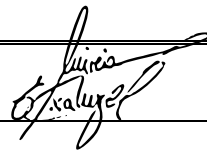


## Sentinel-3 SLSTR Uncertainties in Level-1 Products Python Tool User Manual

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**CHANGE LOG**

<b>Date</b>	<b>Issue</b>	<b>Revision</b>	<b>Pages</b>	<b>Reason for change</b>
28-Oct-2019	2	0		Changes made according to the RIDs. <ul style="list-style-type: none"><li>- Section 2: "MapnoiS3 tool's requirements"</li><li>- Two possibilities included for the output directory name</li><li>- Output file name changed to: &lt;band&gt;_uncertainty_&lt;g&gt;&lt;v&gt;.nc</li></ul>

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## 1 Scope of Document / Introduction

*MapnoiS3* is a Python code developed to allow the addition of per-pixel noise  $NE\Delta T$  and  $NE\Delta L$ , and radiometric uncertainty information to the SLSTR Level-1 products. The tool can deal with several SLSTR Level-1 products in one go, and with as many channels and scan views as the user requires. This work has been performed under the European Union's Copernicus Programme, and managed by EUMETSAT through the contract EUM/CO/18/4600002122/AOC.

## 2 MapnoiS3 tool's requirements

The *MapnoiS3* code was written in Python 3.7. and it works in any operating system, Mac OS X, Linux, and Windows.

The simplest way to start *MapnoiS3* is to install Python3 and pip3 package installer for Python3. Then pip3 can be used to install the modules that MapnoiS3 needs. The required modules are: sys, time, os, pathlib, xml.dom, numpy, and netCDF4.

The modules sys, time, os, and pathlib are contained in the Python's standard library. The other modules can be installed with the following command:

```
pip3 install <module>
```

or

```
sudo pip3 install <module>
```

## 3 Obtaining the MapnoiS3 code

*MapnoiS3* is provided as a tarball file which can be opened as:

```
tar -zxvf mapnoiS3.tar.gz
```

This will create a folder called *mapnoiS3* in the user's directory. It contains the *code* archive with the python scripts, and the *input* folder, which contains the input xml file, and the Level-1 and Level-2 ADFs products required by the algorithm.

## 4 MapnoiS3 Input Files

The MapnoiS3 code consists of two folders: *input* and *code*

### 4.1 The INPUT folder

The input folder contains:

#### 4.1.1 Config\_file.xml

"*config\_file.xml*" is the input file where the user should write the paths to the input datasets and the necessary channels and scan views. The user should fill the *config\_file.xml* file as follows:

```
<?xml version="1.0" encoding="UTF-8"?>
<mapnoiS3_config>
  <path_slstr value="/data/" description="Path to SLSTR L1 input products" type="STRING" />
  <path_adfL1 value="/mapnoiS3/input/ADFs/Level1/" description="Path to SLSTR ADF L1 input products" type="STRING" />
  <path_adfL2 value="/mapnoiS3/input/ADFs/Level2/" description="Path to SLSTR ADF L2 input products" type="STRING" />
  <path_out value="/output/" description="Path to output products" type="STRING" />
  <channels value="s1,s3,s5,s6,s7,s9,f1" description="List of channels to process, separated by commas" type="STRING" />
  <scan value="nadir,oblique" description="Scan view to process (nadir and/or oblique, separated by comma)" type="STRING" />
</mapnoiS3_config>
```

- The first parameter value should contain the path to the directory containing the SLSTR Level-1 products that the user wants to analyse. The code deals with products of both instruments, SLSTR-A and SLSTR-B, separately. The L1 products from different instruments should be placed in different folders, and the code should be run independently, for each instrument using the correspondent ADF products.
- The second parameter value should contain the path to the ADF Level-1 products. Currently, the code contains by default only the ADFs Level-1 products of SLSTR-A.
- The third parameter value should contain the path to the ADF Level-2 products. The code provides by default the ADFs Level-2 products of SLSTR-A
- The fourth parameter value should contain the output directory in which the code's output files will be stored. If the parameter is left blank or empty, then the output uncertainty netcdf files will be stored inside the corresponding Level-1 SLSTR product.
- The fifth parameter value contains the channels. The user can select one channel or as many channels as wanted separated by commas.
- The sixth parameter value indicates the scan view, nadir and/or oblique separated by a comma.

#### 4.1.2 ADF folder

The ADF folder contains by default the ADF Level-1 and Level-2 products corresponding to SLSTR-A.

## 4.2 The CODE folder

The code consists of four python scripts: *mapnoiS3.py*, *input\_reader.py*, *calc\_uncert.py*, and *output\_writer.py*.

- *mapnoiS3.py* is the main executable script. It calls at several modules:
- *input\_reader.py* which reads the parameters from the file *config\_file.xml*
- *calc\_uncert.py* which calculates the radiometric uncertainty, NEDL, NEDT and dL/dT at the pixel level, for every SLSTR product, channel and scan view requested by the user
- *output\_writer.py* contains the functions necessary to create the output netcdf files

## 5 Quick Start

To get the code running in Linux or MacOS, the user needs to change the main script *mapnoiS3.py*, and the code folder to executable as follows:

```
chmod +x path/mapnoiS3/code/mapnoiS3.py
```

The path environment variable has to be appended in the *.bash\_profile* file:

```
export PATH="path/mapnoiS3/code:$PATH"
```

The code can be run from a Linux command line as follows:

```
mapnoiS3.py "/path/mapnoiS3/input/config_file.xml"
```

Once the code is executing, it will write the following output:

```
<Date> <Time> Processing Product: path/<SLSTR L1 product name>/  
Writing Uncertainty Datasets...  
S1_radiance_an_uncertainties.nc..... Done  
S1_radiance_ao_uncertainties.nc..... Done  
S2_radiance_an_uncertainties.nc..... Done  
...  
<Date> <Time> Finished!!!
```

## 6 MapnoiS3 Output Files

For each SLSTR Level-1 product analysed:

```
<MMM>_SL_1_RBT__<data_start>_<data_stop>_<creation_time>_....SEN3
```

where <MMM> is S3A or S3B, the code will create an output directory per product, named as:

```
<MMM>_SL_1_UNC__<data_start>_<data_stop>_SEN3
```

at the output path indicated in the "*config\_file.xml*" file. If the output path is left empty then the output products will be located in the level-1 SLSTR product directory:

```
<MMM>_SL_1_RBT__<data_start>_<data_stop>_<creation_time>_....SEN3/
```

The output directory contains a netcdf file per each channel and each scan view selected. The netcdf file contains the NEDL and the radiometric uncertainties at the pixel level for the VIS/SWIR channels, and the NEDT, the radiometric uncertainties and the slope dL/dT for the infrared and the fire channels.