

GIRO executable – first release

Purpose

The purpose of sharing this version of the GIRO executable which provides little functionality is to verify that the handling of NetCDF files by the executable works properly on different Linux machines (both 32 bits and 64 bits).

In the presentation [GIRO_VITICCHIE] one finds the proposal to share a first version of the GIRO executable to perform a first test of:

- reading of the input NetCDF files (observation + spectral response function),
- computation of the observables, and
- writing of a “dummy” lunar calibration file in which only the observables will be stored while the rest of the information is left at `_FillValue` (for the definition of observables please refer to [HLD_GIRO_IO]).

These are the main functionalities of the executable files available in this archive.

Content of the `GIRO_firstrelease.tar.gz` archive

When unpacking the `GIRO_firstrelease.tar.gz` archive the user will find locally the following files and folders:

| Name | Type | Description |
|---|-----------------|--|
| <code>GIRO_firstrelease32.exe</code> | executable file | GIRO executable to be used on 32 bits Linux machines |
| <code>GIRO_firstrelease64.exe</code> | executable file | GIRO executable to be used on 64 bits Linux machines |
| <code>./data/</code> | folder | Folder containing three NetCDF lunar observation files from both MTSAT2 and MSG3 |
| <code>./SRFs/</code> | folder | Folder containing the NetCDF spectral response function files of MTSAT2 and MSG3 |
| <code>./results/</code> | folder | Empty |
| <code>readme.pdf</code> | .pdf document | This document |
| <code>NetCDF.licence, zlib.licence, and hdf5.licence</code> | text files | Copyrights of the static libraries of the executable |

Such folder structuring must be respected when using either executable file. In detail, in the folder in which the executable will be launched the three folders data/, SRFs/ and results/ must be available. During a run, the GIRO executable looks for the spectral response function file of a satellite in the folder SRFs/ and then in the folder data/ for lunar observation files to analyse. The naming of the files stored in both folders must respect the format convention described in [HLD_GIRO_IO]. Sub-folders are allowed in both folders data/ and SRFs/ with the exception made for subfolders whose name contains the code-name of a satellite (see next section for the description of the code-name).

Running the GIRO executable

A GIRO calibration run can be launched with the command line (for a 32 bits machine):

```
$ ./GIRO_firstrelease32.exe SAT_NAME
```

where SAT_NAME is the code-name of the satellite that is used in the naming of the spectral response function NetCDF file of the satellite and the lunar observation NetCDF files from the same satellite. For example:

SAT_NAME = **MSG3** (argument of the command line)

W_XX-EUMETSAT-Darmstadt,VIS+IR+SRF,**MSG3**+SEVIRI_C_EUMG.nc (MSG3 SRF file in SRFs/)

W_XX-EUMETSAT-Darmstadt,VISNIR+SUBSET+MOON,**MSG3**+SEVIRI_C_EUMG_20140318140112_01.nc
(lunar observation file in data/)

The GIRO executable can be launched for a single satellite. Each GIRO run is performed works on all the channels of a satellite that can be analysed using the GIRO executable. The selection of the analysable channels is performed by referring to their spectral extension/coverage. In detail, in order to be analysed, a channel must be completely included in the spectral range 0.3 – 2.5 μm . As a result of this process, a list of analysable channels is defined and the executable looks into each lunar observation file to read exclusively the data related to these channels. This means that the user can store data from all the channels of a satellite in a lunar observation file; the GIRO executable will select the analysable part of such file. Please note that this selection is done by comparing the names of the channels as found in the spectral response function file and the same names as found in the lunar observation files. From this stems that the naming and codes indicating the satellite, the instrument, and the instrument channels must be consistent in the spectral response function file and in the lunar observation files.

In order to get a help on how to run the GIRO executable the user can use the command line:

```
$ ./GIRO_firstrelease32 --help
```

Also in the case of a wrong command line the help is printed on screen.

Interpreting the output of the run

The files that have been included in the folders data/ and SRFs/ will allow the user to run the GIRO executable in the case he/she did not prepare any lunar observation NetCDF file. In detail, two different runs can be performed:

1. Run on three lunar observation files from MTSAT2 (i.e., a satellite whose instrument has one analysable channel).
2. Run on three lunar observation files from MSG3 (i.e., a satellite whose instrument has four analysable channels).

These files contain all the COMPULSORY, ADDITIONAL, and IMAGETTES data (see [GIRO_VITICCHIE], [GIRO_TAKAHASHI], and [HLD_GIRO_IO] for the definition of these sets of data).

When launching:

```
$ ./GIRO_firstrelease32.exe MTSAT2
```

the executable prints the number of analysable channels for MTSAT2 (i.e., one) and the number of lunar observation files that have been found to be analysed (i.e., three).

The following messages will specify the paths to the files that are produced by the GIRO executable. Currently, two kinds of files are produced:

1. Sanity check files: **sanity_check_'SAT_NAME'+ 'Instrument'+ 'Channel'.info**
these files (one file per analysed channel) collect the results of the comparison between the observables as provided by the user and the observables as derived by the imagette processing of the GIRO executable (see sections 3.3 and 5.2 in [HLD_GIRO_IO]) for each analysed file. For example, in the file `sanity_check_MTSAT2+Imager+VIS.info` one finds:

```
W_JP-JMA-MSC,VISNIR+SUBSET+MOON,MTSAT2+Imager_C_RJTD_20100701062451_01.nc
Quantity      User      Imgt Processing
Observed Irradiance  0.000702360438230500  0.000702360438649869
Observed DC      15887136  15887136
DC Offset        50.515755395683456186  50.515755395683456186
Total number of pixels  82395    82395

W_JP-JMA-MSC,VISNIR+SUBSET+MOON,MTSAT2+Imager_C_RJTD_20110704163217_01.nc
Quantity      User      Imgt Processing
Observed Irradiance  0.000026484273576469  0.000026484273701312
Observed DC      924069    924069
DC Offset        48.963885088919290922  48.963885088919290922
Total number of pixels  9607     9607

W_JP-JMA-MSC,VISNIR+SUBSET+MOON,MTSAT2+Imager_C_RJTD_20130725035138_01.nc
Quantity      User      Imgt Processing
Observed Irradiance  0.001303947964100031  0.001303947964754193
Observed DC      27668717  27668717
DC Offset        50.745347698334967390  50.745347698334967390
Total number of pixels  116446   116446
```

In this example the observed irradiance as provided by the user and the observed irradiance as derived by the imagette processing are slightly different even though the procedure employed in the computation of these quantities is exactly the same. The difference stems from the fact that when storing the imagettes in the lunar observation NetCDF file the user has performed a rounding of the radiance values in the imagette. This rounding could not be applied to the digital count (DC) imagette; for this reason the Observed DC, the DC Offset and the Total number of pixels are exactly

the same in the two columns (these are derived from the DC imagette). This example shows the usefulness of the imagette processing combined to the sanity checks to quantify the impact, for example, of a method of storing the data on the final results of the processing.

2. A single lunar calibration NetCDF file:

```
W 'wmo_LocationIndicator',SATCAL+ROLOVISNIR,'SAT_NAME'+ 'Instrument'_  
C 'wmo_CCCC_Code' '_Observation_time_of_the_first_imagette_YYYYMMDDHH  
MMSS' '_major_version_number'.nc (for the content of this file refer to [HLD_GIRO_IO]).
```

When launching:

```
$ ./GIRO_firstrelease32.exe MSG3
```

the executable will print a total number of four analysable channels and of three lunar observation files to analyse. Also in this case the paths to the output files that are produced by the procedure are printed; in detail, five output files will be produced when analysing MSG3 data:

1. `sanity_check_MSG3+SEVIRI+VIS006.info`
2. `sanity_check_MSG3+SEVIRI+VIS008.info`
3. `sanity_check_MSG3+SEVIRI+HRVIS.info`
4. `sanity_check_MSG3+SEVIRI+NIR016.info`
5. `W_XX-EUMETSAT-Darmstadt,SATCAL+ROLOVISNIR,MSG3+SEVIRI_C_EUMG_20130101145644_00.nc`

i.e., four sanity check files and one lunar calibration file. Besides this, also three error messages will be printed during the processing:

```
COMPULSORY INFORMATION Irr_OBS MISSING IN FILE 'file name'
```

These messages follow the creation of the sanity check file of the HRVIS channel (i.e., when the procedure examines the content of the HRVIS channel in the lunar observation files), and point out that no irradiance value has been provided by the user. This is an output that a user must expect when analysing data from MSG satellites in which not in all lunar observations the Moon is available in all the VISNIR channels simultaneously. This stems from the fact that the HRVIS (high resolution) channel covers only a part of the field of view covered by the VIS06, VIS08, and NIR16 (low resolution) channels. By checking the content of the sanity check file produced for the HRVIS channels the user will find the `_FillValue` adopted for the lunar calibration NetCDF files: -999.

Analysing your own data

In the case in which the user had prepared his/her own lunar observation files following the format specifications in [HLD_GIRO_IO], in order to run the `GIRO_firstrelease` on such data he/she will need to prepare the SRF NetCDF file of the satellite with which the data were acquired. To produce the SRF file please contact Masaya Takahashi (see the list of points of contact); he will make the file available in the GSICS wiki page from which the `GIRO_firstrelease.tar.gz` has been downloaded.

Recommendations for the users

Verifying that the GIRO executables run properly on your local machine is not the only goal of the exercise described in the previous section! We strongly recommend that the users spend some time in checking the content of both input and output NetCDF files. In detail, the user should compare the content of both the lunar observation files and the lunar calibration files against the content of the tables reported in [HLD_GIRO_IO]. It is worth pointing out that some additional/complementary information can be found in

these NetCDF files (e.g., variable attributes like **valid_min**, **valid_max**); these were not described in the [HLD_GIRO_IO] for the sake of shortness. In spite of this, when producing his/her own dataset, the user should try to include these additional information in the NetCDF lunar observation files.

If the user is not familiar with the handling of NetCDF files this link will be useful:

<http://www.unidata.ucar.edu/software/netcdf/docs/netcdf-tutorial.html>

List of GUIs to read NetCDF files: <http://nsidc.org/data/netcdf/tools.html>

System requirements

| | |
|-----------------------------------|--|
| OS | Linux 32 bits: gcc 4.6.2 Linux 64 bits: gcc 4.3.2 |
| Required libraries/shared objects | libm.so.6, libdl.so.2, and libc.so.6 |

Release notes

| | | |
|---------|-------------------------|---|
| Release | First Release | 25 th July 2014 |
| | Compilation Environment | Linux 32 bits: gcc 4.6.2 Linux 64 bits: gcc 4.3.2 Zlib 1.2.8 HDF 5-1.8.13 NetCDF-4.3.2 |
| | Tested on | Ubuntu 14.04 LTS 32 bits, openSUSE 11.1 64 bits, and openSUSE 12.1 32 bits |
| | Licences | Please refer to the .licence files for the Copyrights of the static libraries used by the executable. |

Points of contact

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 Sebastien Wagner sebastien.wagner-at-eumetsat.int

References

[HLD_GIRO_IO] https://gsics.nesdis.noaa.gov/pub/Development/20140624/GSICS_ROLO_HighLevDescript_IO_Definition_wiki.pdf (please ignore the warning message)
 [GIRO_VITICCHIE] https://gsics.nesdis.noaa.gov/pub/Development/20140624/Lunar_Calibration_Toolbox_Implementation.pptx (please ignore the warning message)
 [GIRO_TAKAHASHI] https://gsics.nesdis.noaa.gov/pub/Development/20140624/20140624_Takahashi_LunarCal_DataFmt.pptx (please ignore the warning message)