Regional Cooperation for Limited Area Modeling in Central Europe

LACE nwp central europe

HOOF: Homogenization Of Opera files

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Outline

- Motivation
- Homogenization algorithm
- Usage
- Metadata analysis tool

Content of input OPERA/OIFS file

- Raw reflectivity (TH)
- Corrected reflectivity(dBZ)
  - Quality 1 (BROPO module, many filters including wlan removal, attenuation, beam blockage)
  - Quality 2 (Satellite check)
  - Quality 3 (Beam block index)
  - Quality 4 (Total quality flag)
- Radial winds
- Other quantities ...

Organization of input data

- General structure:
  - */how*
  - */what*
  - */where*
  - */dataset/*
    - /data
      - /what
      - /data
    - /quality
      - /what
      - /data
    - /how
    - /what
    - /where

General structure is fixed, but data is organized slightly differently between radars:

- Data groups are grouped in datasets or each in its own dataset.
- Some attributes are missing or displaced.

Several measurements can be packed into one OIFS file due to 15 minute aggregation interval (1-3 measurements)

Homogenization algorithm (1)

- Split OIFS file to measurements
  - Find the elevation angle of dataset/elevation containing dBZ with minimal starttime – this is the beginning of the first measurement
  - Find all other datasets containing dBZ with the same elevation angle and sort them by starttime – these are beginnings of other measurements
  - All other datasets are then grouped into measurements by comparing starttimes
  - Each measurement is written into a separate file
- Motivation: Selecting a single/most appropriate measurement and reducing the size of input data set.

Homogenization algorithm (2)

- Bator only operates with DBZ (DBZH),TH and VRAD (VRADH). All other quantities (deduced from dataset/data/what/quantity attribute) are discarded.
- A flexible output file content is implemented via namelist. User can decide which attributes are mandatory and provide default values.
- Specific default values of any attribute can also be changed for individual radars.
- Every measurement is validated according to the set mandatory attributes. If a set group or attribute does not exist, a default value is taken (warning). If the default value of an attribute is None and attribute does not exist, the output file is not written (error).

Homogenization algorithm (3)

- Output file structure is fixed:
  - *Reflectivity datasets:*
    - *dataset/*data1 (DBZ)
    - dataset/data2 (TH)
    - dataset/quality1-4
  - Radial winds datasets
    - *dataset/*data1 (VRAD)
  - The how, what, where groups are retained
  - If TH is missing, DBZ is encoded also as TH

Namelist

Namelist items:

- FileExtensions: the files in the input folder with these extensions will be homogenized
- SavedQuantities: here, all possible names for DBZ, TH and VRAD quantities are specified
- DbzQualityGroups: list of numbers (1-4) of the quality groups attached to DBZ to retain in the output
- RadarAttributes common (the most important namelist item): list of radar attributes which will be written to the output file and their default values (in case they are not present in the input file)
- RadarAttributes NOD: a list of radar attributes, specific to radar with the specified NOD (opera site identification)

```
[FileExtensions]
{.h5 .hdf}
[SavedQuantities]
DBZ = {DBZ DBZH}
TH = {TH}
VRAD = {VRAD VRADH}
[DbzQualityGroups]
{1 2 3 4}
[RadarAttributes common]
/what/object = None
/what/source = None
/what/date = None
/what/time = None
/how/beamwidth = 0.9
/where/lat = None
/where/lon = None
/where/height = None
/dataset/what/startdate = None
/dataset/what/starttime = None
/dataset/what/enddate = None
/dataset/what/endtime = None
/dataset/where/elangle = 2.0
/dataset/where/nrays = 100
/dataset/where/nbins = None
/dataset/where/rscale = None
/dataset/where/rstart = None
/dataset/data/what/quantity = None
/dataset/data/what/gain = None
/dataset/data/what/offset = None
/dataset/data/what/nodata = None
/dataset/data/what/undetect = None
/dataset/quality/how/task = None
/dataset/quality/what/gain = None
/dataset/quality/what/offset = None
[RadarAttributes silis]
#/where/height = 500.0
[RadarAttributes sipas]
#/dataset/how/wmoid = 11111
```

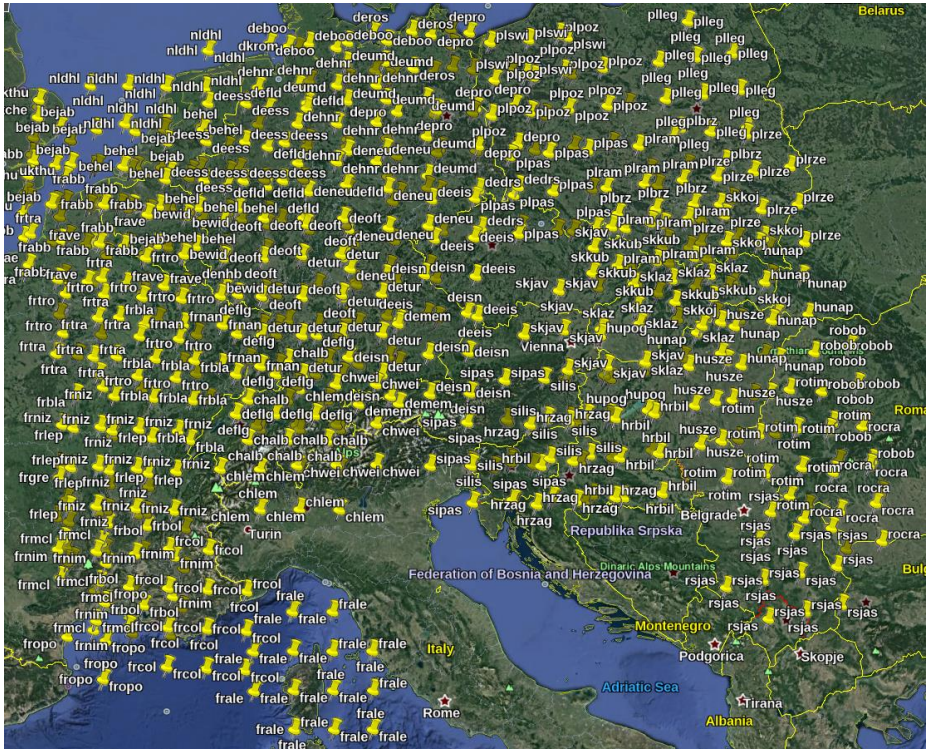
Usage

./HOOF.py <namelist file> <input folder> <output folder>

HOOF = Homogenization Of Opera Files
Any better idea for the name?

Important: The tool is written for Python 2.7 and uses H5py package and Anaconda environment.

It was beta-tested with Bator cy43.



All Opera data within ALADIN/SI domain as read in Bator cy43 (thinned to 80 km)

Metadata analysis tool

- Written for debug purposes and expanded into a GUI
- Scans all files in a folder and constructs union of all unique attributes
- For each attribute, displays and counts all possible values
- For each value of the attribute, shows containing files
- For each file with this value of the attribute, shows all groups with this attribute and value