GRWG Requirements - format for GSICS VIS/NIR products and requirements for GSICS Plotting Tool

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Overview and Purpose

- Overview
  - New GSICS product (GEO-LEO-VNIR) will enter Demo-Phase in 2016
    - EUMETSAT GEO-LEO-VNIR product: in GPPA
    - Products (netCDF) will contain multiple calibration methods' results in one file
    - NetCDF convention: almost fixed, but some issues (e.g. use of enhanced data model) should be discussed within GDWG members
    - Requirement documents for GSICS Plotting Tool would be prepared by GRWG
- Purpose of this talk
  - To introduce new product and GRWG requirement
  - To discuss / get consensus on the requirement (incl. enhanced data model)

Current Convention for the GEO-LEO-VISNIR (DCC) product

Basic idea: to follow existing GEO-LEO-IR convention

- File naming
  - E.g., W_XX-EUMETSAT-Darmstadt,SATCAL+RAC+GEOLEOVNIR,MSG3+SEVIRI-Aqua+MODIS_C_EUMG_20130601000000_demo_01.nc
- netCDF Convention
  - Global attributes
    - Nothing special issues to be discussed
  - Variables
    - Basic variables (e.g. date, channel name)
    - Official calibration coefficients (This will also be discussed for GEO-LEO-IR)
    - Specific variables to GSICS VISNIR products in order to support multiple calibration methods

VIS/NIR netCDF Convention - Global Attributes (1)

:atbd_doc_doi = "N/A" ;
:atbd_doc_url = "http://www.eumetsat.int/Home/Main/DataProducts/Calibration/Inter-calibration/" ;
:conventions = "CF-1.6" ;
:creator_email = "ops@eumetsat.int" ;
:creator_name = "EUMETSAT";
:creator_url = "http://www.eumetsat.int" ;
:date_created = "2016-01-27T13:09:12Z" ;
:date_modified = "2016-01-27T13:09:12Z" ;
:geospatial_lat_max = 60.f ;
:geospatial_lat_min = -60.f ;
:geospatial_lat_units = "degrees_north" ;
:geospatial_lon_max = 60.f ;
:geospatial_lon_min = -60.f ;
:geospatial_lon_units = "degrees_east" ;

VIS/NIR netCDF Convention - Global Attributes (2)

:history = "Blend 2016-01-27T13:09:12Z v1.0.0; …" ;

:id = "W_XX-EUMETSAT-Darmstadt,SATCAL+RAC+GEOLEOVNIR,MSG3+SEVIRI-AQUA+MODIS_C_EUMG_20160123000000_demo_01.nc" ;

:institution = "EUMETSAT" ;

:keywords = "GSICS, satellites, inter-calibration, reflective solar bands" ;

:license = "Calibration information delivered as a GSICS operational product is generated in accordance with GSICS principles…" ;

:local_data_subcategory = 3s ;

:metadata_conventions = "Unidata Dataset Discovery v1.0" ;

:monitored_instrument = "SEVIRI" ;

:monitored_instrument_wmo_code = "57 207" ;

:naming_authority = "int.eumetsat.gsics" ;

:processing_level = "demonstration/v1.0.0" ;

VIS/NIR netCDF Convention - Global Attributes (3)

:reference_instrument = "MODIS" ;
:reference_instrument_wmo_code = "784 389" ;
:references = "ATBD, Unidata NetCDF, Climate Format Conventions" ;
:standard_name_vocabulary = "CF Standard Name Table (Version 19, 22 March 2012)" ;
:summary = "Coefficients of the GSICS Correction for the reflective solar bands of a GEOstationary imager using a LEO imager reference instrument. The current version includes deseasonalisation in the processing." ;
:time_coverage_end = "2016-01-27T13:09:11Z" ;
:time_coverage_start = "2016-01-27T13:09:11Z" ;
:title = "MSG3+SEVIRI vs Aqua+MODIS GSICS Re-Analysis Correction" ;
:window_period = "P-15D+15D" ;
:wmo_data_category = 30s ;
:wmo_international_data_subcategory = 5s ;
:project = "Global Space-based Inter-Calibration System " ;
:srf_url = “SRF (netCDF) URL”; // Optional Global Attribute, to be discussed in GDWG session

GDWG_2015.6a5:The GEOLEOVNIR or LEOLEOVNIR shall include an optional global attribute referencing the location of the associated SRF netCDF file.

VIS/NIR netCDF Convention - Variables (1)

```
float central_wavelength(chan) ;
        :long_name = "nominal channel central wavelength" ;
        :units = "m" ;
char channel_name(chan, chan_strlen) ;
        :long_name = "channel identifier" ;
double date(date) ;
        :bounds = "validity_period" ;
        :units = "seconds since 1970-01-01T00:00:00Z" ;
float mon_official_offset(date, chan) ;
        :long_name = "official calibration offset" ;
        :units = "W m-2 sr-1 um-1" ;
float mon_official_slope(date, chan) ;
        :long_name = "official calibration slope" ;
        :units = "W m-2 sr-1 um-1" ;
double validity_period(date, validity) ;
        :long_name = "correction validity period" ;
        :units = "seconds since 1970-01-01T00:00:00Z" ;
```

Example of SEVIRI DCC product

```
central_wavelength(1) = 0.000635 ;

channel_name(1,5) =  "VIS06" ;

date(2) = 1453334400, 1453420800;

mon_official_offset(2,1) =
  26.41869,  26.41869 ;

mon_official_slope(2,1) =
  0.5180135,  0.5180135;

validity_period(2,2) =
  1452038400, 1454630400, ← date[1]
  1452124800, 1454716800: ← date[2]
```

VIS/NIR netCDF Convention - Variables (2)

char method_name(method, method_strlen) ;
:long_name = "method identifier" ;
float weight_method(date, chan, method) ;
:long_name = "weight of the methods used for the blend in each channel" ;
:units = "1" ;
float mon_offset(date, chan, method) ;
:long_name = "calibration offset with respect to reference instrument" ;
:units = "W m-2 sr-1 um-1" ;
float mon_slope(date, chan, method) ;
:long_name = "calibration slope with respect to reference instrument" ;
:units = "W m-2 sr-1 um-1" ;

Example of SEVIRI DCC product

method_name(2) = "DCC", "BLEND" ;

weight_method(2,1,2) =
1, 1,
1, 1 ;

mon_offset(2,2) =
–’ –’
–’ – ’ ;

mon_slope(2,1,2) =
0.582811, 0.582811, ← date[1]
0.5828199, 0.5828199; ← date[2]
↑ DCC ↑ BLEND

Discussion on the GRWG requirements

- New “algorithm types” for file naming
- New Global Attributes
- Use of NetCDF-4 enhanced data model
- Incorporation of new GSICS product(s) in the GSICS Bias Plotting Tool

Discussion
- New “algorithm types” for file naming

To add GEOLEOVNIR and LEOLEOVNIR for GRWG VIS/NIR group products

Example of MSG-3/SEVIRI vs. Aqua/MODIS VIS/NIR product:
W_XX-EUMETSAT-Darmstadt,SATCAL+RAC+GEOLEOVNIR,MSG3+SEVIRI-AQUA+MODIS_C_EUMG_20160123000000_demo_01

Proposed new convention on the Wiki

Alphanum. Code	Name	Code Figure
GEOLEOIR	GEO-LEO-IR algorithm data	1
LEOLEOIR	LEO-LEO-IR algorithm data	2
GEOLEOVNIR	GEO-LEO-VISNIR algorithm data	3
LEOLEOVNIR	LEO-LEO-VISNIR algorithm data	4

https://gsics.nesdis.noaa.gov/wiki/Development/FilenameConvention

Impacts on GDWG activities – just to update the THREDDs directory tree when the product is submitted to GPPA.

Discussion
- New Global Attributes for file naming

GDWG_2015.6a5:

The GEOLEOVNIR or LEOLEOVNIR shall include an optional global attribute referencing the location of the associated SRF netCDF file.

:srf_url = “URL of the SRF (netCDF) file”;

No impacts on GDWG activities – but what name do we recommend?

Discussion
- Use of NetCDF enhanced data model

GEO-LEO-VNIR Products (netCDF) will contain multiple calibration methods' results in ONE FILE

Current proposal by GRWG

char method_name(method, method_strlen) ;
:long_name = "method identifier" ;
float weight_method(date, chan, method) ;
:long_name = "weight of the methods used for the blend in each channel" ;
:units = "1" ;

Advantage:

- No need to use enhanced data model

Disadvantage:

- Variables have multiple dimensions (>=3)
- All the methods have to use the same variables
  - ✓ Method-specific variables are not allowed

Grouping could be useful even though GDWG did not recommend in 2015

SEVIRI vs. Aqua/MODIS VISNIR product

- **Combined result** (DCC+Moon+…)
  Global attributes, Dimensions, Variables
- **Method1** (Deep Convective Cloud)
  Global attributes, Dimensions, Variables
- **Method2** (Moon)
  Global attributes, Dimensions, Variables
- **Method3** (Desert)
  Global attributes, Dimensions, Variables

Solution-2

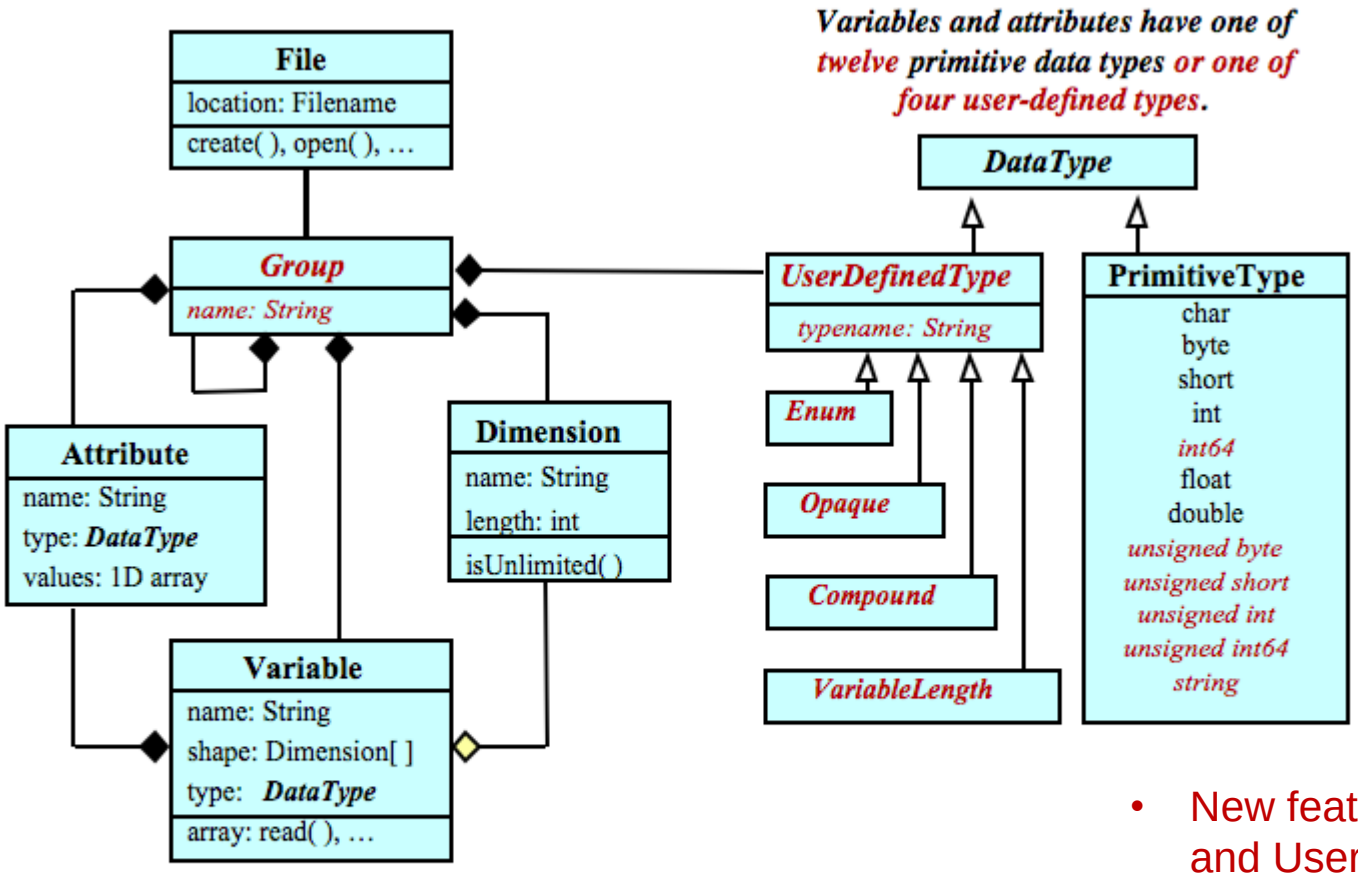
To add *calibration method names* to variable names

float blend_date(date, chan) ;
float blend_mon_slope(date, chan) ;
float blend_mon_offset (date, chan) ;

float dcc_date(date, chan) ;
float dcc_mon_slope(date, chan) ;
float dcc_mon_offset (date, chan) ;

float moon_date(date, chan) ;
float moon_mon_slope(date, chan) ;
float moon_mon_offset(date, chan) ;
float moon_irr_giro (date, chan) ;
…

NetCDF-4 Data Model



- New features: Groups and User-Defined Types

A file has a top-level unnamed group. Each group may contain one or more named subgroups, user-defined types, variables, dimensions, and attributes. Variables also have attributes. Variables may share dimensions, indicating a common grid. One or more dimensions may be of unlimited length.

http://www.unidata.ucar.edu/software/netcdf/workshops/2011/datamodels/Nc4-uml.html

When to Use the Enhanced Data Model – from 2011 Unidata NetCDF Workshop

http://www.unidata.ucar.edu/software/netcdf/workshops/2011/datamodels/Nc4-WhyUse.html

- Enhanced data model: offers rich features for structuring data, but breaks backward compatibility
- Classic model: simple, well-understood, and had been around for a long time

Reasons to use the classic model:

- Data using the classic model can be read by all existing netCDF software
- Writing programs for classic model data is easier
- Most or all existing netCDF conventions are targeted at the classic model
- Many great features, like compression, parallel I/O, large data sizes, etc., are available within the classic model

Reasons to use the enhanced model:

- Complex data structures can be represented very easily in the data, leading to easier programming

Discussion
- Use of NetCDF enhanced data model

- Do we recommend the data model from technical point of view?
  - Can users/system adapt the enhanced model?
  - https://www.unidata.ucar.edu/presentations/Rew/rew-egu.pdf
- Impacts on GDWG activities – High(?)
  - Updates of GSICS Bias Plotting Tool
    - This will be required even if the enhanced data model is not used
    - How many resources do we have?
  - Needs to revisits on future GSICS tools (e.g. netCDF generation tool)?

Agenda item summary; assign action identifier, make EP recommendations and propose a lead for the action (to be updated in the discussion)

- Action Identifier:
  - **GDWG.2016.6g.1: XX to …**
  - **GDWG.2016.6g.2: XX to …**
  - **GDWG.2016.6g.3: XX to …**

- Substantial effort if required by the GDWG, GDWG chair should inform this activity to GSICS Executive Panel, and ask for feedback regarding:

  The GDWG estimates XX week of resources is needed to support this action.

- Identify the Working Group Member Taking the Lead on this Action:

  - XXXX