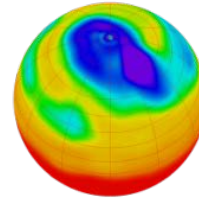




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Parameter naming in GRIB and CF

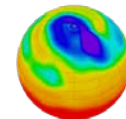
Alison Pamment

**Centre for Environmental Data Archival,
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Alison.Pamment@stfc.ac.uk

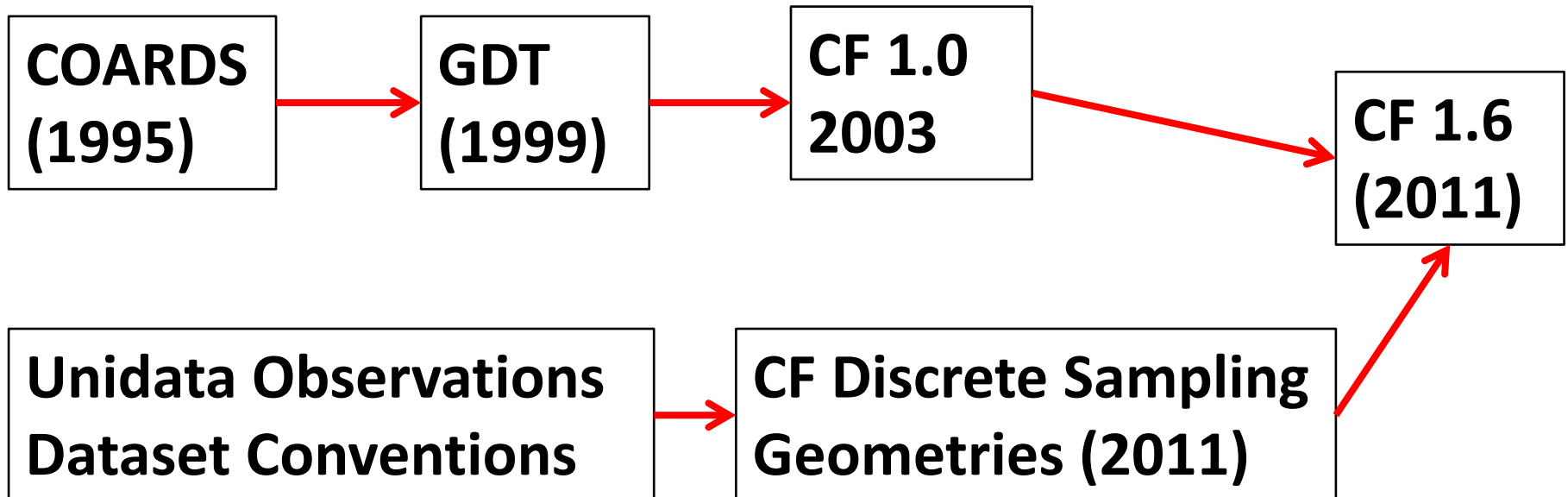
Introduction

- Parameter names are used as both ‘discovery’ and ‘usage’ metadata
- Key piece of metadata that must be mapped between GRIB and netCDF if users are to work easily and conveniently with both formats
- GRIB metadata follow WMO documents (Manual on Codes)
- CF stands for ‘Climate and Forecast’ metadata conventions – described in conventions doc – see <http://cfconventions.org/documents.html>



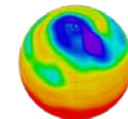
Why CF?

- NetCDF users guide (NUG) provides generic metadata conventions (ground rules)
- Besides NUG, 16 metadata conventions for use with NetCDF (some current, some now superseded)



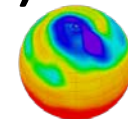
Why CF?

- Other current conventions recommend usage of particular CF attributes for a specific purpose
 - NODC (*National Oceanographic Data Center*) templates
 - ACDD (*Attribute Convention for Dataset Discovery*)
- CF is the only netCDF metadata convention that contains an extensive list of standardized parameter names → **CF standard names**



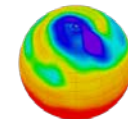
CF standard name table

- Names are published periodically in the **standard name table** on the CF website
- Standard name table version number is incremented at each update
- Version number of standard name table is independent of CF version number
- ‘Master document’ is XML file following schema described in CF conventions document
- XML is processed to HTML for human readability
- Also in NERC vocabulary server (P071)



CF standard names (1)

- Lower case, digits and underscores (no upper case)
- American spellings
- (Almost) all standard names have an accompanying description
- Names are never removed once they have been added
 - Name can be modified using an ‘alias’
- Most recent (version 27) contains over 2500 standard names and there are about 300 proposed names



CF standard names (2)

GRAMMAR:

[surface][component]base_quantity [at surface][in medium][due to process][assuming condition]

EXAMPLES:

*tropopause*_air_temperature

*downward*_water_vapor_flux_*in*_air_*due to*_diffusion

Canonical units

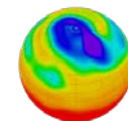
- Canonical_units are agreed at same time as standard name – they go hand in hand, e.g.
 - mass_concentration → kg m⁻³
 - mole_concentration → mol m⁻³
- String valued
- Must be supported by Unidata UDUNITS package which converts between recognized units – degrees Celsius is OK!

HTML Table

Standard Name	Canonical Units	AMIP	GRIB
air_potential_temperature Potential temperature is the temperature a parcel of air or sea water would have if moved adiabatically to sea level pressure.	K	theta	13
air_pressure	Pa	plev	1
air_pressure_at_cloud_base	Pa		

Parameter identification in GRIB

- WMO documentation describes it as “table driven code form”
 - Metadata within a data file has to be interpreted with reference to external tables
- Parameter tables differ between GRIB editions 1 (**FM 92–XI Ext. GRIB**) and 2 (**FM 92-XIV Ext. GRIB**)
- Both GRIB editions still in use (2014)
- Parameter tables can differ between modelling centres
- Table versions can be incremented independently of GRIB edition
- SI units only – stated in tables



GRIB Edition 1

- **Code table 2 – *Indicator of parameter***

Code	Parameter	Unit
000	Reserved	
001	Pressure	Pa
002	Pressure reduced to MSL	Pa
003	Pressure tendency	Pa s ⁻¹
126	Wind mixing energy	J
127	Image data	
128–254	Reserved for originating centre use	
255	Missing value	

GRIB Edition 2

Discipline - Section 0 - table 0.0

0 Meteorology
1 Hydrology
...
192
255

Category - table 4.1

E.g. Discipline 0 – Meteorological products

0
1
2
...
19

Parameter - table 4.2

E.g. Category 0 – Temperature

Code

Precipitation

0 Res

1 Rai

2 Th

3 Fre

...

Code

Cloud

Code ta

*Thunder
coverage*

...

Code table 4.218 –

Pixel scene type

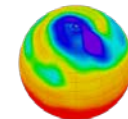
GRIB Edition 2: which tables?

Section 0

- GRIB edition number (2)

Section 1

- GRIB Master tables version number (table 1.0)
 - Currently 12: 12 November 2013
- GRIB local tables version number (table 1.1)
(discouraged for data exchange!)
 - 0 = not used; 1 – 254 = local vn; 255 = missing
- Identification of originating/generating centre
(Common Code table C–11)



Mapping GRIB and CF parameters (1)

- Scope
 - Which GRIB edition(s)?
 - Which tables (master, local, both)?
 - Which centres?
 - Current (September 2014) GRIB tables only?
 - All parameters?

Mapping GRIB and CF parameters (2)

- What information would mappings need to capture?

A **simple(!)** example:

CF std name table vn 27: tropopause_air_temperature

MAPS TO

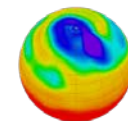
GRIB ed 2: Master table vn 12:

Master table 0.0 code 0 (meteorological product):

Master table 4.1 code 0 (temperature category):

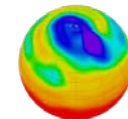
Master table 4.2 code 0 (parameter is temperature):

Master table 4.5 code 7 (tropopause)



Mapping GRIB and CF parameters (3)

- Awkward cases:
 - Upward and downward fluxes distinguished by sign convention in GRIB
 - Different canonical units
- Practical issues
 - Where are master/local tables published?
 - Where will the mappings be officially documented? WMO website, CF website, modelling centres?
 - What if there is no mapping for a parameter?



Mapping GRIB and CF parameters (4)

- Governance questions:
 - Who will create mappings?
 - How will they be reviewed/approved?
- Creating parameter mappings is a non-trivial task!
- Need solution which works for both machines and humans