CCI Land Surface Temperature

Re-gridding and Sub-setting User Manual

Ref.: LST-CCI-D3.4-3
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Organisation: Consortium CCI LST

Applicable Documents

AD-1	Re-gridding and Sub-setting ATBD v0.1
AD-2	Product User Guide D4.3

1. Background

1.1. Objectives

The Re-gridding and sub-setting tool has been developed in the frame of the LST_cci project, in response to requests expressed by the users during the LST_cci Users Workshop in 2020. Its main objective is to map a LST product onto a new grid in a coarser resolution, while propagating the uncertainties in a trustable way. The tool is also able to produce a real subset of the product defined by user-provided latitude and longitude, minimum and maximum coordinates.

1.2. Scope

The tool is dedicated to LST_CCI products. It relies on input product name which must conform to the CCI naming convention. A list of currently known CCI LST products is given in table 1.

CCI LST Product Name
ERS-2_ATSR__L2P
ERS-2_ATSR__L3C
ENVISAT_ATSR__L2P
ENVISAT_ATSR__L3C
TERRA_MODIS_L2P
TERRA_MODIS_L3C
AQUA_MODIS_L2P
AQUA_MODIS_L3C
SENTINEL3A_SLSTR_L2P
SENTINEL3A_SLSTR_L3C
MSG_SEVIRI_L3U
SSMI_SSMIS_L2P
SSMI_SSMIS_L3C
MULTISENSOR_IRCDR_L3S
MULTISENSOR_IRMGP_L3S

Table 1: List of currently known LST products from [AD-2]

The tool is designed to produce an output file with a coarser resolution only. Finer resolutions are forbidden and will cause the tool to abort with an error message. Nevertheless, an output resolution equal to the input resolution is authorized.

As the tool applies a mean function on a floating window over input product, the floating window size must fit the product map: the target resolution must be a multiple of the input file resolution. (for instance, a 0.5 degrees resolution input file can be regridded toward a coarser 0.25 degrees resolution, but cannot target a resolution of 0.16 degrees: the regridded map would not fit the input one).

The tool expects variables to be present in the input file. If not, variables are simply ignored in the output file.

Errors detected during processing are reported in a log file to help user solving it. By default, the log file is erased, and kept only in case of error detection. User can avoid the log file deletion with the –keep-log option.

1.2.1. Version 1.1 updates

The LST CCI regridding tool version 1.1 is a rehearsal of the version 1.0 with implementation of bug fixing and correction unwanted behaviour discovered during the 2022 workshop. The new implementation is related to:

- Removal of the DOI in the regridded product
- Implementation of the IR and MW use cases as defined in ATBD 1.2
- Add a verification on sub-coordinates: the sub-coordinates must be inside the input product frame
- Minor updates on error management and error display.

1.2.2. Disclaimer

The LST tool was developed with Python3 on Linux Ubuntu 20.04 and is designed to work on Linux systems. The binary file is provided for Linux and won't run on other OS.
NB: The original Python source file is not limited to Linux targets, though it has not been designed for a wider scope, nor tested on another system.

2. Installation

The installation package is a standalone executable for Linux OS accessible to LST_cci members on the project sharepoint.

The version for the users will be made available in the Open Data Portal (tbc).

It is proposed in two versions:

- A zip file containing LST regrid tool script file and all necessary libraries (350MB Zipped - 470 MB unzipped)
- A single binary file embedding all the zipped libraries (350 MB) (requires the download of the landsea_mask folder and the two landmask files: landmask_001.nc and landmask_005.nc)

NB: The single file bundle requires the decompression of embedded libraries, consuming some overhead time before the regridding process really starts.

The LST regridding tool requires land maps (to identify cloudy pixels) and expects a directory named 'landsea_mask' containing files landmask_001.nc and landmask_005.nc beside the binary file. Those files are provided on the download page. The files are already included in the zip bundle but must be added manually beside the single self-content binary package.

2.1. Installation of the single binary file

- Download the lst_cci_regrid binary file
- Export the PATH variable in a terminal:
- *export PATH=$PATH:/path/where/you/put/the/tool*
- Type lst_cci_regrid to run this executable file

NB: the export command can be appended to the user '.profile' file to set it automatically in each newly-opened terminal.

NB: Depending on your system setup you may have to change the permissions of your executable file. The following command will enable all users to execute the file:

chmod 755 lst_cci_regrid

2.2. Installation of the zip bundle

- Download the zip file
- Decompress in a dedicated folder:
- *tar xvzf lst_cci_regrid.tgz*
- Run the lst_cci_regrid binary file: it is located at the root directory of the unpacked bundle (NB. It might be necessary to prepend './' to the binary command for the OS to recognize it: use './lst_cci_regrid')

NB: The decompressing process takes some time to achieve the decompression of a huge number of files. Decompressed files will occupy 1.2 GB of disk space.

lst_cci_regrid tool is a binary file based on a Python3 script and can be used with the following command followed with arguments:

```
./lst_cci_regrid <arguments>
```

The '-h' option provides help on parameters:

```
lst_cci_regrid -h
```

```
usage: lst_cci_regrid [-h] [--resolution RESOLUTION] [--output-file OUTPUT_FILE] [--coords COORDS]
[--threads THREADS] [--comp-level COMP_LEVEL] [--keep-log KEEP_LOG] input_file output_dir

Re-grid a set of CCI LST variables in a LST_cci product on a selected area (default applies to whole
product).

positional arguments:
  input_file          input LST_cci product
  output_dir          output directory

optional arguments:
  -h, --help          show this help message and exit
  --resolution RESOLUTION
                      Output resolution. If not provided, the input resolution is used and only sub-setting is
applied, without re-gridding.
  --output-file OUTPUT_FILE
                      force output file name
  --coords COORDS     a string surrounded with "" representing the extremum coordinates of the
rectangular sub-area to process.
                      Expected format is "latmin[-90; 90] latmax[-90; 90] lonmin[-180; 180] lonmax[-180;
180]".
                        Example: lst_cci_regrid <input file> <output_dir> --coords "-20 10 -100 100"
                      NB: values must be provided in that order: latitude min, latitude max, longitude min,
longitude max
                      Lattitude values are in range [-90; 90] and longitude values in range [-180; 180]
  --threads THREADS   number of parallel CPU threads to use during processing, by default use all (4
on this machine, ignoring hyper-threading).  --threads THREADS
                      number of parallel CPU threads to use during processing, by default use all (4 on this
machine, ignoring hyper-threading).
  --comp-level COMP_LEVEL
                      NetCDF4 compression level (0=none 9=max), by default use 1
```

--keep-log KEEP_LOG
true/false: keep or not the log file (log file is always kept in case of error)

- input_file: input LST product is a required argument indicating the file to process.
- Output_dir: output directory is a required argument indicating where to store the result product.
- h/help: the help argument is optional and displays a quick help on tool usage
- resolution: the resolution argument is optional and required for regridding operations only. If not provided, only a subsetting is realised (the original image is cropped to the sub area dimensions).
- Output-file: the optional output-file argument is used to force the name of the output product to user's demand
- Threads: the optional thread argument is used to speed up the process dividing the computation into as many threads as specified. To be efficient, we advise to set a number of threads between 1 and the number of available cores on the hardware device.
- Comp-level: the optional compression level indicates the compression ratio into the NETCDF file. The compression-level can significantly impact the processing performances.
- Keep-log: the optional keep-log argument keeps the log file intact at the end of reprocessing. By default, the log file is removed if no error occurred.
- Coords: the optional coords argument is used to specify a sub-area. The sub-area is a rectangle aligned with latitude and longitude axis. The argument is a string composed of the 4 values separated with a space, ' ', and indicates the rectangle borders, ordered like this:
  1. latitude min
  2. latitude max
  3. longitude min
  4. longitude max

  Example:
  lst_cci_regrid <input file> <output_dir> --coords "-20 10 -100 100"

2.3. Output product naming

If not specified with the --output-file argument, the output file name is copied from the input file name with resolution field updated with the target resolution.

In other terms, in case of sub-setting without regridding, the resolution is kept: the output file name is the same as the input file name. The only way to differentiate input and output product is with the –output-dir argument provided in input.
NB: inside the NETCDF output product, global attributes are updated to reflect the use of the LST regridding tool.

3. Tool data handling

3.1. Regridding and sub-setting

The LST regridding tool offers two main functions which are regridding and sub-setting.

The regridding operation lowers a product resolution according to provided parameters, with specific mean functions applied to LST variables. The regridding operation obtains a coarser resolution (it cannot output a resolution finer than the original).

The sub-setting operation is a crop step which consists in reducing tool operations to a selected sub-map defined with longitude-latitude extremum coordinates of the rectangularmap under consideration. Focusing on a sub-map instead of the whole product results in a significant computation time saving.

The regridding and sub-setting operations can be used either together or separately: the mean functions are applied on the LST variables inside the sub-setting window if --coords is provided, or the whole product if --coords is not specified. By default, if no --resolution option is provided, only the sub-setting step is performed and the input resolution is kept.

3.2. Working steps

The tool handles a pre-defined set of variables (see AD-1) in the LST_CCI input product through a mean function before copying the result in the output product.

The output file name is computed based on the input file name and the LST_CCI file naming convention: the file resolution and creation date are replaced in the input file name.

During processing, the variable currently being processed and the mean function used are displayed.

After all variables are forwarded to the output product, the total uncertainty is computed from the actual result.

If minimum / maximum latitude and longitude coordinates are provided, the processing will be applied on this sub-map only and the output product will appear as zoomed in.

All variable attributes are preserved.

Global attributes are either copied or updated.

Input variables not identified in the predefined set are ignored.

By default, the lst_unc_loc_atm and lst_unc_loc_sfc variables mean functions is an arithmetic mean. If the output resolution is greater than 0.05 deg, then the variables mean function is nanmean_uncorrelated_loc as specified in column 2 'Propagation from 0.05˚' of the following table (extracted fromATB [AD-1]).

Category	Variable		Propagation to 0.05° Daily Files	Propagation to 0.05° Monthly Files	Propagation from 0.05°
Coordinates	time		Direct copy	Direct copy	Direct copy
	dtime		Eq. 1	Eq. 1	Eq. 1
	lat		Remapping	Remapping	Remapping
	lon		Remapping	Remapping	Remapping
	Channel		Direct copy	Direct copy	Direct copy
Geophysical variables	Lst		Eq. 1	Eq. 1	Eq. 1
	Lcc		Non-propagation	Non-propagation	Non-propagation
	lst_time_correction		Eq. 1	Eq. 1	Eq. 1
Uncertainty information – total uncertainty	lst_uncertainty	IR	Eq. 9	Eq. 9	Eq. 9
		MW	Eq. 2	Eq. 2	Eq. 2
Uncertainty information – individual components	lst_unc_ran		Eq. 4	Eq. 4	Eq. 4
	lst_unc_loc_atm		Eq. 6	Eq. 7	Eq. 7
	lst_unc_loc_sfc	UOL	Eq. 6	Eq. 6	Eq. 7
		GSW, SMW, NNEA	Eq. 6	Eq. 6	Eq. 7
	lst_unc_loc_cor		Eq. 6	Eq. 6	Eq. 6
	lst_unc_time_correction	IR	Eq. 5	Eq. 5	Eq. 5
		MW	Eq. 2	Eq. 2	Eq. 2
	lst_unc_sys		Eq. 5	Eq. 5	Eq. 5
Retrieval information	Satze		Eq. 1	Eq. 1	Eq. 1
	Sataz		Eq. 1	Eq. 1	Eq. 1
	Solze		Eq. 1	Eq. 1	Eq. 1
	solaz		Eq. 1	Eq. 1	Eq. 1
	n		Arithmetic sum	Arithmetic sum	Arithmetic sum
Quality information	qual_flag		Non-propagation	Non-propagation	Non-propagation

Many of the CCI LST products from IR sensors are provided at a spatial resolution of 0.01° and are processed by University of Leicester (UOL). If UOL is detected in the input file, and if the input file resolution is less than 0.05°, while resolution argument is greater than 0.05 then the regridding is processed in two steps: to an intermediate 0.05° resolution first, then to the target resolution.

While processing, warnings and errors can occur. Both cases give rise to an informational message on the display console. The tool tries to recover from warnings but ends in error if fails. Errors provide a message and abort processing.

During the process, a log file is created as indicated in the standard output. If no error is detected, the log file is deleted. Otherwise, the log file is preserved and informs on errors (Log file can be preserved with the –keep-log option as argument).

4. Examples

4.1. Subsetting of a product:

lst_cci_regrid TDS/ESACCI-LST-L3C-LST-MODISA-0.05deg_1MONTHLY_DAY-20060701000000-fv3.00.nc output_05 --coords "0 90 0 180"

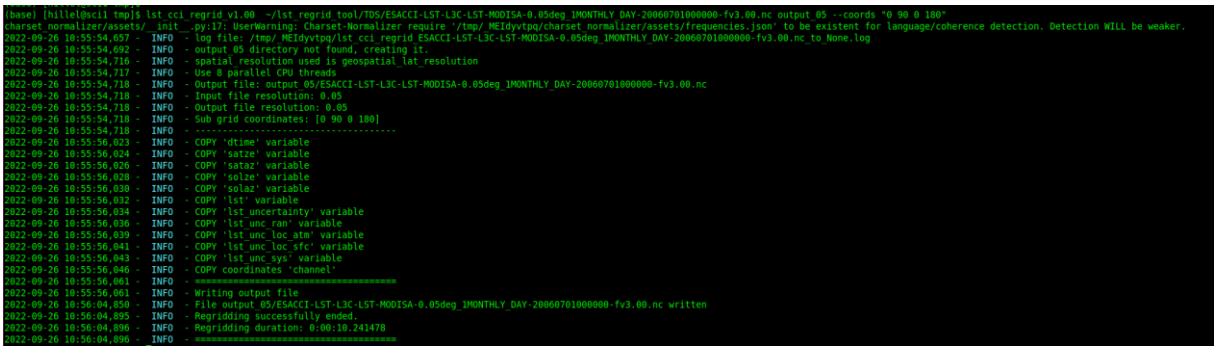

Figure 1: console execution

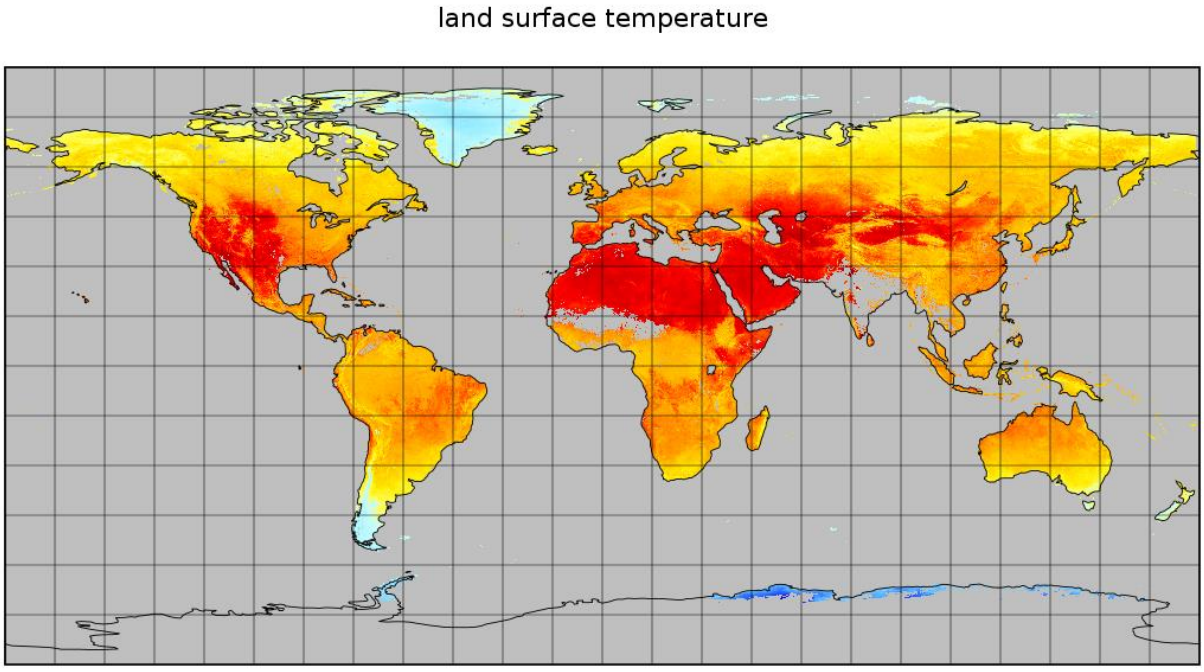

Figure 2: Original temperature

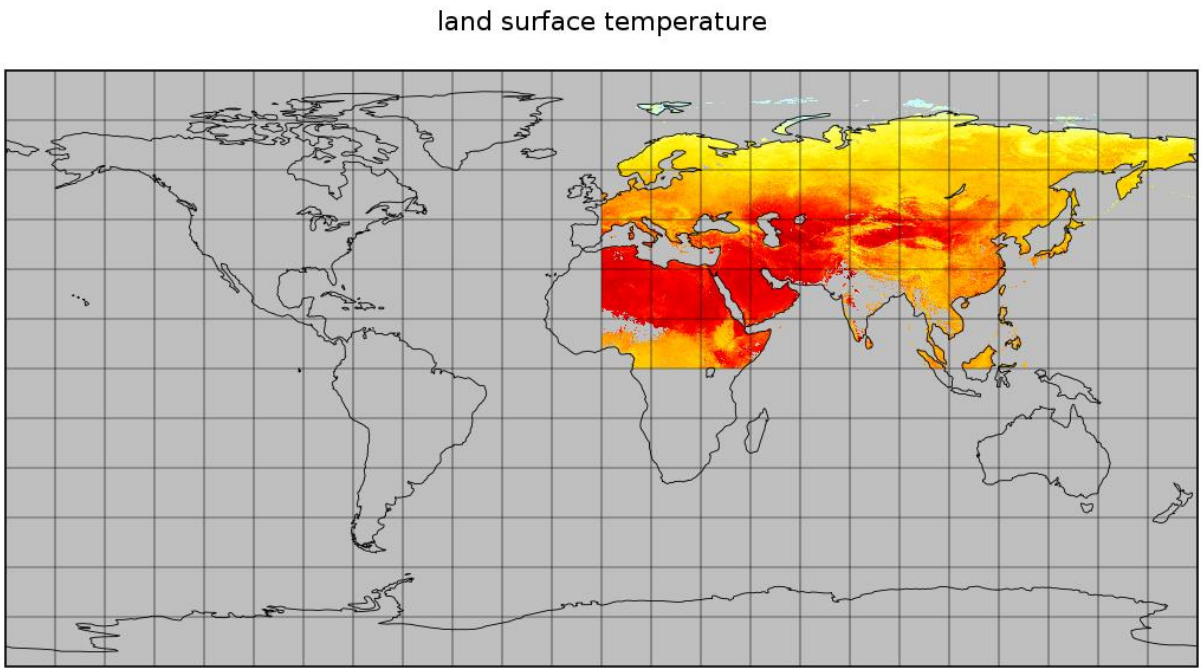

Figure 3: Sub-setted temperature

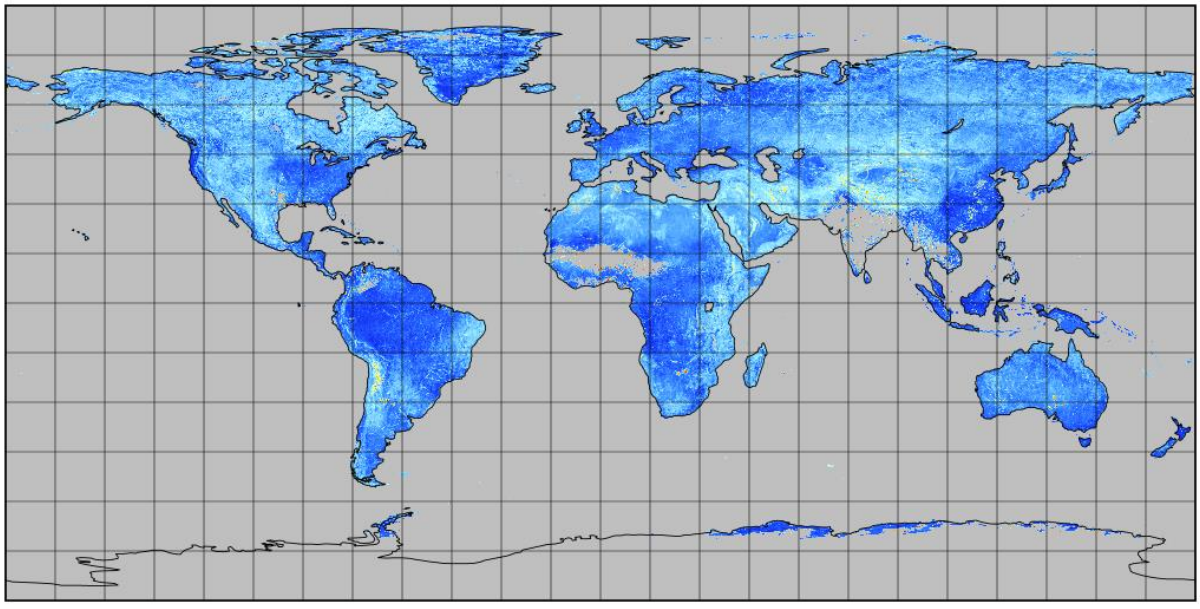

Figure 4: Original LST uncertainties

land surface temperature total uncertainty

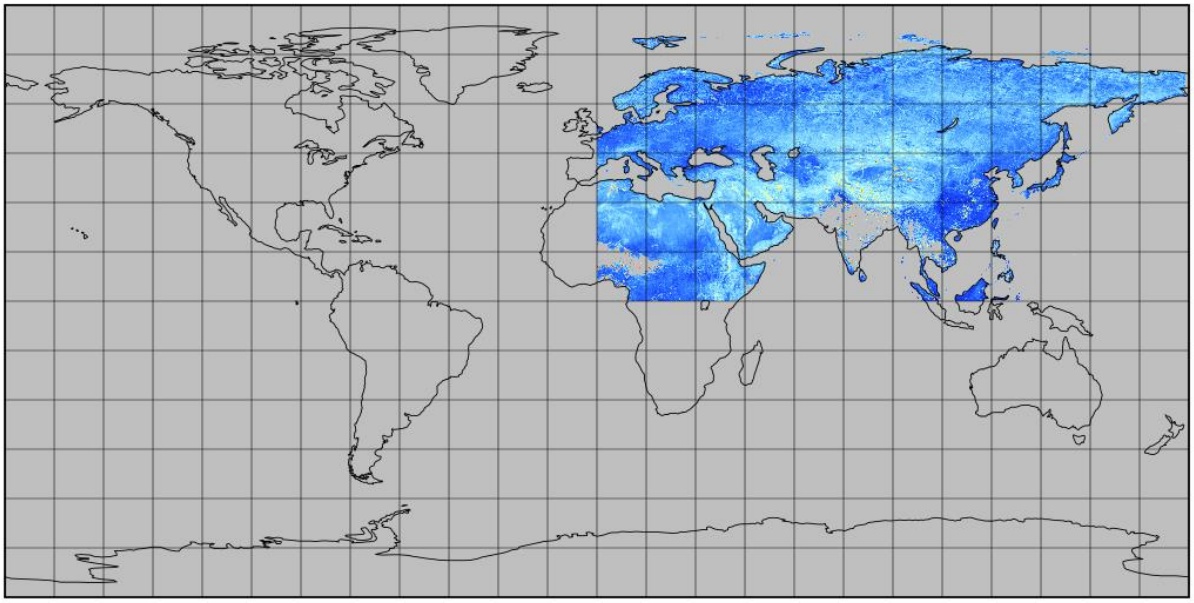

Figure 5: subset of LST uncertainties

4.2. Running the regrid tool on a whole file, lowering the resolution from 0.05 degree to 0.25 degree:

```
lst_cci_regrid TDS/ESACCI-LST-L3C-LST-MODISA-0.05deg_1MONTHLY_DAY-20060701000000-fv3.00.nc output_025 --resolution 0.25
```

```
(base) [hillel@sci1 tmp]$ lst_cci_regrid_v1.00  ~/lst_regrid_tool/TDS/ESACCI-LST-L3C-LST-MODISA-0.05deg_1MONTHLY_DAY-20060701000000-fv3.00.nc output_25 --resolution 0.25
charset_normalizer/assets/__init__.py:17: UserWarning: Charset-Normalizer require '/tmp/_MEI297MpZ/charset_normalizer/assets/frequencies.json' to be existent for language/coherence detection. Detection WILL be weaker.
2022-09-26 11:06:54,102 -  INFO  - log file: /tmp/_MEI297MpZ/lst_cci_regrid_ESACCI-LST-L3C-LST-MODISA-0.05deg_1MONTHLY_DAY-20060701000000-fv3.00.nc_to_0.25.log
2022-09-26 11:06:54,134 -  INFO  - output_25 directory not found, creating it.
2022-09-26 11:06:54,159 -  INFO  - spatial resolution used is geospatial_lat_resolution
2022-09-26 11:06:54,170 -  INFO  - Open 0.05 degree resolution land mask
2022-09-26 11:06:54,181 -  INFO  - Use 8 parallel CPU threads
2022-09-26 11:06:54,181 -  INFO  - Output file: output_25/ESACCI-LST-L3C-LST-MODISA-0.25deg_1MONTHLY_DAY-20060701000000-fv3.00.nc
2022-09-26 11:06:54,181 -  INFO  - Input file resolution: 0.05
2022-09-26 11:06:54,181 -  INFO  - Output file resolution: 0.25
2022-09-26 11:06:54,181 -  INFO  - ------------------------------------
2022-09-26 11:06:55,194 -  INFO  - REGRID 'dtime' Method  mean
2022-09-26 11:06:55,226 -  INFO  - REGRID 'satze' Method  mean
2022-09-26 11:06:55,241 -  INFO  - REGRID 'sataz' Method  mean
2022-09-26 11:06:55,255 -  INFO  - REGRID 'solze' Method  mean
2022-09-26 11:06:55,269 -  INFO  - REGRID 'solaz' Method  mean
2022-09-26 11:06:55,284 -  INFO  - REGRID 'lst' Method  mean
2022-09-26 11:06:55,297 -  INFO  - REGRID 'lst_uncertainty' Method  mean
2022-09-26 11:06:55,494 -  INFO  - REGRID 'lst_unc_ran' Method  nanmean_uncorrelated_unc
2022-09-26 11:07:06,749 -  INFO  -   lst_unc_loc_atm: Output resolution > 0.05: use 'Propagation from 0.05 degree' algorithms
2022-09-26 11:07:06,750 -  INFO  - REGRID 'lst_unc_loc_atm' Method  nanmean_uncorrelated_loc
2022-09-26 11:07:06,789 -  INFO  -   lst_unc_loc_sfc: Output resolution > 0.05: use 'Propagation from 0.05 degree' algorithms
2022-09-26 11:07:06,789 -  INFO  - REGRID 'lst_unc_loc_sfc' Method  nanmean_uncorrelated_loc
2022-09-26 11:07:06,844 -  INFO  - REGRID 'lst_unc_sys' Method  nanmean_fullcorr_large_scale_unc
2022-09-26 11:07:14,596 -  INFO  - COPY coordinates 'channel'
2022-09-26 11:07:14,597 -  INFO  - Computing total uncertainties
2022-09-26 11:07:14,612 -  INFO  - Compute sum of uncertainties
2022-09-26 11:07:19,324 -  INFO  - ------------------------------------
2022-09-26 11:07:19,325 -  INFO  - Writing output file
2022-09-26 11:07:50,608 -  INFO  - File output_25/ESACCI-LST-L3C-LST-MODISA-0.25deg_1MONTHLY_DAY-20060701000000-fv3.00.nc written
2022-09-26 11:07:50,664 -  INFO  - Regridding successfully ended.
2022-09-26 11:07:50,664 -  INFO  - Regridding duration: 0:00:56.564817
2022-09-26 11:07:50,664 -  INFO  - ------------------------------------
```

Figure 6: Example of console execution on a whole file

Display example result:

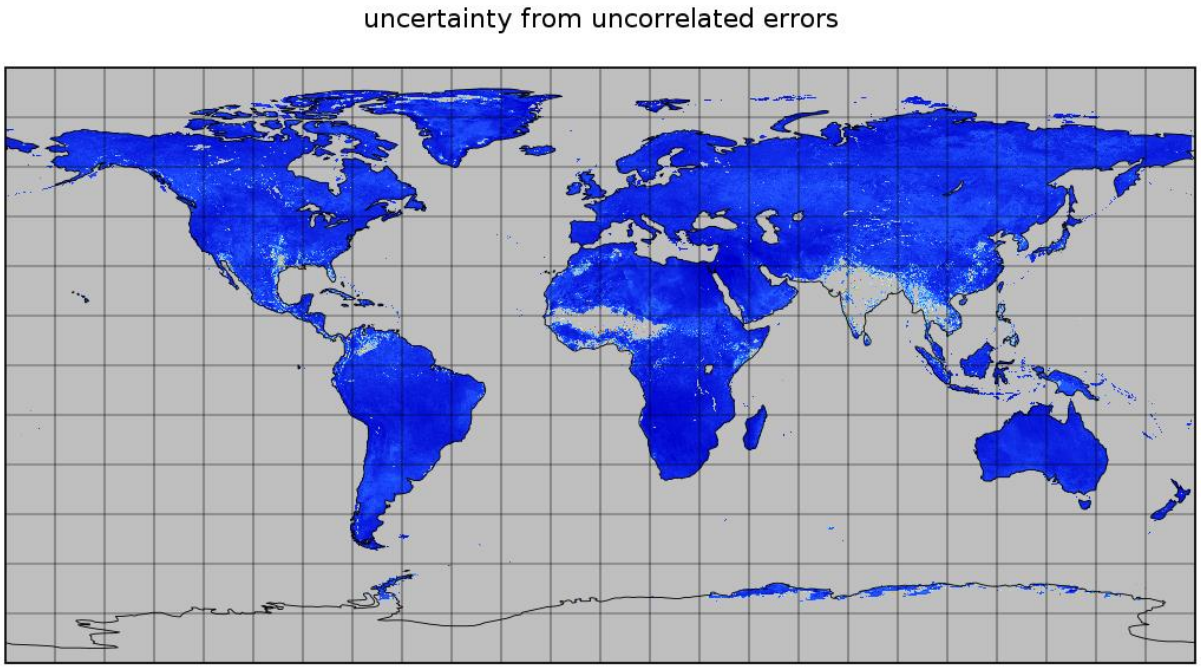

Figure 7: original lst_unc_ran variable

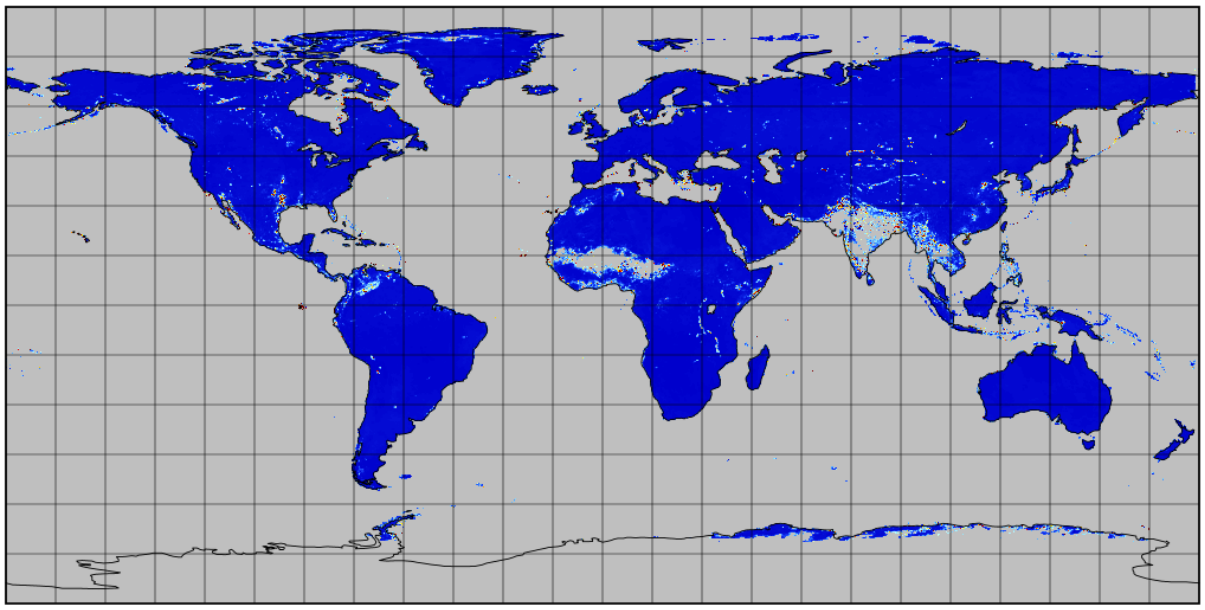

Figure 8: Regridded lst_unc_ran variable

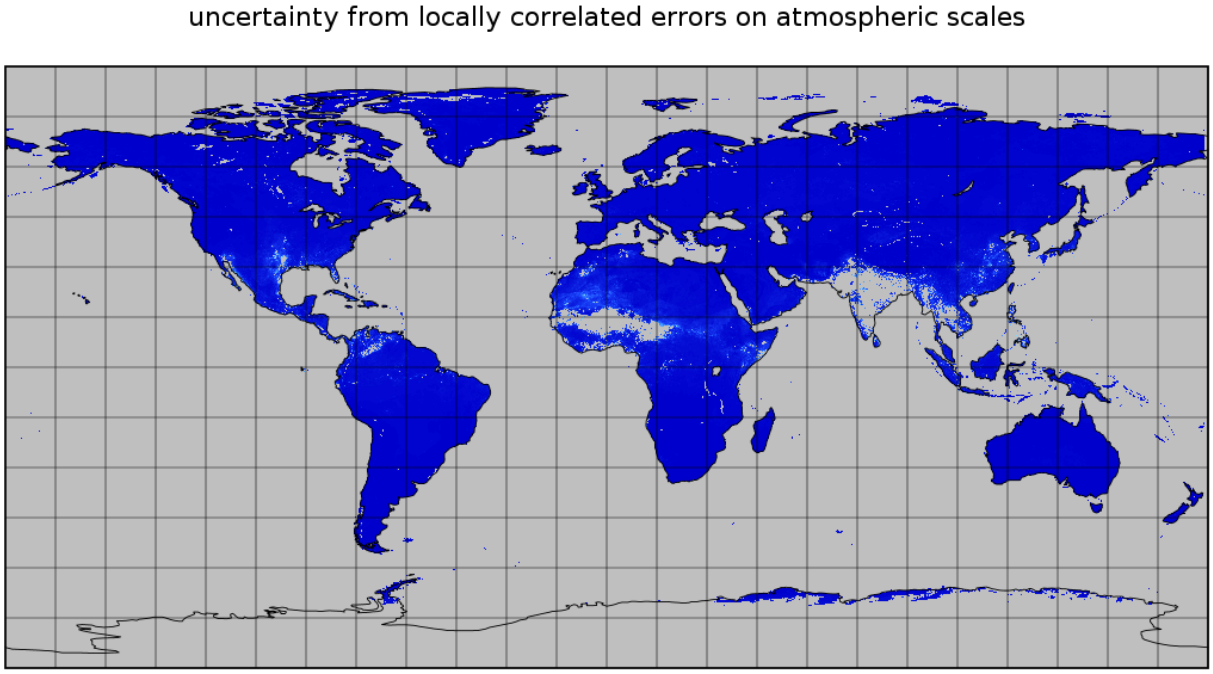

Figure 9: original file lst_unc_loc_atm variable

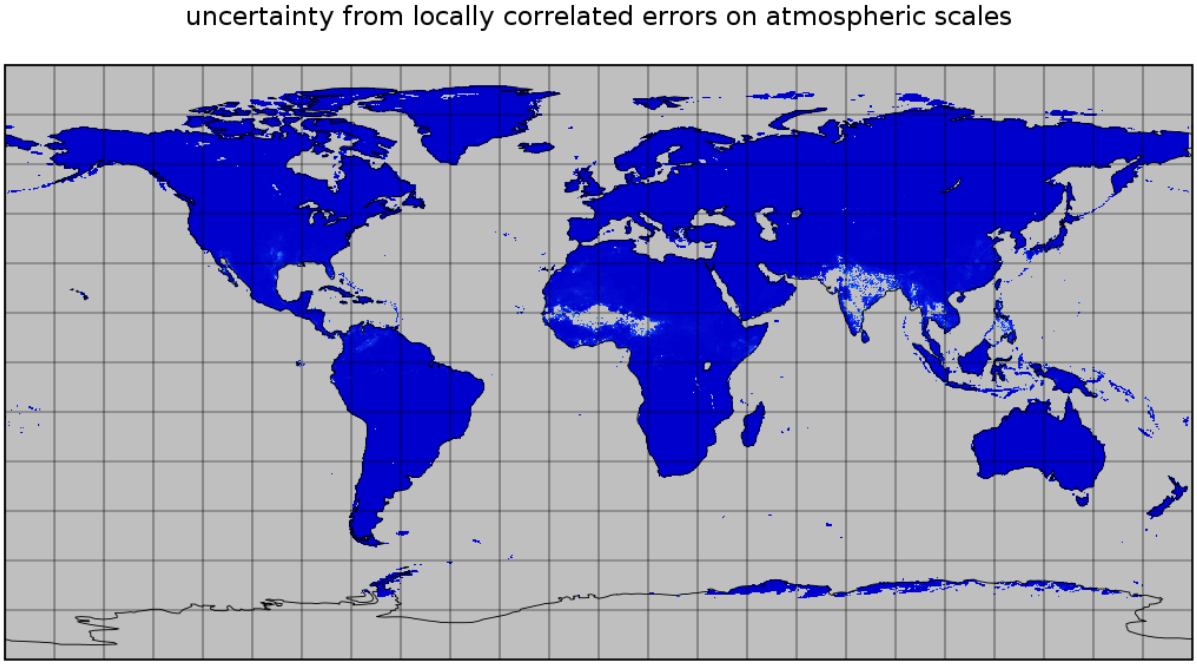

Figure 10: regridded lst_unc_loc_atm variable

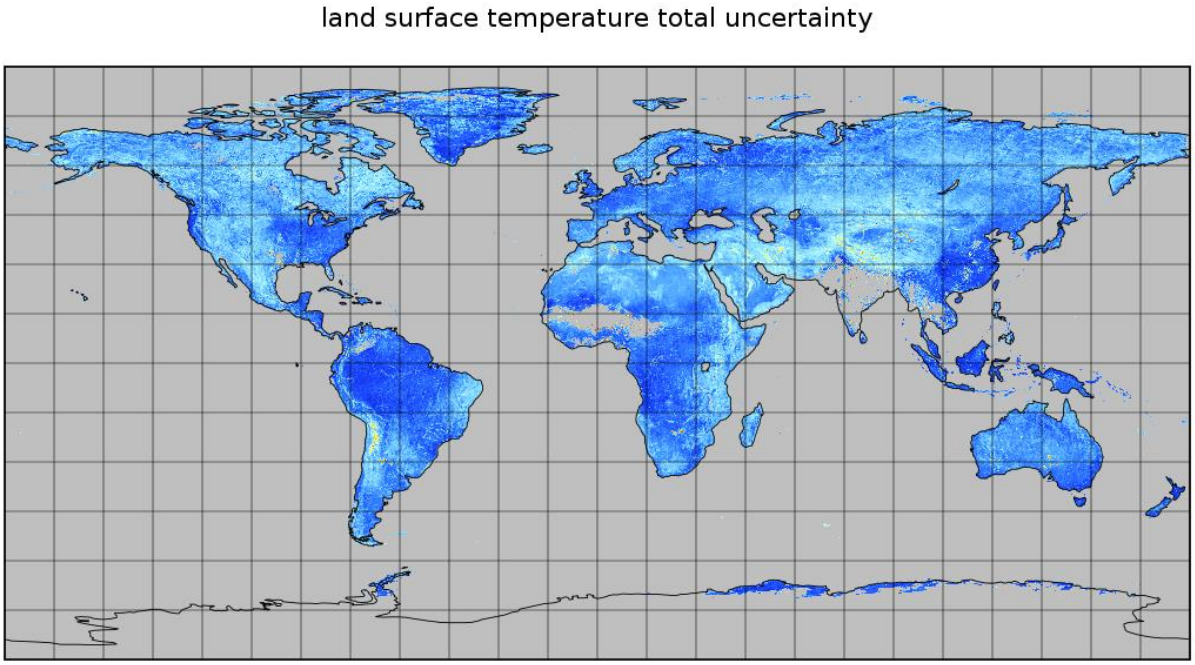

Figure 11: original file total uncertainties

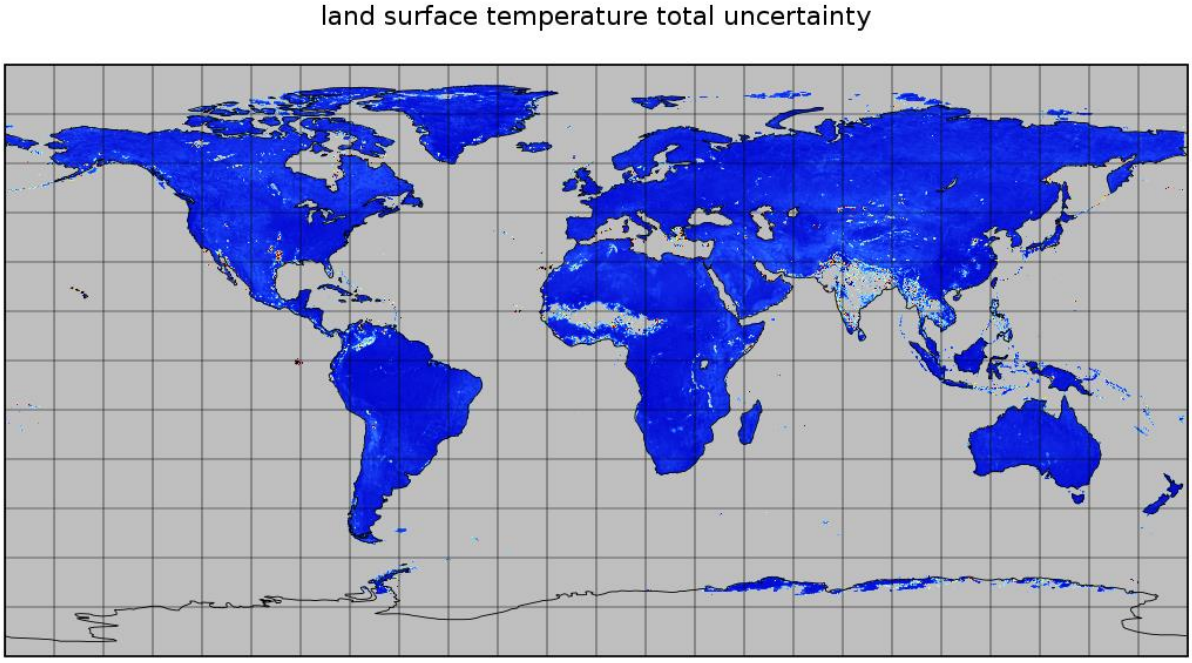

Figure 12: Regridded file total uncertainties

4.3. Running the regrid tool on a sub-area, lowering the resolution from 0.05 degree to 0.25 degree:

```
lst_cci_regrid TDS/ESACCI-LST-L3C-LST-MODISA-0.05deg_1MONTHLY_DAY-20060701000000-fv3.00.nc output_25 --coords "0 90 0 180" --resolution 0.25
```

```
(base) [hillel@scil tmp]$ lst_cci_regrid_v1.00  ~/lst_regrid_tool/TDS/ESACCI-LST-L3C-LST-MODISA-0.05deg_1MONTHLY_DAY-20060701000000-fv3.00.nc output_25 --coords "0 90 0 180" --resolution 0.25
charset_normalizer/assets/__init__.py:17: UserWarning: Charset-Normalizer require '/tmp/.MEIchytBN/charset_normalizer/assets/frequencies.json' to be existent for language/coherence detection. Detection WILL be weaker.
2022-09-26 11:10:39,182 -  INFO  - log file: /tmp/.MEIchytBN/lst_cci_regrid_ESACCI-LST-L3C-LST-MODISA-0.05deg_1MONTHLY_DAY-20060701000000-fv3.00.nc_to_0.25.log
2022-09-26 11:10:39,244 -  INFO  - spatial resolution used is geospatial_lat_resolution
2022-09-26 11:10:39,251 -  INFO  - Open 0.05 degree resolution land mask
2022-09-26 11:10:39,261 -  INFO  - use a sub selection of land map
2022-09-26 11:10:39,264 -  INFO  - Use 8 parallel CPU threads
2022-09-26 11:10:39,264 -  WARNING  - Output file output_25/ESACCI-LST-L3C-LST-MODISA-0.25deg_1MONTHLY_DAY-20060701000000-fv3.00.nc exists and will be replaced.
2022-09-26 11:10:39,265 -  INFO  - Input file resolution: 0.05
2022-09-26 11:10:39,266 -  INFO  - Output file resolution: 0.25
2022-09-26 11:10:39,266 -  INFO  - Sub grid coordinates: [0 90 0 180]
2022-09-26 11:10:39,266 -  INFO  - ------------------------------------
2022-09-26 11:10:40,321 -  INFO  - REGRID 'dtime' Method  mean
2022-09-26 11:10:40,343 -  INFO  - REGRID 'satze' Method  mean
2022-09-26 11:10:40,351 -  INFO  - REGRID 'sataz' Method  mean
2022-09-26 11:10:40,358 -  INFO  - REGRID 'solze' Method  mean
2022-09-26 11:10:40,366 -  INFO  - REGRID 'solaz' Method  mean
2022-09-26 11:10:40,374 -  INFO  - REGRID 'lst' Method  mean
2022-09-26 11:10:40,382 -  INFO  - REGRID 'lst_uncertainty' Method  mean
2022-09-26 11:10:40,451 -  INFO  - REGRID 'lst_unc_ran' Method  nanmean_uncorrelated_unc
2022-09-26 11:10:43,451 -  INFO  -   lst_unc_loc_atm: Output resolution > 0.05: use 'Propagation from 0.05 degree' algorithms
2022-09-26 11:10:43,451 -  INFO  - REGRID 'lst_unc_loc_atm' Method  nanmean_uncorrelated_loc
2022-09-26 11:10:43,473 -  INFO  -   lst_unc_loc_sfc: Output resolution > 0.05: use 'Propagation from 0.05 degree' algorithms
2022-09-26 11:10:43,473 -  INFO  - REGRID 'lst_unc_loc_sfc' Method  nanmean_uncorrelated_loc
2022-09-26 11:10:43,517 -  INFO  - REGRID 'lst_unc_sys' Method  nanmean_fullcorr_large_scale_unc
2022-09-26 11:10:45,599 -  INFO  - COPY coordinates 'channel'
2022-09-26 11:10:45,601 -  INFO  - Computing total uncertainties
2022-09-26 11:10:45,610 -  INFO  - Compute sum of uncertainties
2022-09-26 11:10:46,943 -  INFO  - ====================================
2022-09-26 11:10:46,943 -  INFO  - Writing output file
2022-09-26 11:10:55,169 -  INFO  - File output_25/ESACCI-LST-L3C-LST-MODISA-0.25deg_1MONTHLY_DAY-20060701000000-fv3.00.nc written
2022-09-26 11:10:55,215 -  INFO  - Regridding successfully ended.
2022-09-26 11:10:55,216 -  INFO  - Regridding duration: 0:00:16.036366
2022-09-26 11:10:55,216 -  INFO  - ====================================
```

Figure 13: Example of console execution on a sub-area

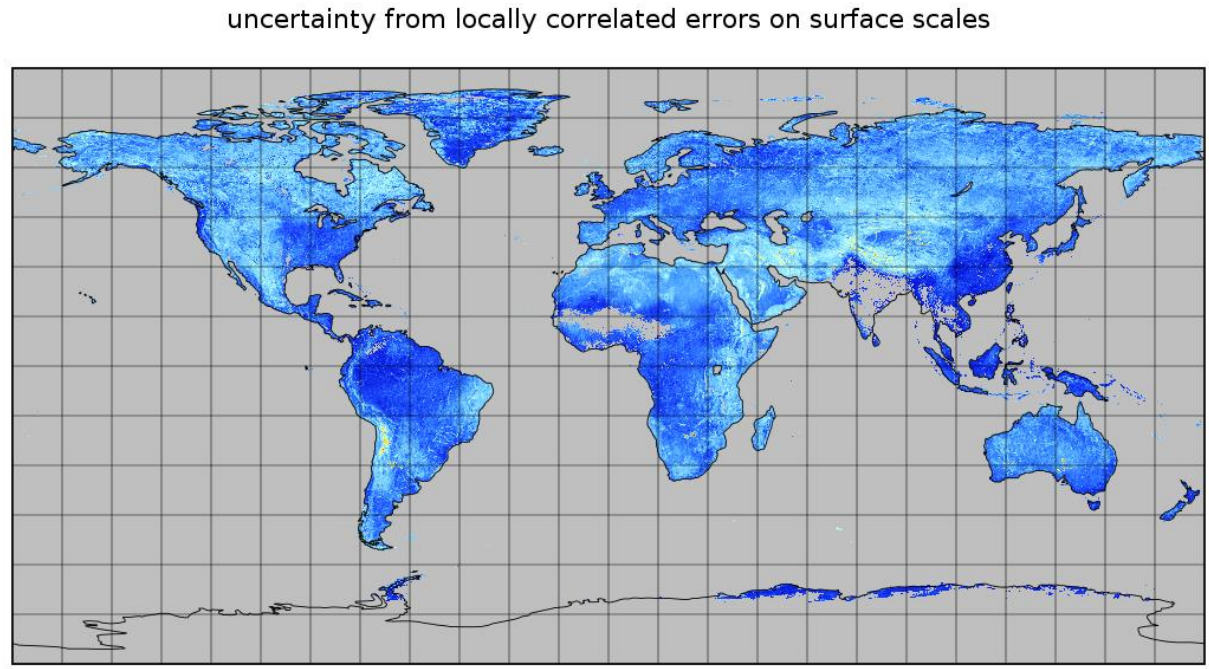

Figure 14: Original lst_unc_loc_sfc values

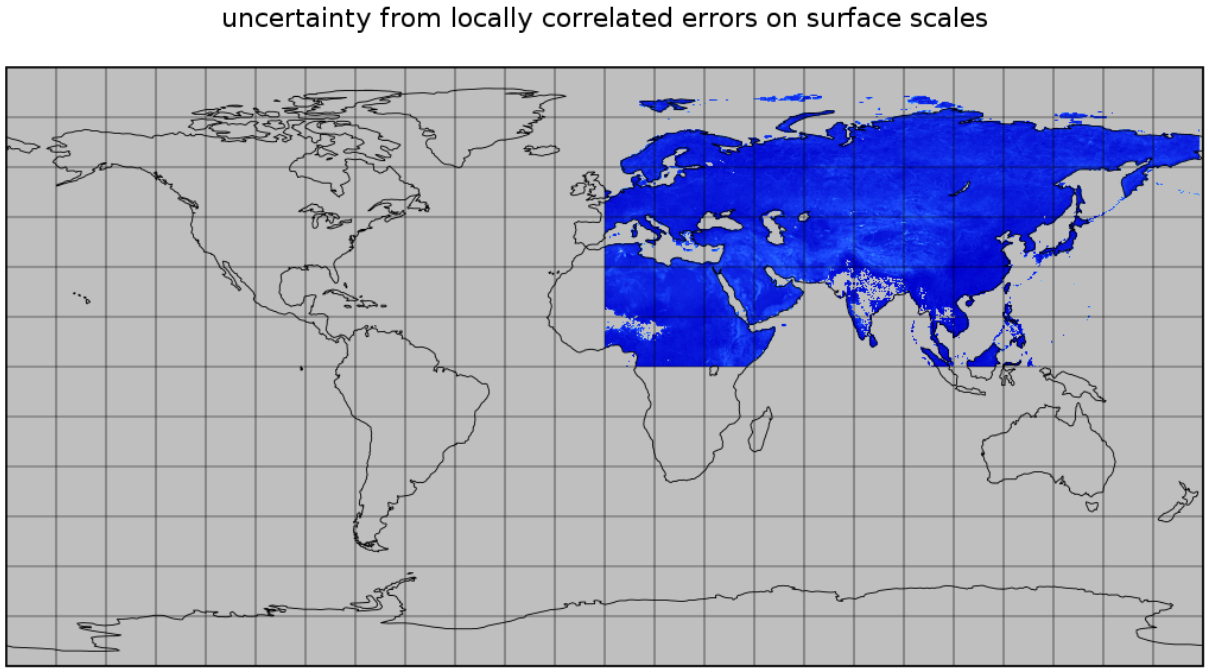

Figure 15: Regridded lst_unc_loc_sfc values

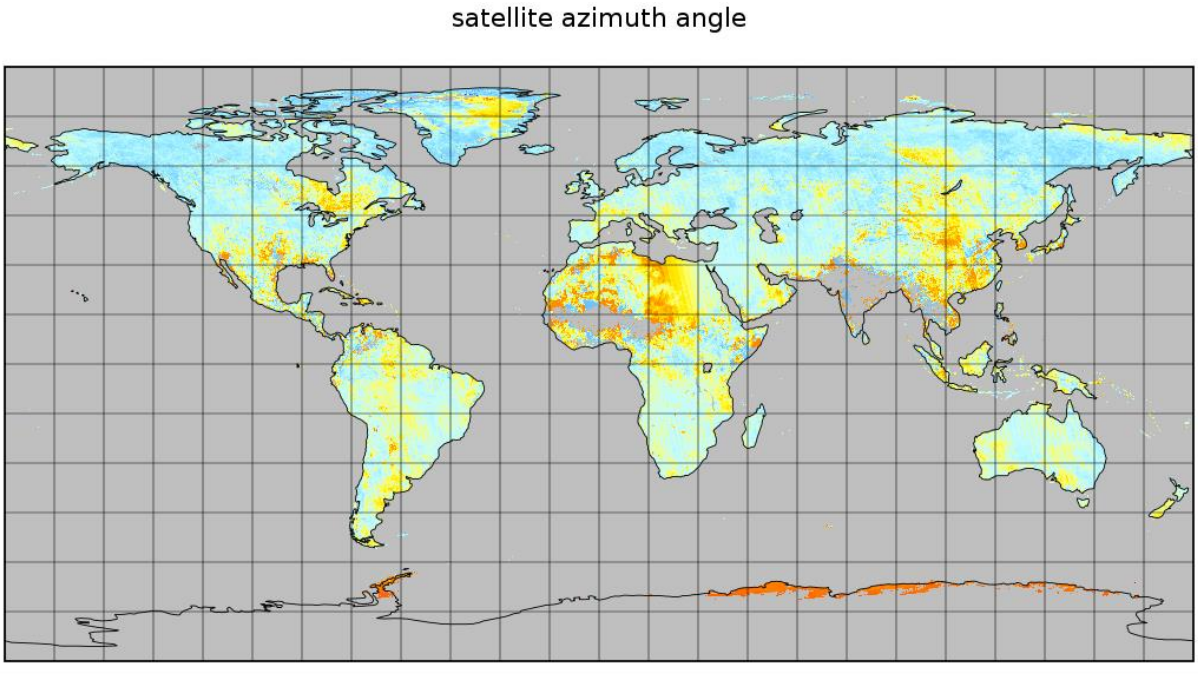

Figure 16: Original SATAZ values

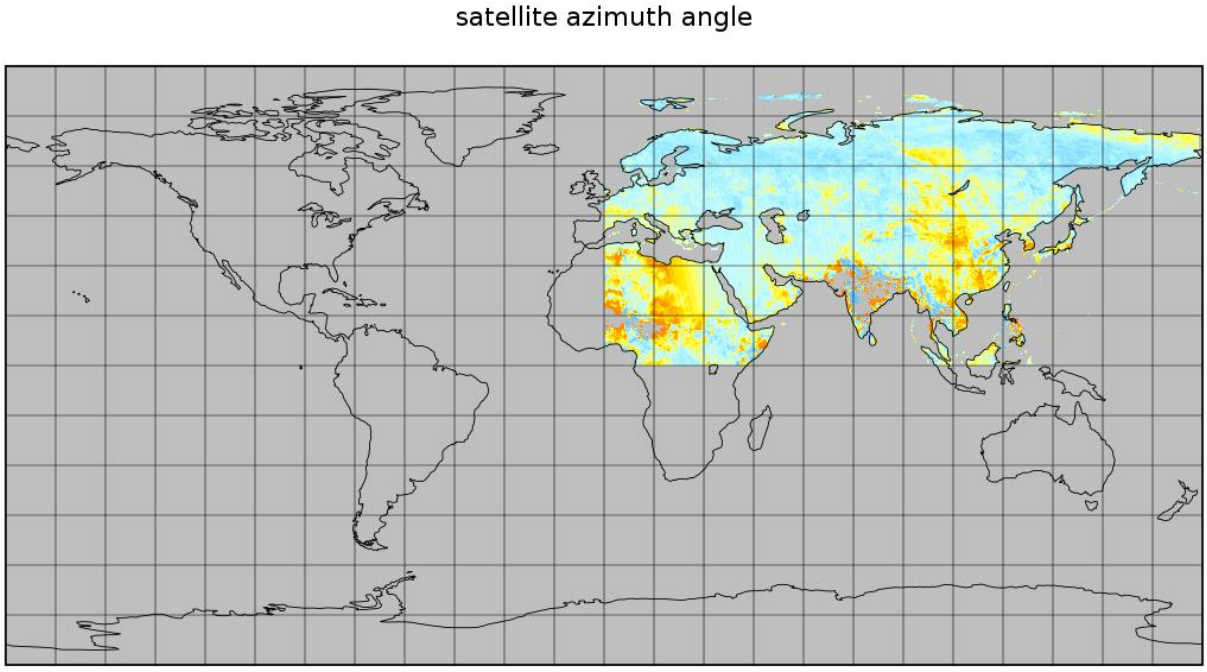

Figure 17: Regridded SATAZ values

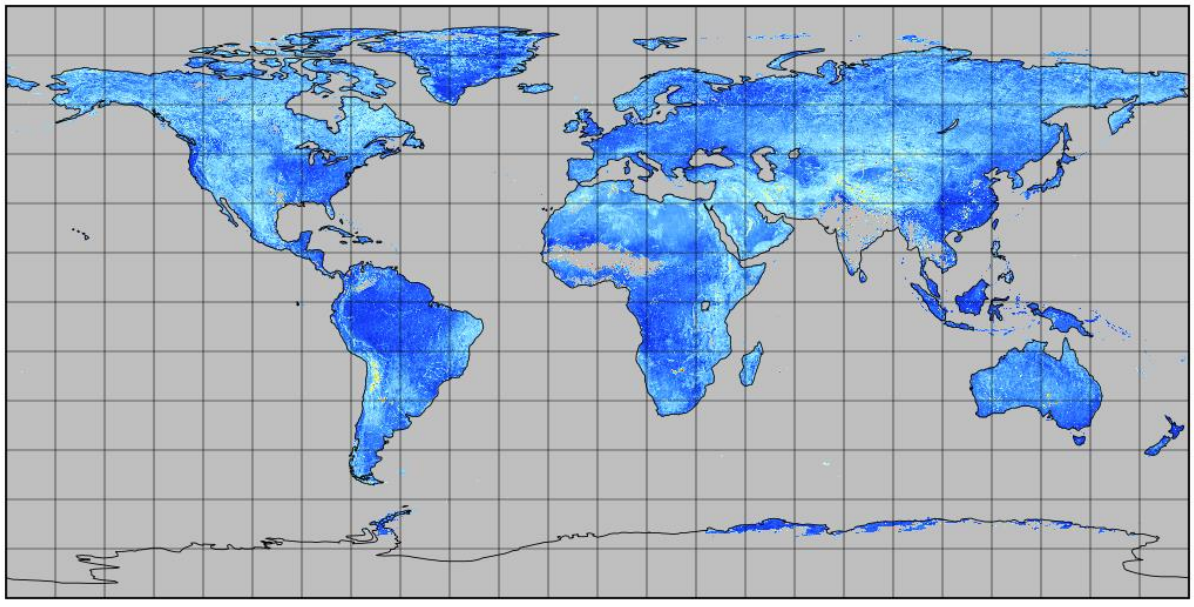

Figure 18: Original LST uncertainty

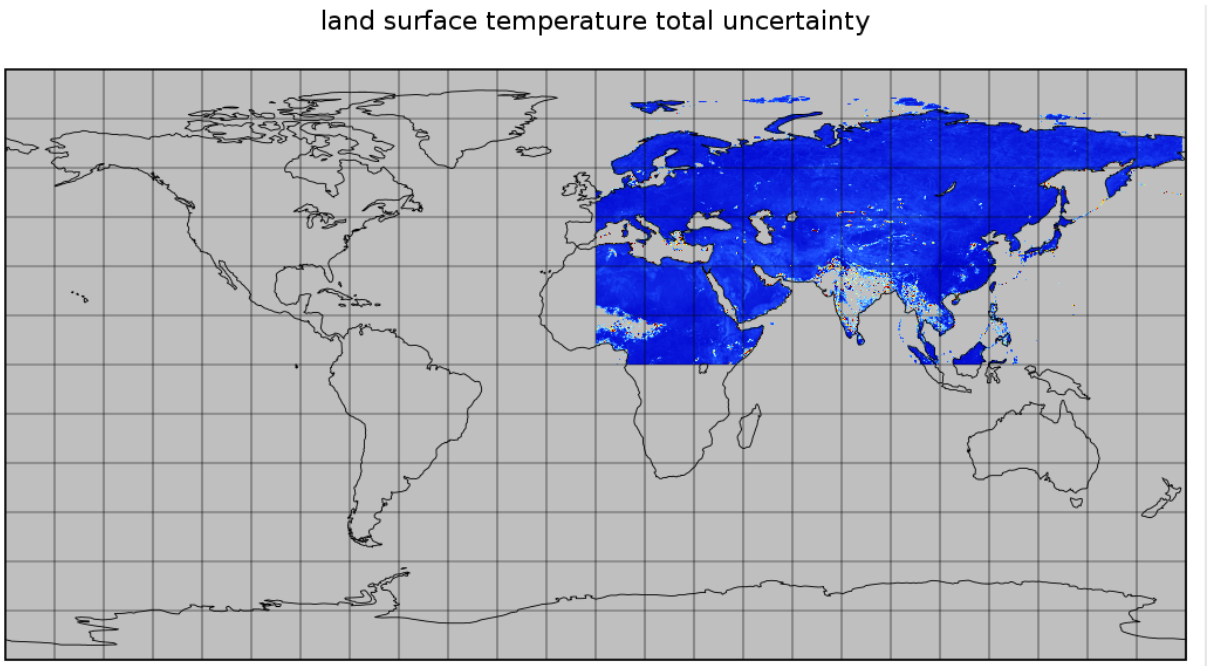

Figure 19: Regridded LST uncertainty

4.4. Running the regrid tool using '2 steps' algorithm with UOL product and threads:

```
lst_cci_regrid TDS/ESACCI-LST-L3C-LST-MODISA-0.01deg_1MONTHLY_DAY-20060701000000-fv3.00.nc output_05 --coords "0 90 0 180" --resolution 0.5 --threads 3
```

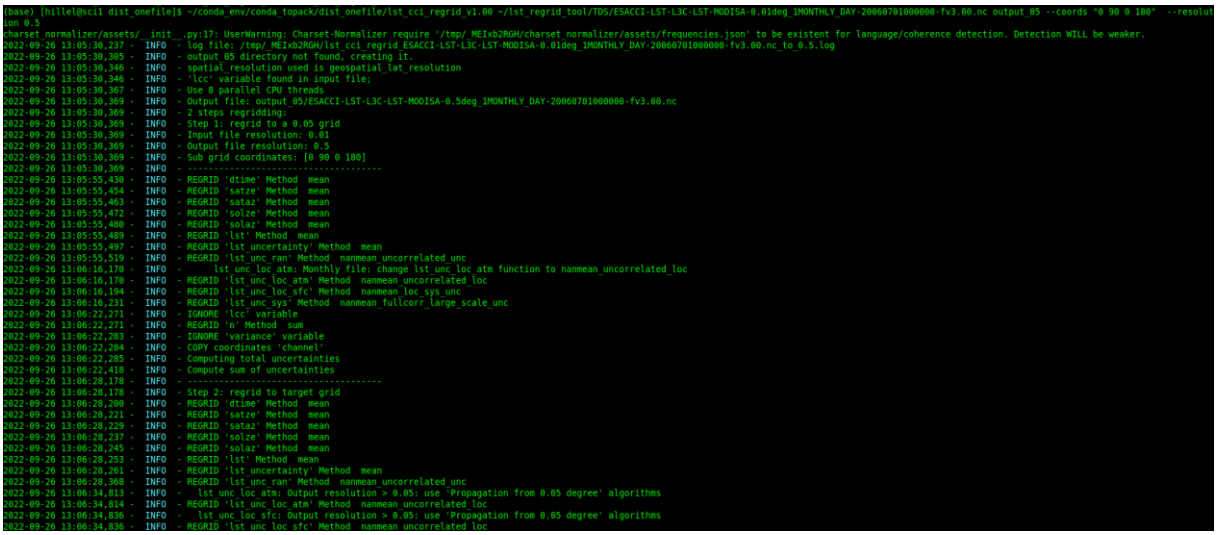

Figure 20:Example of console execution using 2 steps algorithm

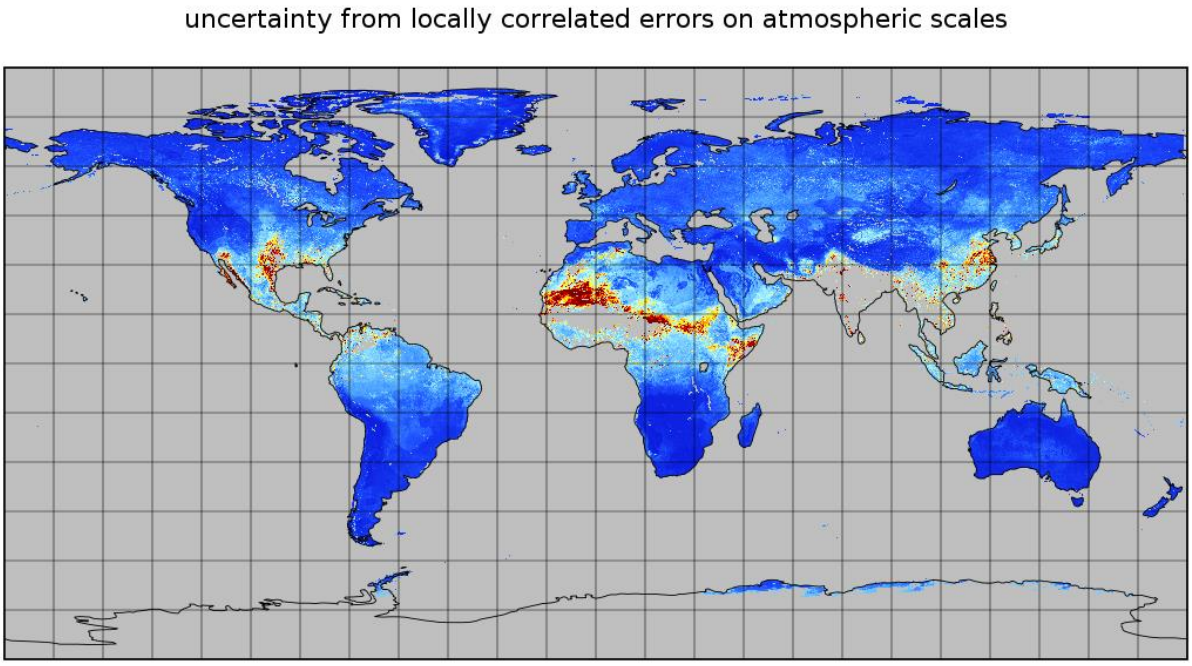

Figure 21: original file lst_unc_loc_atm variable

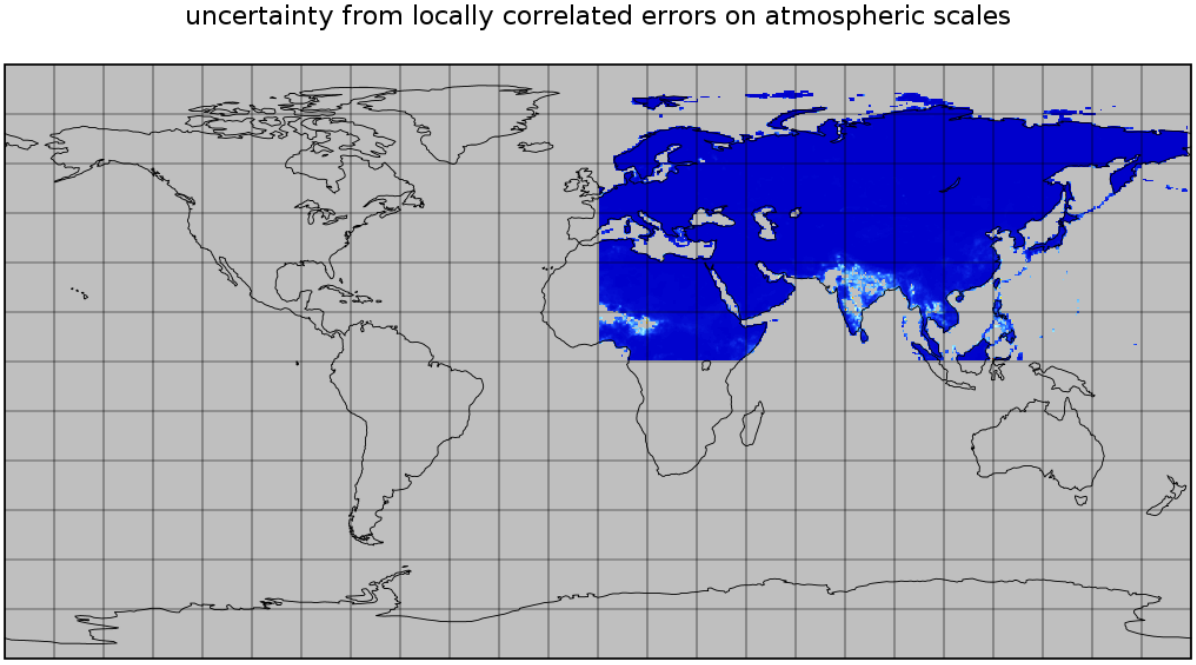

Figure 22: regridded lst_unc_loc_atm variable

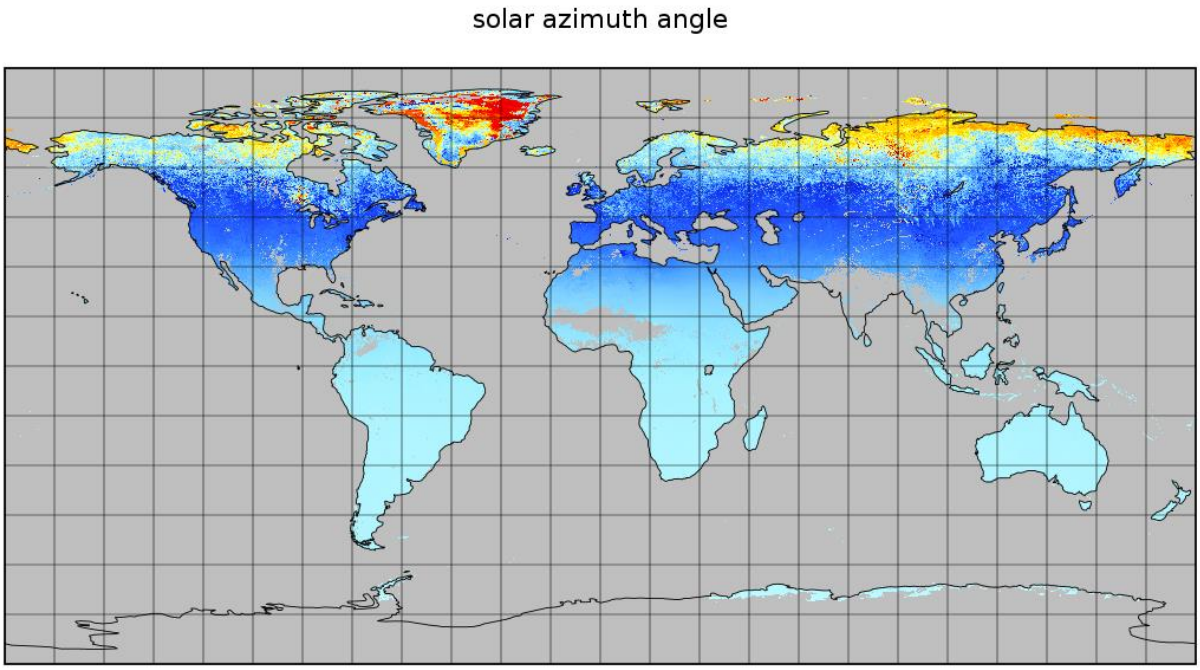

Figure 23: original solaz variable

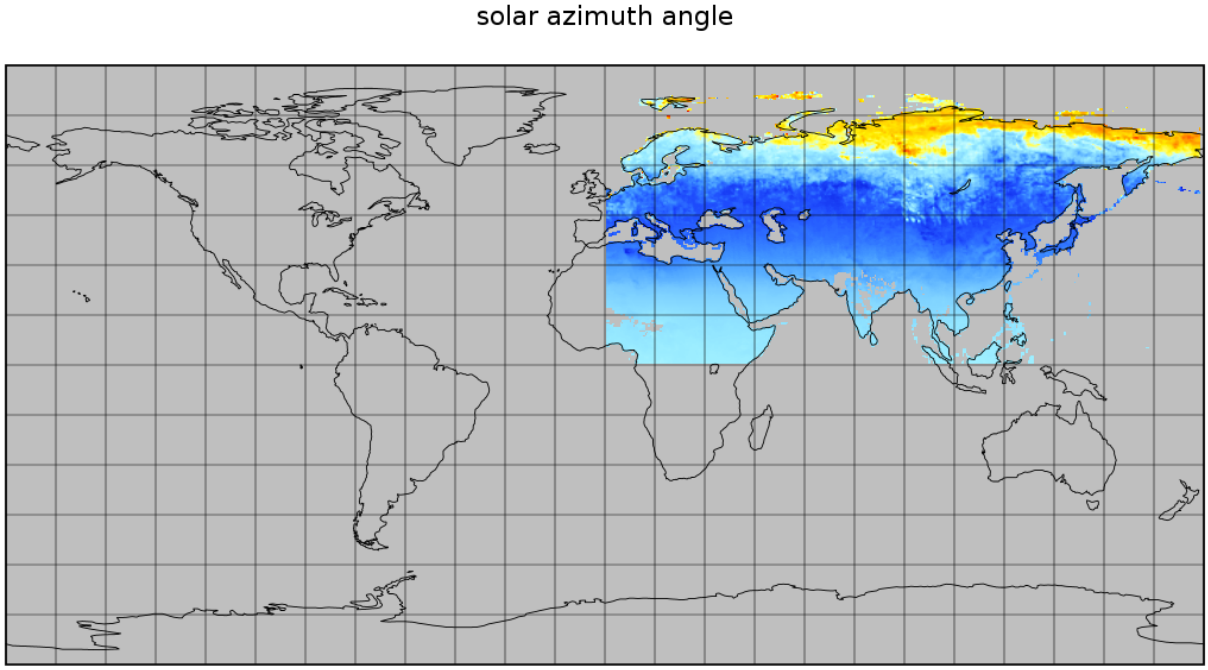

Figure 24: regridded solaz variable

4.5. Error cases

Some error handling examples:

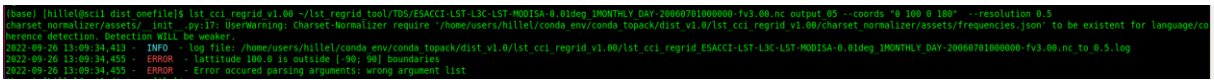

Figure 25: lat / lon out of bound

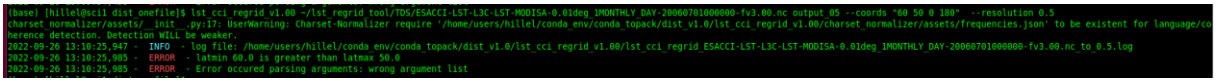

Figure 26: lat/lon wrongly ordered

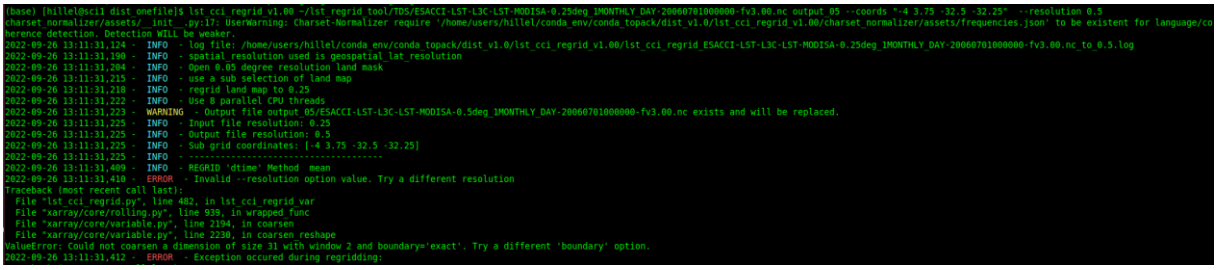

Figure 27: wrong resolution

NB: resolution value is not fully checked before the regridding starts. Resolution errors are raised at execution time.

5. Performances

The re-gridding tool is a python script supporting multi-threading.

Performances depends on host capabilities, the input file size, the claimed resolution, and the sub-map size.

Tests done on: Intel(R) Core(TM) i7-4770S CPU @ 3.10GHz with 28 GB of RAM

latmin=0 latmax=50 lonmin=0 lonmax=50 Threads=1

Compression Level	0,01° to 0,01° Duration (s)	0,01° to 0,01° Size (MB)	0,01° to 0,05° Duration (s)	0,01° to 0,05° Size (MB)
1	26,44	273	21,73	13
4	30,07	263	21,06	12
9	188,04	256	26,32	12
RAM (MB)	800		550	

latmin=0 latmax=50 lonmin=0 lonmax=50 Thread=2

Compression Level	0,01° to 0,01° Duration (s)	0,01° to 0,01° Size (MB)	0,01° to 0,05° Duration (s)	0,01° to 0,05° Size (MB)
1	20,91	273	13,24	13
4	27,05	263	13,72	12
9	184,83	256	18,48	12
RAM (MB)	820		590	

latmin=-90 latmax=90 lonmin=-180 lonmax=180 Threads=1

Compression Level	0,01° to 0,01° Duration (m)	0,01° to 0,01° Size (MB)	0,01° to 0,05° Duration (m)	0,01° to 0,05° Size (MB)
1	6,72	2279	7,95	102
4	7,53	2164	7,88	97
9	26,7	2111	8,67	95
RAM (GB)	15		6,7	

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