EGMS-toolkit

Alexis Hrysiewicz University College Dublin / iCRAG

Feb 07, 2024

DOCUMENTATION

Welcome to `EGMStoolkit`s documentation!

CHAPTER

ONE

EGMS TOOLKIT

EGMS toolkit is a set of python scripts to download and manage the InSAR data from European Ground Motion Service. The toolkit allows:

- to download the data automatically;
- to merge the files;
- to clip/crop the datasets.

UNDER DEVELOPMENT

Release info: Version 0.2.5 Beta, Feb., 2024

The online documentation can be found here.

1.1 Dependencies and installation

The requirements are:

- Python 3
- GDAL
- GMT (with GSHHG)

To install the **EGMS toolkit**,

On Linux and MacOS:

```
git clone https://github.com/alexisInSAR/EGMStoolkit.git
pip3 install -e EGMStoolkit
```

On Windows:

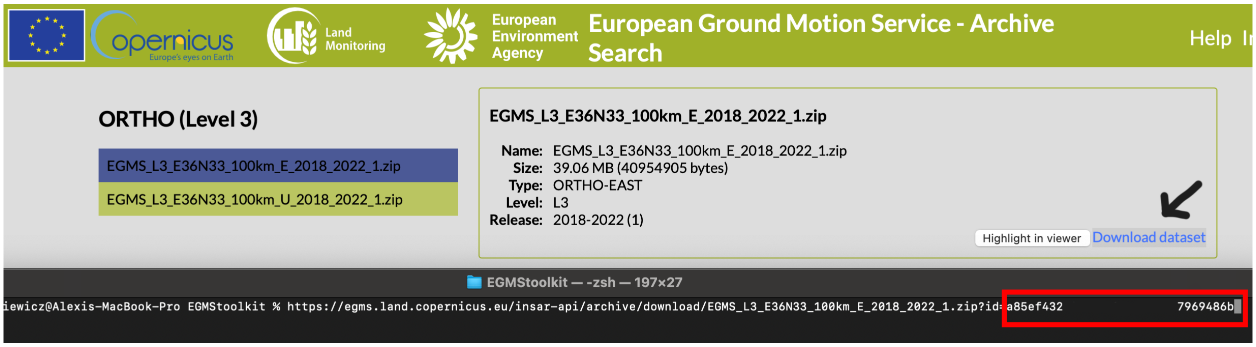
```
git clone https://github.com/alexisInSAR/EGMStoolkit.git
py -m pip3 install -e EGMStoolkit
```

Note: For an installation in protected directories, the path of the Sentinel-Burst-ID map could be modified.

1.2 Run the toolkit

There are two ways to use the toolkit (in shell or in Python).

The user needs to use the temporary token from the EGMS website. It can be found at the end of download links (see image below). Any download links can be used, the user can use a random download link.



ORTHO (Level 3)

EGMS_L3_E36N33_100km_E_2018_2022_1.zip

EGMS_L3_E36N33_100km_U_2018_2022_1.zip

EGMS_L3_E36N33_100km_E_2018_2022_1.zip

Name: EGMS_L3_E36N33_100km_E_2018_2022_1.zip
Size: 39.06 MB (40954905 bytes)
Type: ORTHO-EAST
Level: L3
Release: 2018-2022 (1)

EGMStoolkit — -zsh — 197×27

```
iewicz@Alexis-MacBook-Pro EGMStoolkit % https://egms.land.copernicus.eu/insar-api/archive/download/EGMS_L3_E36N33_100km_E_2018_2022_1.zip?id=a85ef432                7969486b
```

Please find an example of the script use in your shell terminal.

```
EGMStoolkit -l L2a,L2b -r 2018_2022 -t XXXXXXXXXXXXXXXXXXXX -b -6.427059639290446,53.2606655698541,-6.0952332730202095,53.41811986118854 -o ./Output_directory --track 1 --pass Ascending --nomerging -noclipping --quiet --clean
```

Note: The -h option is useful to get a help, i.e.,

```
EGMStoolkit -h
```

The –docs option is useful to get the documentation of EGMS-toolkit: i.e.,

```
EGMStoolkit --docs
```

In addition, EGMStoolkit can be used in a Python environment: see the example in the EGMStoolkit documentation.

1.3 Merging the L2 datasets

Due to the Sentinel-1 acquisition mode, EGMStoolkit offers two different methods of merging:

- Without deleting of duplicate of measurement points in burst/swath overlaps;
- With deleting of duplicate of measurement points in burst/swath overlaps based on the convace-hull algorithm.

The method can be selected by modifing (True or False) the option __*removeduplicate*__. The __*length_threshold*__ can be used for the same function (1000 by default).

The VRT format can be used for the merging and interpolation steps.

1.4 Authors

Alexis Hrysiewicz University College Dublin / iCRAG

1.5 Partners

University College Dublin	iCRAG
UCD DUBLIN	iCRAG IRISH CENTRE FOR RESEARCH IN APPLIED GEOSCIENCES

1.5.1 EGMS toolkit

EGMS toolkit is a set of python scripts to download and manage the InSAR data from European Ground Motion Service. The toolkit allows:

- to download the data automatically;
- to merge the files;
- to clip/crop the datasets.

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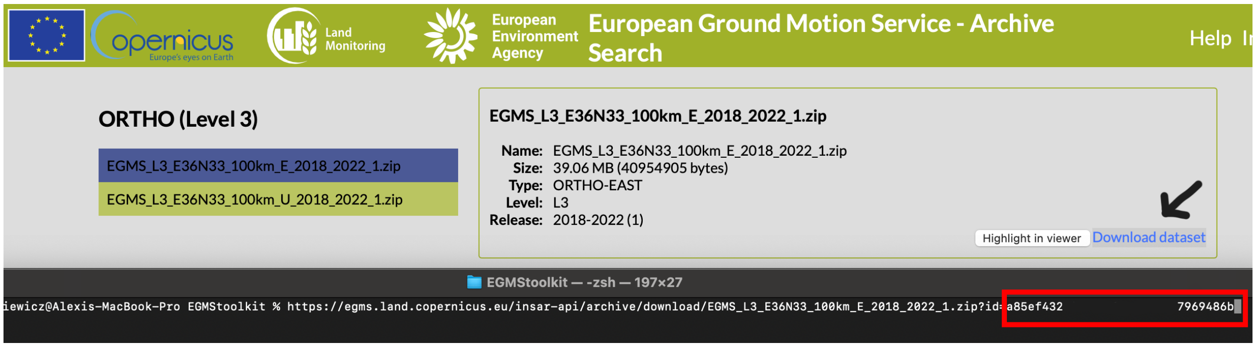
Run the toolkit

There are two ways to use the toolkit (in shell or in Python).

The user needs to use the temporary token from the EGMS website. It can be found at the end of download links (see image below). Any download links can be used, the user can use a random download link.



European Ground Motion Service - Archive Search

ORTHO (Level 3)

EGMS_L3_E36N33_100km_E_2018_2022_1.zip
EGMS_L3_E36N33_100km_U_2018_2022_1.zip

EGMS_L3_E36N33_100km_E_2018_2022_1.zip

Name: EGMS_L3_E36N33_100km_E_2018_2022_1.zip
Size: 39.06 MB (40954905 bytes)
Type: ORTHO-EAST
Level: L3
Release: 2018-2022 (1)

Highlight in viewer Download dataset

EGMStoolkit — -zsh — 197×27

```
iewicz@Alexis-MacBook-Pro EGMStoolkit % https://egms.land.copernicus.eu/insar-api/archive/download/EGMS_L3_E36N33_100km_E_2018_2022_1.zip?id=a85ef432[redacted]7969486b
```

Please find an example of the script use in your shell terminal.

```
EGMStoolkit -l L2a,L2b -r 2018_2022 -t XXXXXXXXXXXXXXXXXXXX -b -6.427059639290446,53.2606655698541,-6.0952332730202095,53.41811986118854 -o ./Output_directory --track 1 --pass Ascending --nomerging -noclipping --quiet --clean
```

Note: The -h option is useful to get a help, i.e.,

```
EGMStoolkit -h
```

The –docs option is useful to get the documentation of EGMS-toolkit: i.e.,

```
EGMStoolkit --docs
```

In addition, EGMStoolkit can be used in a Python environment: see the example in the EGMStoolkit documentation.

Merging the L2 datasets

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- With deleting of duplicate of measurement points in burst/swath overlaps based on the convace-hull algorithm.

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The VRT format can be used for the merging and interpolation steps.

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Partners

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1.5.2 Example of EGMS toolkit in Python environment

Date: 26 Jan. 2024 by Alexis Hrysiewicz

Import the required modules

As a Python package, we import the **EGMS-toolkit** sub-packages. For this example, (and for a complete processing), **EGMS-toolkit** requires 4 modules:

- *EGMSS1burstIDapi*: management of the S1-Burst-ID map (from the *classes* modules);
- *EGMSS1ROIapi*: process the selection of datasets based on a ROI (from the *classes* modules);
- *EGMSdownloaderapi*: downloader of EGMS data (from the *classes* modules);
- *egmsdatatools*: some supplementary tools (from the *functions* modules).

[1]:

```
from EGMStoolkit.classes import EGMSS1burstIDapi
from EGMStoolkit.classes import EGMSS1ROIapi
from EGMStoolkit.classes import EGMSdownloaderapi
from EGMStoolkit.functions import egmsdatatools
```

Of course, it also is possible to directly import EGMStoolkit:

```
import EGMStoolkit
```

Manage the Sentinel-1-Burst-ID map

The first step is the creation of the *S1burstIDmap* object to manage the Sentinel-1-Burst-ID map.

> **NOTE:** To improve the clarity of this example, the verbose mode will be actived for some selected processing step.

Create the python variable

We call the class with the verbose and logging modes deactived.

[2]:
```
info = EGMSS1burstIDapi.S1burstIDmap(verbose=False,log=None)
```

Of each **EGMS-toolkit** class, the *print()* method can be used to visualise its attributes.

[3]:
```
info.print()
```

```
date_str_init: 29/05/2022, dirmap: /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/
↪EGMStoolkit/src/EGMStoolkit/3rdparty, pathIDmap: /Users/alexis_hrysiewicz/Work/UCD_
↪InSAR_Scripts/EGMStoolkit/src/EGMStoolkit/3rdparty/S1_burstid_20220530, list_date: [
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↪'20240129', '20240130', '20240131', '20240201', '20240202'], verbose: False, log: None
```

Dowloading of the Sentinel-1-Burst-ID map

EGMS-toolkit requires the Sentinel-1-Burst-ID map to detect the datasets. **EGMS-toolkit** can check the latest version and download the file by using the following method.

By default, the file will be stored in the *3rdparty* directory. However, the user can change the directory by modifying the *dirmap* attributes of the class.

```
[4]: info.downloadfile(verbose=False)
```

```
[4]: <EGMStoolkit.classes.EGMSS1burstIDapi.S1burstIDmap at 0x169fde0e0>
```

Check the tile/bursts available according the user inputs

From the Sentinel-1-Burst-ID map, **EGMS-toolkit** is now able to detect the associated EGMS datasets. Of course, the user can give some parameters to control the search.

Create the Python variable.

We call the class.

```
[5]: ROIpara = EGMSS1ROIapi.S1ROIparameter(verbose=False)
```

Definition of some parameters

For the EGMS level

The user can define the level of EGMS datasets: i.e., L2a, L2b or L3.

```
[6]: ROIpara.egmslevel = 'L2b' # Level of EGMS data
```

For the ROI (or bbox)

The user must define the ROI. There are three ways to define this parameters:

- by a list of EPSG:4326 coordinates [W,S,E,N];
- by a country name (i.e., GB, FR, etc.);
- by a shapefile in EPSG:4326 coordinates (multiline string format).

```
[7]: ROIpara.bbox = [-6.427059639290446,53.2606655698541,-6.0952332730202095,53.
↪41811986118854]
```

For the release

Currently, there are two available releases: - 2015-2021; - 2018-2022.

The user can select one of these releases.

```
[8]: ROIpara.release = '2018_2022'
```

Conversion of the bbox to a ROI

EGMS-toolkit requires a conversion of the bbox to a ROI. The toolkit will create a shapefile to store the ROI. The default value is *bbox.shp*.

```
[9]: ROIpara.createROI(verbose=False)
```

```
[9]: <EGMStoolkit.classes.EGMSS1ROIapi.S1ROIparameter at 0x169fde020>
```

Detection of the EGMS datasets

Now, **EGMS-toolkit** has the required information to detect the EGMS datasets.

By default, all relative orbits and passes will be selected. Of course, the user can used two options to define the relative orbits and pass of Sentinel-1 satellites.

> **NOTE:** Lists of tracks and passes can be given for multiples searches.

```
[10]: ROIpara.detectfromIDmap(info,Track_user=1,Pass_user='Ascending',verbose=True)
```

```
################################################################################
EGMStoolkit 0.2.1 Beta

--------------------------------------------------------------------------------
EGMStoolkit.classes.EGMSS1ROIapi.EGMStoolkit.classes.EGMSS1ROIapi:
        Detect the data regarding the burst IDs

        Script: /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/
↪EGMStoolkit/classes/EGMSS1ROIapi.py
                Copyright 2024, UCD / iCRAG
################################################################################

WARNING in EGMS-toolkit processing: in EGMStoolkit.classes.EGMSS1ROIapi.checkfile
        /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/EGMStoolkit/
↪classes/EGMSS1ROIapi.py
                --> The use of the S1 burst ID map is less accurate than the use of .xml␣
↪S1 files.
For the L2a and L2b levels
|| 1127661/1127661 [100%] in 45.1s (24992.20/s)
```

```
[10]: <EGMStoolkit.classes.EGMSS1ROIapi.S1ROIparameter at 0x169fde020>
```

Save and load results from detection

EGMS-toolkit can save and load the results of a detection.

[11]:
```
# Save the burst ID list
ROIpara.saveIDlistL2()
# Load the burst ID list
ROIpara.loadIDlistL2()
```

[11]:
```
<EGMStoolkit.classes.EGMSS1ROIapi.S1ROIparameter at 0x169fde020>
```

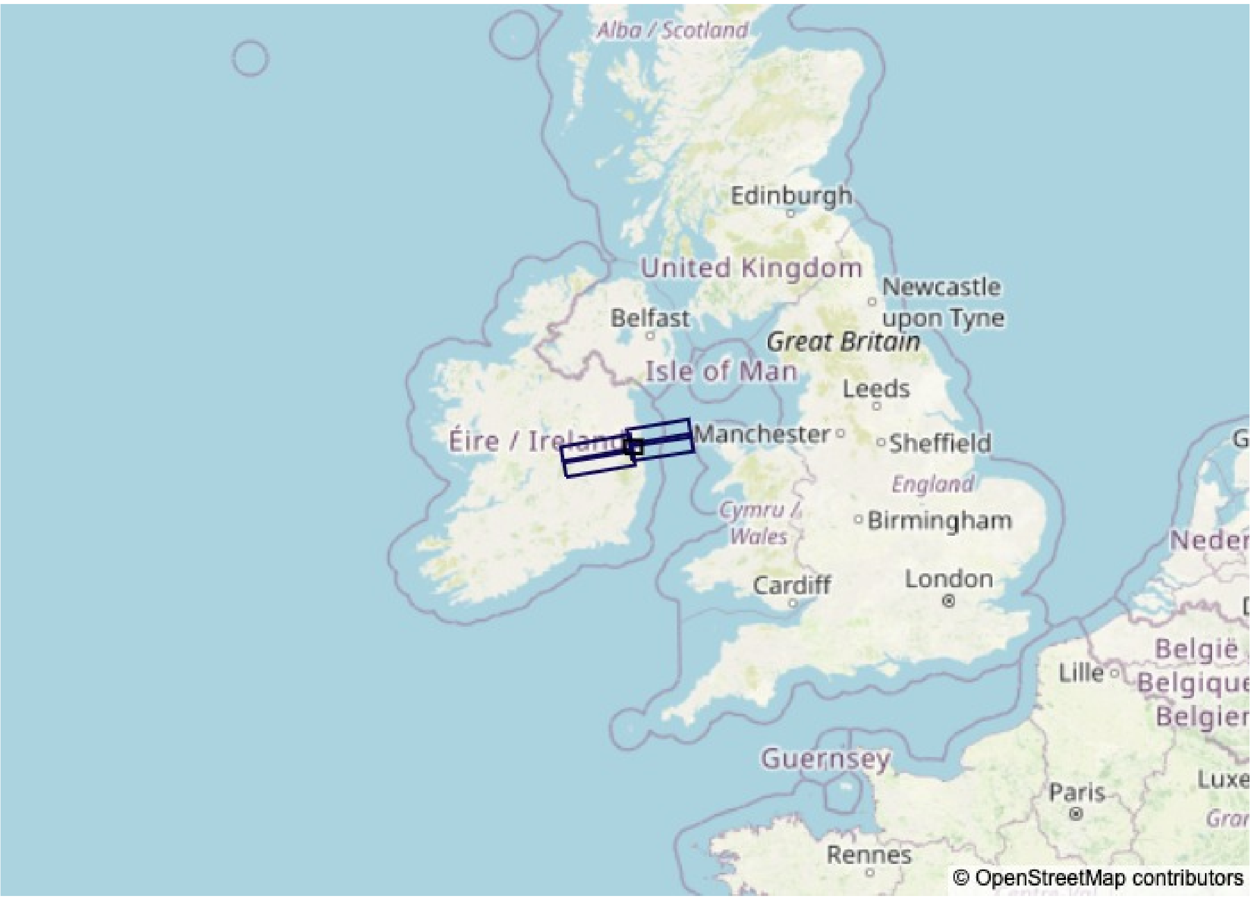
By default, the file name is *egmslist.pkl* but the user can change it with the *input* option.

Display a map

To visualise the results, **EGMS-toolkit** can display the expected datasets.

[12]:
```
ROIpara.displaymap(output='fig_search.jpg')
```

If the *ouput* option is not given, the figure will be displayed and not saved.



Download the EGMS data

The next step therefore is the downloading of the datasets. However, the user needs to create the links.

Create the python variable

We call the class.

[13]:
```
downloadpara = EGMSdownloaderapi.egmsdownloader(verbose=False)
```

```
WARNING in EGMS-toolkit processing: in EGMStoolkit.classes.EGMSdownloaderapi.
↪checkparameter
        /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/EGMStoolkit/
↪classes/EGMSdownloaderapi.py
                --> The user token is not correct.
```

The **WARNING** is due to a incorrect token. The user will modify it later.

Update the list of datasets (and create the links)

Now, the user can concatenate their search to create a list of downloading links.

[14]:
```
downloadpara.updatelist(infoS1ROIparameter=ROIpara)
```

```
WARNING in EGMS-toolkit processing: in EGMStoolkit.classes.EGMSdownloaderapi.
↪checkparameter
        /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/EGMStoolkit/
↪classes/EGMSdownloaderapi.py
                --> The user token is not correct.
WARNING in EGMS-toolkit processing: in EGMStoolkit.classes.EGMSdownloaderapi.
↪checkparameter
        /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/EGMStoolkit/
↪classes/EGMSdownloaderapi.py
                --> The user token is not correct.
```

[14]:
```
<EGMStoolkit.classes.EGMSdownloaderapi.egmsdownloader at 0x16a5fe470>
```

And the user can displayed the lists of datasets.

[15]:
```
downloadpara.printlist(verbose=True)
```

```
WARNING in EGMS-toolkit processing: in EGMStoolkit.classes.EGMSdownloaderapi.
↪checkparameter
        /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/EGMStoolkit/
↪classes/EGMSdownloaderapi.py
                --> The user token is not correct.
################################################################################
EGMStoolkit 0.2.1 Beta


--------------------------------------------------------------------------------
EGMStoolkit.classes.EGMSdownloaderapi.EGMStoolkit.classes.EGMSdownloaderapi:
        Print the list(s) of EGMS files

        Script: /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/
```

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```
↪EGMStoolkit/classes/EGMSdownloaderapi.py
                Copyright 2024, UCD / iCRAG
################################################################################

For the EGMS data: L2b
         File 1: EGMS_L2b_001_0314_IW2_VV_2018_2022_1.zip (Release 2018_2022)
         File 2: EGMS_L2b_001_0314_IW3_VV_2018_2022_1.zip (Release 2018_2022)
         File 3: EGMS_L2b_001_0315_IW2_VV_2018_2022_1.zip (Release 2018_2022)
         File 4: EGMS_L2b_001_0315_IW3_VV_2018_2022_1.zip (Release 2018_2022)
```

```
[15]: <EGMStoolkit.classes.EGMSdownloaderapi.egmsdownloader at 0x16a5fe470>
```

Concatenate other searches

Often, the user would like to download datasets with different parameters (i.e., tracks). **EGMS-toolkit** can concatenate other searches to optimise the downloading time.

Firstly, the next lines will add the search for L3 vertical EGMS datasets of the 2015-2021 release.

```
[16]: ROIpara.egmslevel = 'L3'
      ROIpara.egmsL3component = 'UD'
      ROIpara.release = '2015_2021'
      ROIpara.detectfromIDmap(infoburstID=info,verbose=False)
      downloadpara.updatelist(infoS1ROIparameter=ROIpara,verbose=False)
```

```
WARNING in EGMS-toolkit processing: in EGMStoolkit.classes.EGMSS1ROIapi.checkfile
        /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/EGMStoolkit/
↪classes/EGMSS1ROIapi.py
                --> The use of the S1 burst ID map is less accurate than the use of .xml␣
↪S1 files.
WARNING in EGMS-toolkit processing: in EGMStoolkit.classes.EGMSdownloaderapi.
↪checkparameter
        /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/EGMStoolkit/
↪classes/EGMSdownloaderapi.py
                --> The user token is not correct.
WARNING in EGMS-toolkit processing: in EGMStoolkit.classes.EGMSdownloaderapi.
↪checkparameter
        /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/EGMStoolkit/
↪classes/EGMSdownloaderapi.py
                --> The user token is not correct.
```

```
[16]: <EGMStoolkit.classes.EGMSdownloaderapi.egmsdownloader at 0x16a5fe470>
```

Secondly, we will also add an other search for L3 horizontal EGMS datasets of the 2018-2022 release.

```
[17]: ROIpara.egmslevel = 'L3'
      ROIpara.egmsL3component = 'EW'
      ROIpara.release = '2018_2022'
      downloadpara.updatelist(infoS1ROIparameter=ROIpara.detectfromIDmap(infoburstID=info))
```

```
WARNING in EGMS-toolkit processing: in EGMStoolkit.classes.EGMSS1ROIapi.checkfile
        /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/EGMStoolkit/
↪classes/EGMSS1ROIapi.py
```

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```
                --> The use of the S1 burst ID map is less accurate than the use of .xml␣
↪S1 files.
WARNING in EGMS-toolkit processing: in EGMStoolkit.classes.EGMSdownloaderapi.
↪checkparameter
        /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/EGMStoolkit/
↪classes/EGMSdownloaderapi.py
                --> The user token is not correct.
WARNING in EGMS-toolkit processing: in EGMStoolkit.classes.EGMSdownloaderapi.
↪checkparameter
        /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/EGMStoolkit/
↪classes/EGMSdownloaderapi.py
                --> The user token is not correct.
```

[17]:
```
<EGMStoolkit.classes.EGMSdownloaderapi.egmsdownloader at 0x16a5fe470>
```

And the user can print the new list.

[18]:
```
downloadpara.printlist(verbose=True)
```

```
WARNING in EGMS-toolkit processing: in EGMStoolkit.classes.EGMSdownloaderapi.
↪checkparameter
        /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/EGMStoolkit/
↪classes/EGMSdownloaderapi.py
                --> The user token is not correct.
################################################################################
EGMStoolkit 0.2.1 Beta

--------------------------------------------------------------------------------
EGMStoolkit.classes.EGMSdownloaderapi.EGMStoolkit.classes.EGMSdownloaderapi:
        Print the list(s) of EGMS files

        Script: /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/
↪EGMStoolkit/classes/EGMSdownloaderapi.py
                Copyright 2024, UCD / iCRAG
################################################################################

For the EGMS data: L2b
         File 1: EGMS_L2b_001_0314_IW2_VV_2018_2022_1.zip (Release 2018_2022)
         File 2: EGMS_L2b_001_0314_IW3_VV_2018_2022_1.zip (Release 2018_2022)
         File 3: EGMS_L2b_001_0315_IW2_VV_2018_2022_1.zip (Release 2018_2022)
         File 4: EGMS_L2b_001_0315_IW3_VV_2018_2022_1.zip (Release 2018_2022)
For the EGMS data: L3UD
         File 1: EGMS_L3_E32N34_100km_U.zip (Release 2015_2021)
For the EGMS data: L3EW
         File 1: EGMS_L3_E32N34_100km_E_2018_2022_1.zip (Release 2018_2022)
```

[18]:
```
<EGMStoolkit.classes.EGMSdownloaderapi.egmsdownloader at 0x16a5fe470>
```

Change the user token

In order to dowload the EGMS data, the user requires to be authorised on the EGMS servers. The hack is to use the user token which can be found, online, at the end of downloading links.

This token is time-limited.

```
[19]: downloadpara.token = 'XXXXXXXXXXX'
```

Download the EGMS data

Now, it is possible to download the data. All the used options are optionnal and are defined by default.

```
[20]: downloadpara.download(outputdir='./Output',unzipmode=False,cleanmode=False)
```

```
[20]: <EGMStoolkit.classes.EGMSdownloaderapi.egmsdownloader at 0x16a5fe470>
```

Unzip the files

The downlaoded files are .zip archives. The following method will unzip the archives.

However, it is possible to unzip the file directly with the download method by using the unzipmode option.

```
[21]: downloadpara.unzipfile(outputdir='./Output',unzipmode=True,cleanmode=True,verbose=True)
```

```
################################################################################
EGMStoolkit 0.2.1 Beta

--------------------------------------------------------------------------------
EGMStoolkit.classes.EGMSdownloaderapi.EGMStoolkit.classes.EGMSdownloaderapi:
        Unzip the EGMS files

        Script: /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/
↪EGMStoolkit/classes/EGMSdownloaderapi.py
                Copyright 2024, UCD / iCRAG
################################################################################

1 / 6 files: Unzip the file: EGMS_L3_E32N34_100km_E_2018_2022_1.zip
2 / 6 files: Unzip the file: EGMS_L3_E32N34_100km_U.zip
3 / 6 files: Unzip the file: EGMS_L2b_001_0314_IW3_VV_2018_2022_1.zip
4 / 6 files: Unzip the file: EGMS_L2b_001_0315_IW3_VV_2018_2022_1.zip
5 / 6 files: Unzip the file: EGMS_L2b_001_0315_IW2_VV_2018_2022_1.zip
6 / 6 files: Unzip the file: EGMS_L2b_001_0314_IW2_VV_2018_2022_1.zip
```

```
[21]: <EGMStoolkit.classes.EGMSdownloaderapi.egmsdownloader at 0x16a5fe470>
```

Clean the unused files

Then, the user can delete the files that are not in the lists.

```
[22]: downloadpara.clean(outputdir='./Output',verbose=False)
```

```
[22]: <EGMStoolkit.classes.EGMSdownloaderapi.egmsdownloader at 0x16a5fe470>
```

Post-processing of the EGMS data

The files are in the *output* directory:

It therefore is smarter to post-process the files.

Of course, all steps are optional.

Merge the .csv files

The first post-processing is the merging of .csv. The user can define several options: - *outputdir* the ouput directory; - *inputdir* the input directory (where are stored the EGMS .csv files); - *verbose* the verbose mode - *paratosave* parameter regarding the EGMS names [all or string value]. [latitude, longitude, easting, northing, height, height_wgs84] which will always be saved.

The last option is mode. Indeed, the scripts can find the .csv files based on the search lists (onlist mode) or on the stored files (onfiles mode). For the last mode, the downloadpara class is required.

Three other options are available:

- **removeduplicate** (bool): Remove the duplicate points [Default: True]
- **length_threshold** (int): Length for the concave hull [Default: 1000]
- **usevrtmerging** (bool): Use the vrt for merging [Default: False]

```
[23]: egmsdatatools.datamergingcsv(infoEGMSdownloader=downloadpara,inputdir='./Output',
      ↪outputdir='./Output',mode='onlist',verbose=True,paratosave='all')
```

```
################################################################################
EGMStoolkit 0.2.1 Beta

--------------------------------------------------------------------------------
EGMStoolkit.functions.egmsdatatools.EGMStoolkit.functions.egmsdatatools:
        Merge the datasets in csv format

        Script: /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/
↪EGMStoolkit/functions/egmsdatatools.py
                Copyright 2024, UCD / iCRAG
################################################################################

        Output Directory: ./Output
        Input Directory: ./Output
        Selected parameters: all
        Mode: onlist
Merging for EGMS_L3_2015_2021_UD...
Merging for EGMS_L2b_001_VV_2018_2022_1...
Merging for EGMS_L3_2018_2022_1_EW...
```

Merge the .tiff files (only for the vertical and horizontal displacements)

The .tiff can also be merged. The options are similar.

The paratosave option does not exist here.

[26]:
```
egmsdatatools.datamergingtiff(infoEGMSdownloader=downloadpara,inputdir='./Output',
↪outputdir='./Output',mode='onlist',verbose=True)
```

```
################################################################################
EGMStoolkit 0.2.1 Beta

--------------------------------------------------------------------------------
EGMStoolkit.functions.egmsdatatools.EGMStoolkit.functions.egmsdatatools:
        Merge the datasets in tiff format (only for L3 level)

        Script: /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/
↪EGMStoolkit/functions/egmsdatatools.py
                Copyright 2024, UCD / iCRAG
################################################################################

        Output Directory: ./Output
        Input Directory: ./Output
        Selected parameters: all
        Mode: onlist
Merging for EGMS_L3_2015_2021_UD...
Used command: gdal_merge.py -o ./Output/EGMS_L3_2015_2021_UD.tiff -n -9999 -a_nodata -
↪9999 ./Output/L3UD/2015_2021/EGMS_L3_E32N34_100km_U/EGMS_L3_E32N34_100km_U.tiff
0...10...20...30...40...50...60...70...80...90...100 - done.
Merging for EGMS_L3_2018_2022_1_EW...
Used command: gdal_merge.py -o ./Output/EGMS_L3_2018_2022_1_EW.tiff -n -9999 -a_nodata -
↪9999 ./Output/L3EW/2018_2022/EGMS_L3_E32N34_100km_E_2018_2022_1/EGMS_L3_E32N34_100km_E_
↪2018_2022_1.tiff
0...10...20...30...40...50...60...70...80...90...100 - done.
```

Clip/crop the data

The user can clip or crop the files regarding the ROI (or another shapefile).

The new parameter *namefile* allows to define the file. By default, all will clip/crop all the files. The option **clipuseogr2ogr** (bool, optional) can be used to force the use of ogr2ogr for clipping (default is False).

[27]:
```
egmsdatatools.dataclipping(inputdir='./Output',outputdir='./Output',namefile='all',
↪shapefile='bbox.shp',verbose=True)
```

```
################################################################################
EGMStoolkit 0.2.1 Beta

--------------------------------------------------------------------------------
EGMStoolkit.functions.egmsdatatools.EGMStoolkit.functions.egmsdatatools:
        Clip the dataset(s)

        Script: /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/
↪EGMStoolkit/functions/egmsdatatools.py
```

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```
                Copyright 2024, UCD / iCRAG
################################################################################

        The file name is: all
        Input Directory: ./Output
        Output Directory: ./Output
        Shapefile: bbox.shp
        1 / 5 file(s): Clip the file ./Output/EGMS_L3_2015_2021_UD.csv to ./Output/EGMS_
↪L3_2015_2021_UD_clipped.csv...
        2 / 5 file(s): Clip the file ./Output/EGMS_L3_2018_2022_1_EW.csv to ./Output/
↪EGMS_L3_2018_2022_1_EW_clipped.csv...
        3 / 5 file(s): Clip the file ./Output/EGMS_L2b_001_VV_2018_2022_1.csv to ./
↪Output/EGMS_L2b_001_VV_2018_2022_1_clipped.csv...
        4 / 5 file(s): Crop the file ./Output/EGMS_L3_2015_2021_UD.tiff to ./Output/EGMS_
↪L3_2015_2021_UD_cropped.tiff...
        5 / 5 file(s): Crop the file ./Output/EGMS_L3_2018_2022_1_EW.tiff to ./Output/
↪EGMS_L3_2018_2022_1_EW_cropped.tiff...
```

Clean the raw files and directories

To save space, the raw files and directories can be deleted.

```
[28]: egmsdatatools.removerawdata(inputdir='./Output',verbose=True)
```

```
################################################################################
EGMStoolkit 0.2.1 Beta

--------------------------------------------------------------------------------
EGMStoolkit.functions.egmsdatatools.EGMStoolkit.functions.egmsdatatools:
        Delete the raw dataset(s) from EGMS

        Script: /Users/alexis_hrysiewicz/Work/UCD_InSAR_Scripts/EGMStoolkit/src/
↪EGMStoolkit/functions/egmsdatatools.py
                Copyright 2024, UCD / iCRAG
################################################################################

        Input Directory: ./Output
Deleting...
Deleting...
```

Post-processing for advanced users

The next sections show some other commands to post-process the data.

Interpolation of point data (.csv) into a .tif raster file

The first command is the possibility to interpolate the point data (from .csv files) into a .tif raster file. Of course, this step can be can be done before the cropping/clipping step.

Creation of the dict. for the gridding parameters

The user requires to define a dictionary with the gridding parameter.

```
[32]: paragrid = dict()
paragrid['Xmin'] = 2896000 # Minimal X coordinate in EPGS:3035
paragrid['Ymin'] = 3317250 # Minimal Y coordinate in EPGS:3035
paragrid['Xmax'] = 3359000 # Maximal X coordinate in EPGS:3035
paragrid['Ymax'] = 3745500 # Maximal Y coordinate in EPGS:3035
paragrid['xres'] = 50 # X spatial resolution in EPGS:3035
paragrid['yres'] = 50 # Y spatial resolution in EPGS:3035
paragrid['algo'] = 'average:radius1=50:radius2=50:angle=0.0:nodata=-9999' # Alfgorithm␣
↪used and options
paragrid['variable'] = 'mean_velocity,mean_velocity_std,acceleration,acceleration_std,
↪seasonality,seasonality_std'
# paragrid['algo'] = 'invdist:power=2.0:smoothing=0.0:radius1=0.0:radius2=0.0:angle=0.0:
↪max_points=0:min_points=0:nodata=0.0'
# paragrid['algo'] = 'invdistnn:power=2.0:radius=1.0:max_points=12:min_points=0:nodata=0'
# paragrid['algo'] = 'average:radius1=0.0:radius2=0.0:angle=0.0:min_points=0:nodata=0.0'
# paragrid['algo'] = 'nearest:radius1=0.0:radius2=0.0:angle=0.0:nodata=0.0'
# paragrid['algo'] = 'linear:radius=-1.0:nodata=0.0'
```

And the user can run the interpolation.

```
[ ]: egmsdatatools.datagridding(inputdir='./Output',outputdir='./Output',namefile='all',
↪verbose=True,paragrid=paragrid)
```

Conversion of .csv files to other vector format

The last command will convert the .csv files to other vector formats. The available formats are:

- ESRI Shapefile (default);
- GPKG;
- GeoJSON.

```
[ ]: egmsdatatools.convertcsv(verbose=False)
```

1.5.3 Issues and improvements

This page summarises the different known issues:

- **HTTP Error 429: Too Many Requests**, the *timeerror462* variable requires to be increased.
- The produced shapefiles use the string format for the number features.

1.5.4 Change log

The different versions:

- 0.2.5: Add the interpolation processing for the .vrt file + optional function arguments for duplicate point and vrt files, Feb. 2024, Alexis Hrysiewicz
- 0.2.4: Add the possibility to merge the L3 .csv file into a .vrt file and fix the problem with the L2 datasets, Feb. 2024, Alexis Hrysiewicz
- 0.2.3: Add the possibility to merge the L2 .csv file into a .vrt file (but can fail), Feb. 2024, Alexis Hrysiewicz
- 0.2.2: Optimisation of clipping based on ogr2ogr, Feb. 2024, Alexis Hrysiewicz
- **0.2.1: Fix regarding the ID burst selection, Feb. 2024, Alexis Hrysiewicz**
  - The value of burst size has been changed to 750 (indead of 1500)
  - Remove the duplicate points for L2 datasets
- 0.2.0: Script structuring and documentation, Jan. 2024, Alexis Hrysiewicz
- 0.1.0: Initial version, Nov. 2023

1.5.5 API Reference

This file will be overwritten by the pydoctor build triggered at the end of the Sphinx build.

Its a hack to be able to reference the API index page from inside Sphinx and have it as part of the TOC.