

WuMapPy

WuMapPy Documentation

Release 0.3

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1 About WuMapPy

1.1 Introduction

The WuMapPy project was initiated in 2014 through cooperation between two units of the CNRS¹ ([UMR5133-Archéorient](#) and [UMR7619-Metis](#)). Since 2017, it is also developed by the LabCom Geo-Heritage (a cooperation between [UMR5133-Archéorient](#) and [Eveha International](#)).

1.2 Description

WuMapPy is a graphic user interface written in Python for friendly sub-surface geophysical survey data processing. All displaying or processing operations are realized by an other Python module named GeophPy.

1.3 Features

- Processing data sets with geophysical filters and technics.
- Compatibility with Python 3.x

1.4 Main authors

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1.5 Licence

WuMapPy has been developped on licence GNU GPL v3.

<https://www.gnu.org/licenses/gpl-3.0.en.html>

2 Installation

A stand-alone version with an executable Windows installer is currently being developped but is not available yet.

For now, a Python (3.x) installation is necessary to install this package.

2.1 Pip or easy_install

You can install, upgrade, uninstall wumappy using pip with these commands:

```
>>> pip install wumappy
>>> pip install --upgrade wumappy
>>> pip uninstall wumappy
```

Or if you don't have pip:

```
>>> easy_install wumappy
```

2.2 Manual installation

Download the zip file “WuMapPy-vx.y” and unzip it.

Place yourself in the “WuMapPy-vx.y” unzipped folder and install WuMapPy with the following command:

```
>>> python setup.py install
```

Note: Installation on Windows

WuMapPy and GeophPy are using others python modules. If the installation of one of these modules failed on windows, you can install independently thes modules using this useful web site : <http://www.lfd.uci.edu/~gohlke/pythonlibs/>

2.3 Dependencies

WuMapPy is only a GUI and all geophysical processing are actually done by the GeophPy module. To use WuMapPy-v0.30 you need the package GeophPy-v0.30 to be installed.

GeophPy uses packages that should be automatically installed with GeophPy. If their installation failed they can be installed independently.

GeophPy dependencies (verified on Windows):

- numpy-1.11.0+mkl
- scipy-0.17.1
- matplotlib-1.4.2
- netCDF4-1.2.4
- Pillow-3.2.0
- PySide-1.2.2
- pyshp-1.2.3
- simplekml
- utm

3 Graphical User Interface Overview

3.1 Introduction

The WuMapPy Graphic User Interface is developed using the PySide library.

To launch the software type the `wumappy` as a command in any console

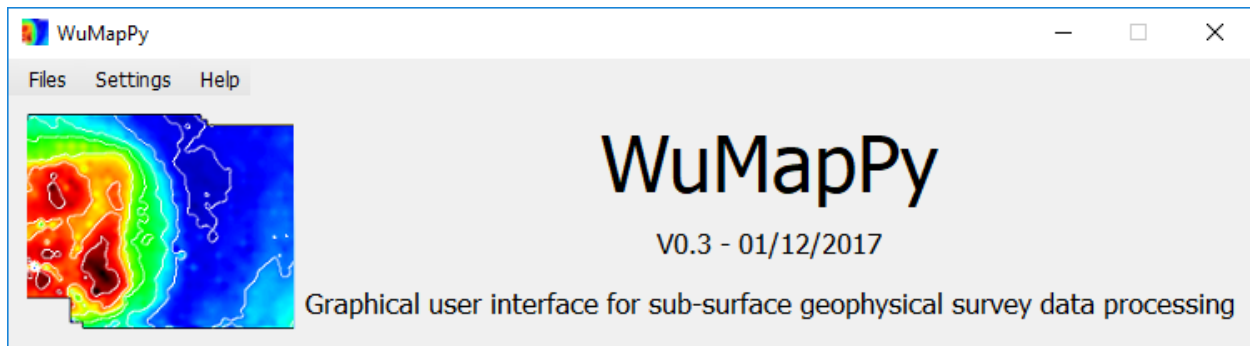
```
>>> wumappy
```

usage: wumappy

3.2 Main Window

From the main window you can access the *Files*, *Settings* and *Help* menus. From there you can:

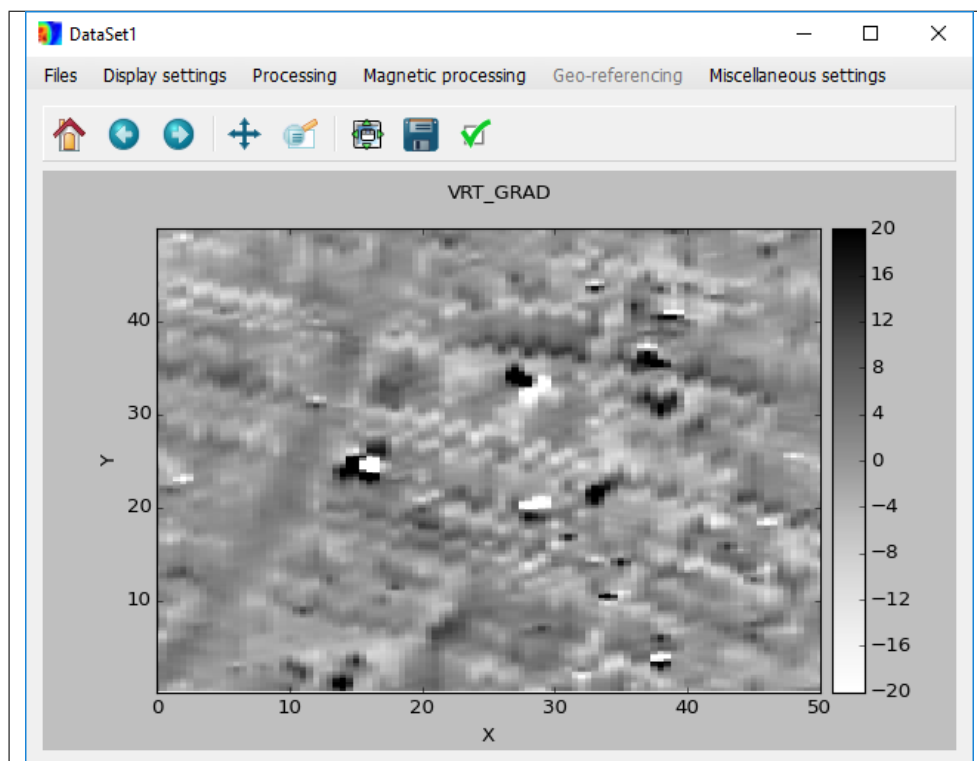
- Open previously processed data or *Import from ascii file* new data.
- Import or *Open Geoposition Set* files.
- Change *Language*, *Font* and others *Miscellaneous settings*.
- Access the GUI *Help* and documentation.



3.3 Data Set Window

Once opened, a DataSet is displayed in a window with a menubar that contains the different available options:

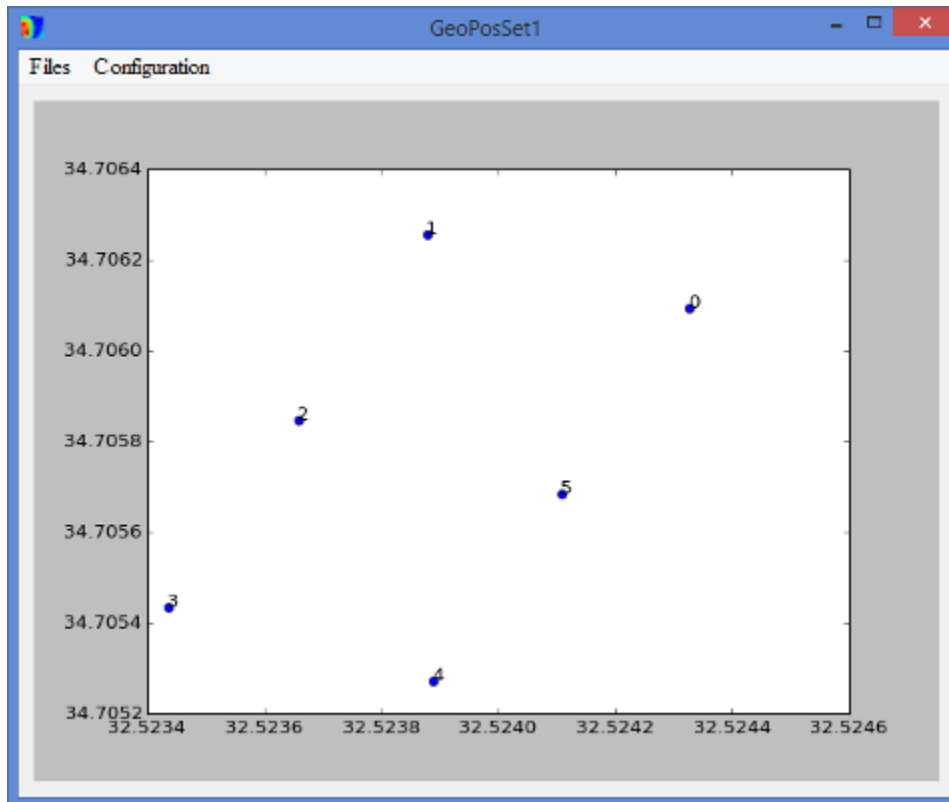
- *Files* (save and export the data)
- *Processing* (general processings)
- *Magnetic Processing*
- *Georeferencing* (available if a Geographic Positions Set is open/imported)
- *Miscellaneous settings*



3.4 Geographic Positions Set Window

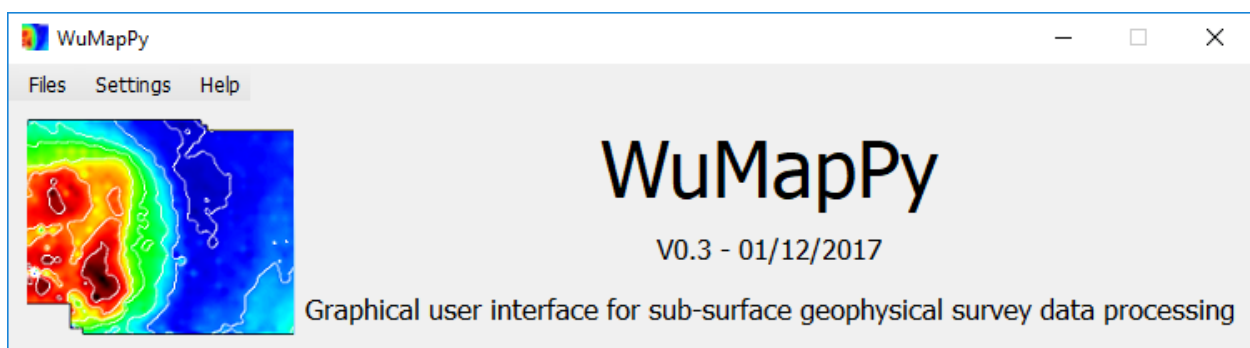
Once opened, a Geographics Positions Set is displayed in a window with a menubar that contains the different available options:

- *Files* (save and export)
- *Configuration*



4 Main Window

Files | Settings | Help

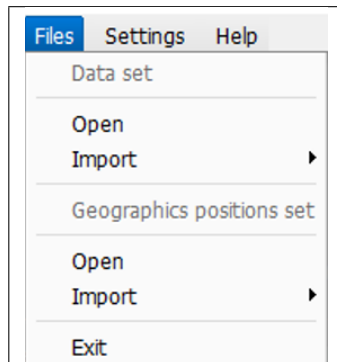


4.1 Files

From this menu you can:

- Open a Data Set file (*.netcdf*).
- Import data from an (X,Y,Z) ascii files.

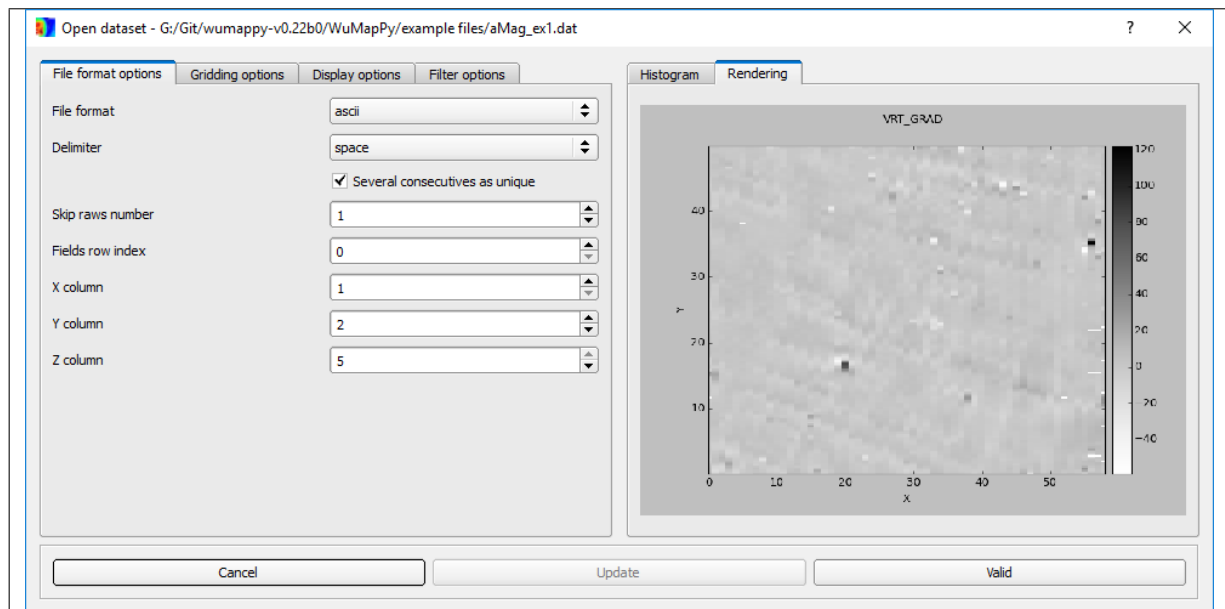
- Open a Geographic Positions Set (.netcdf).
- Import a shapefile (.shp).



Import from ascii file

You can display and pre-process the data or look at the data histogram directly from this menu thanks to the different available tabs.

The *Update* button allows you to preview the effect of the filter before an actual validation when the *real time update* option is switched off.



- File format, Gridding options and Festoon filter tabs.

File format optionsGridding optionsDisplay optionsFilter options

File formatasci
Delimiterspaces
☒ Several consecutives as unique
Skip raws number1
Fields row index0
X column1
Y column2
Z column5

File format optionsGridding optionsDisplay optionsFilter options

Gridding X step1.00
Gridding Y step0.25
Gridding size (59 * 200)
☐ Square Pixels
☐ Automatical gridding
☐ Gridding points display
Interpolationnone
☐ Festoon filtering
Correlation methodCrosscorr
Uniform Shift (pixels)3
Minimum correlation for shifting [0-1]0.40

- Display options and Median filter options tabs.

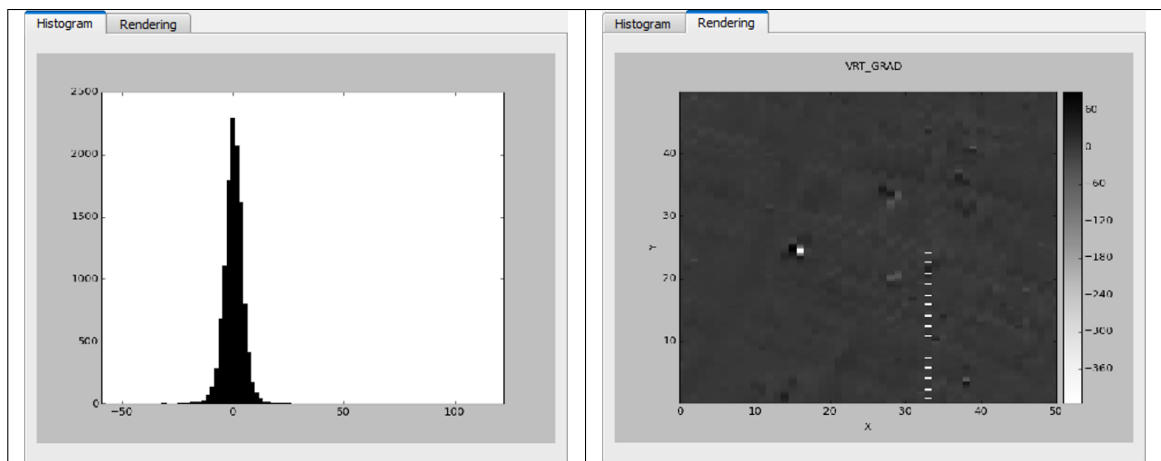
File format optionsGridding optionsDisplay optionsFilter options

Color mapGreys
☐ Color map reverse
☐ Color bar log scale
Minimal value-59
Maximal value122
☐ Peak filtering
Overlimits values
☐ replace by Min, Max values
☐ replace by 'nan'
☐ replace by profile's median

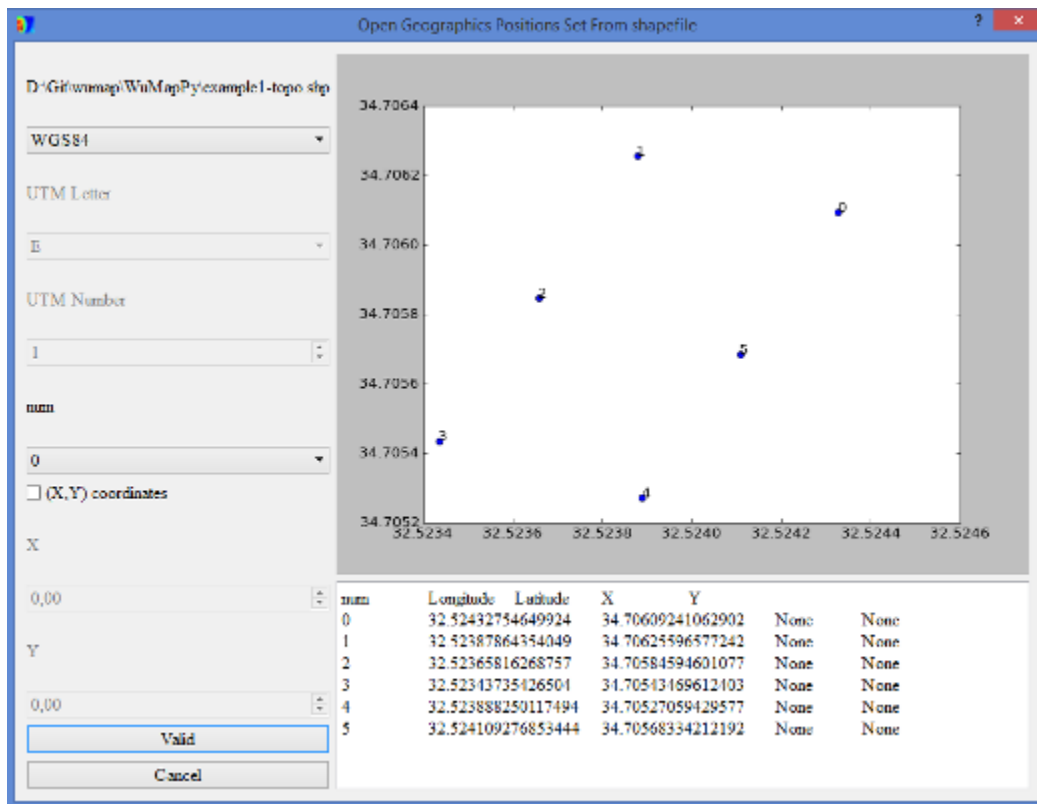
File format optionsGridding optionsDisplay optionsFilter options

☐ Median filtering
Filter size in X (pixels)3
Filter size in Y (pixels)3
Median value filtering (%)0
Constant gap filtering0

- Histogram and dataset Display tab.



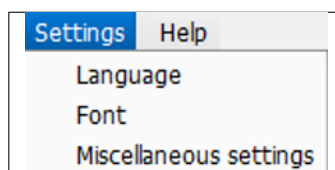
Open Geoposition Set



(for more informations, cf. GeophPy documentation)

4.2 Settings

From this menu you can change the entire GUI *Language*, *Font* and others *Miscellaneous settings*.



Language

The language descriptions are presents as *.lng* files in the *MAIN/wumappy/resources* directory where *MAIN* is the user home directory. The default builtin language for the Graphic User Interface is English, and it's the only one generated by the code and saved as the *english.lng*. This file as the follwing format:

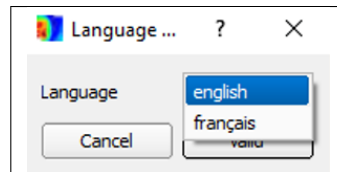
```
>>> english
FILES_ID      Files
SETTINGS_ID   Settings
FONT_ID       Font
MISCSETTINGS_ID Miscellaneous Settings
```

HELP_ID	Help
ABOUT_ID	About

The first line is the language name, the first column is object identifier (menu name, group box name etc.) and the second the displayed traduction.

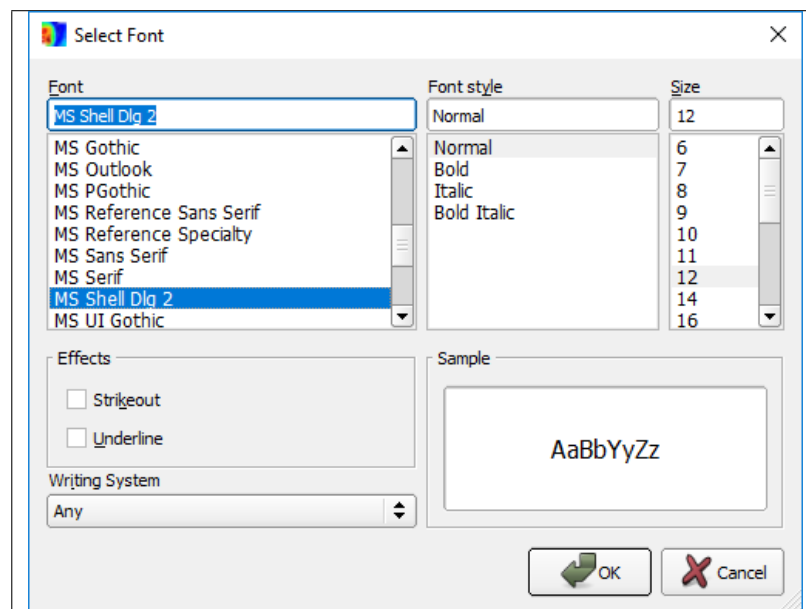
You can easily add and use an other language file: duplicate the *english.lng* file as *otherlanguage.lng*, change the language name in the first row and modify the second row with the correct translation in the new language.

The language files in the *MAIN/wumappy/resources* directory (like *french.lng* or *spanish.lng* etc.) are automatically detected by WuMapPy and become available languages in the *Settings/Language*:

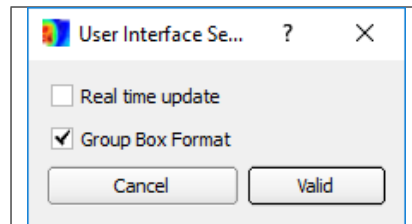


Font

The font type and the font size used in the majority of the windows and dialog box can be modified selecting *Settings->Font* item.



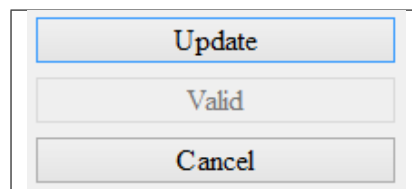
Miscellaneous settings



With this dialog box, it is possible to

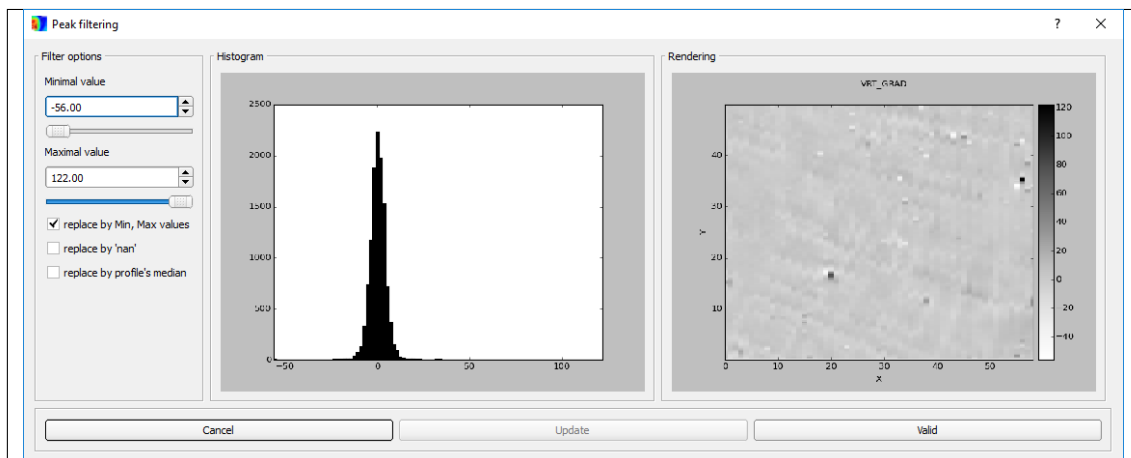
- Check/uncheck the flag of *Real time update* after a modification in a dialog box.

If the flag is unchecked, an *Update* button will be displayed in the dialog box and the map *Rendering* tab will be updated only if this *Update* button is clicked.

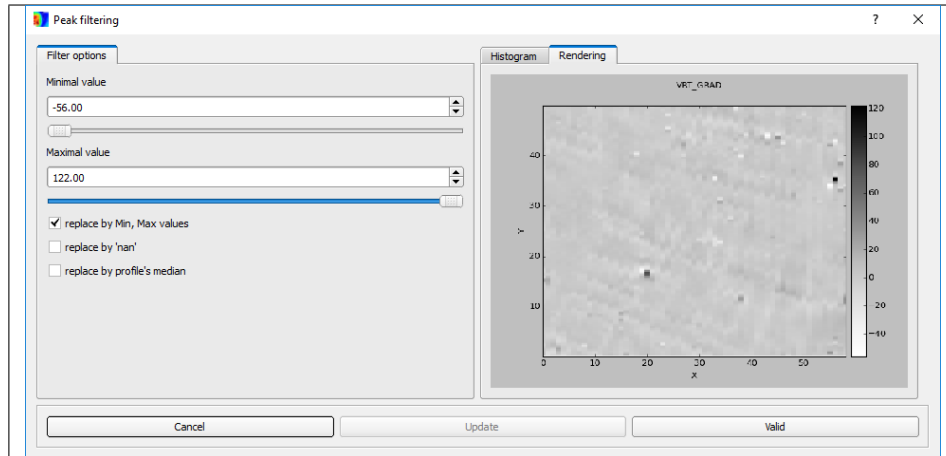


- Check/uncheck the flag of *Group Box Format* display style.

If the flag is unchecked all dialogboxes' tabs will be displayed in the same windows.



If the flag is checked, options will be displayed in different tabs.

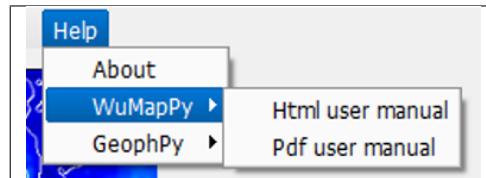


Note: Group Box Format

If the *Group Box Format* is disabled, the dialogboxes with many different tabs may be hard to use.

4.3 Help

In this menu, it's possible to access to the WuMapPy and GeophPy versions number and documentations in two formats (html or pdf).



On Linux operating system, to opening these documentations with the best application, you need, before starting “WuMapPy” application, to write the applications full names to use with html and pdf documents in the “config” file :

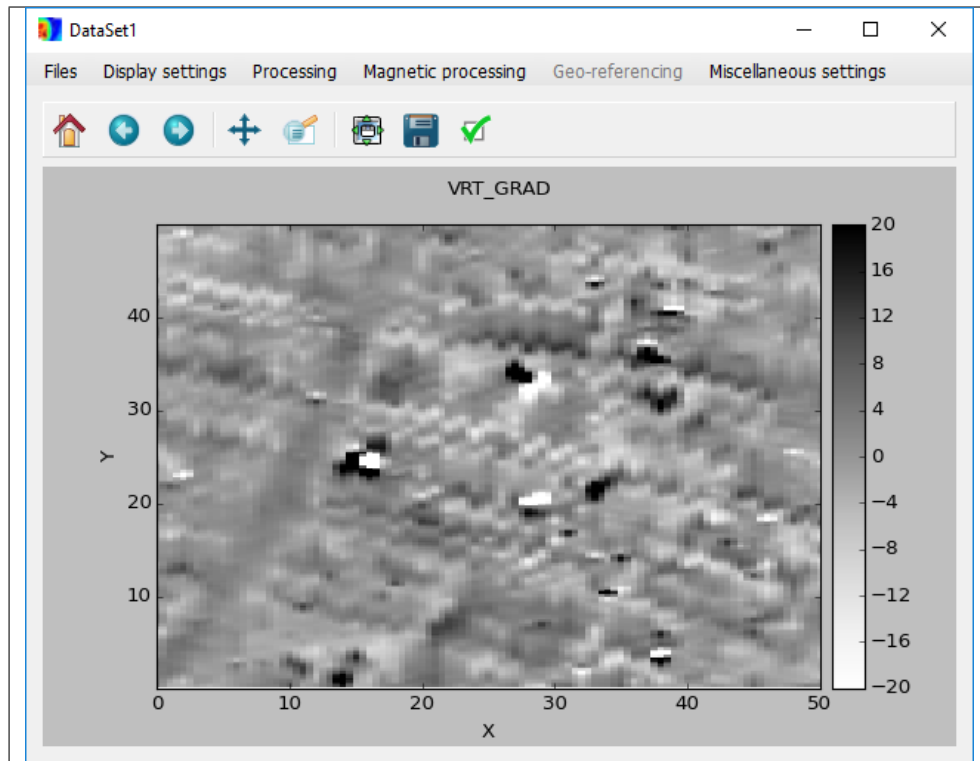
```
>>> [MISC]
      html_viewer = none
      pdf_viewer = none
```

with ‘none’, the default string, the application launches only the file full name (“.../WuMapPy.pdf” for example), and the operating system define which application to execute to opening the documentation file.

Note: The “config” file is saved in “~/wumappy” on Windows, or “~/wumappy” on Linux and Mac OS, where ‘~’ is the user directory.

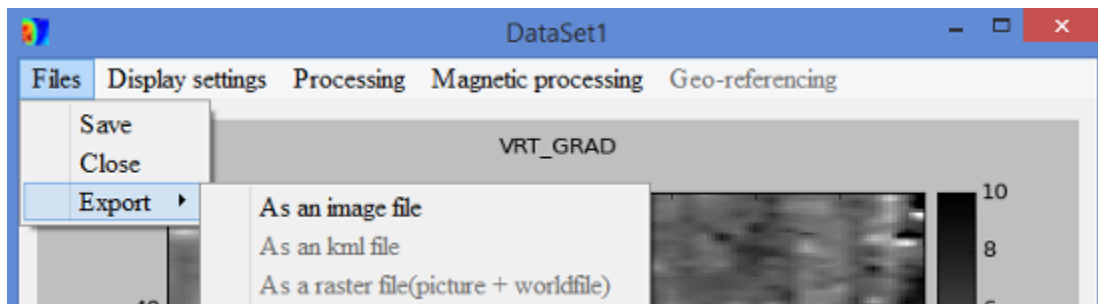
5 Data Set Window

Files | Processing | Magnetic Processing | Georeferencing | Miscellaneous settings



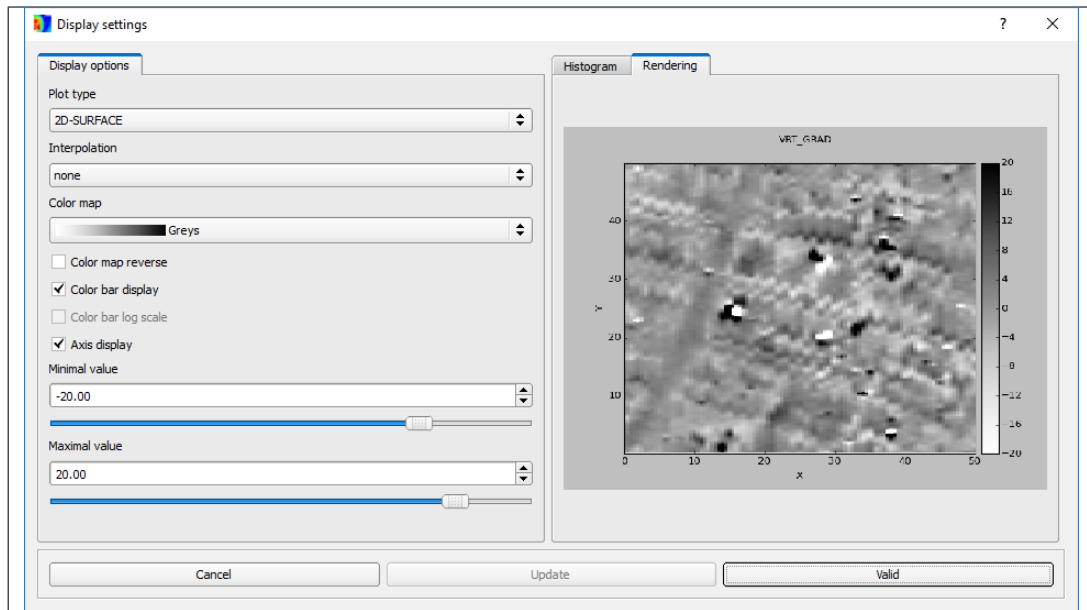
5.1 Files

With this menu, it's possible to save the data set in a netcdf format file, and export the data set in several formats (ascii files, image, ...)



5.2 Display Settings

With this menu, it's possible to changes the DataSet display options (colormap, axis, value limits, ...)



5.3 Processing

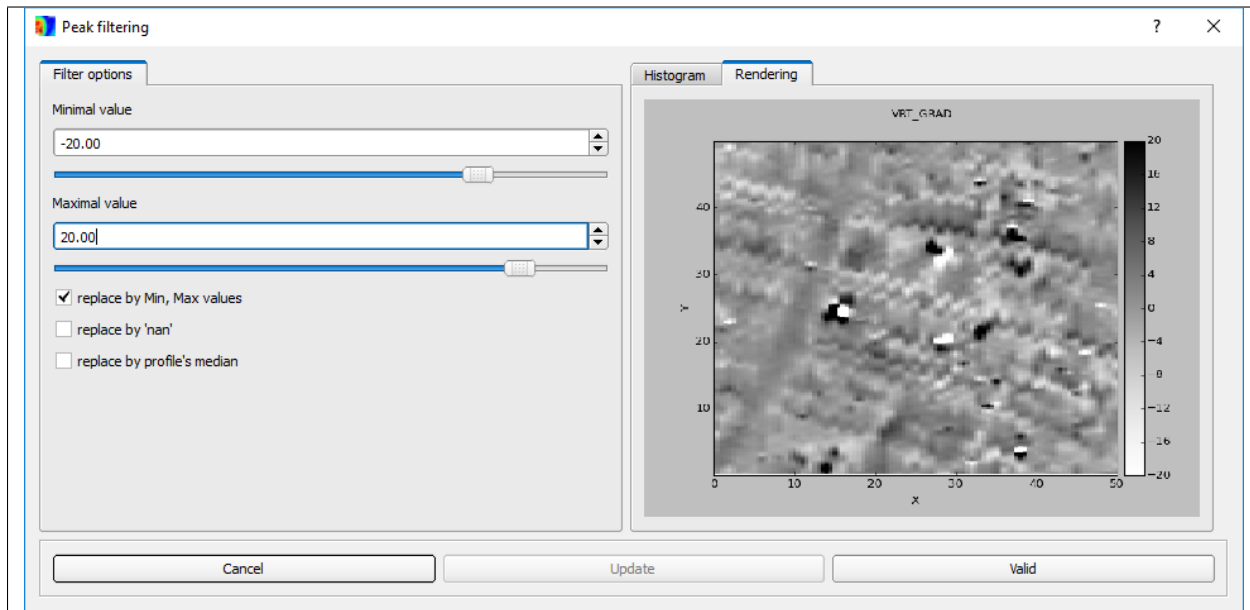
The following general processing are available:

- *Peak filtering*
- *Median filtering*
- *Festoon filtering*
- *Regional trend filtering*
- *Wallis filtering*
- *Anti-ploughing filtering*
- *Constant destriping*
- *Curve destriping*

Note: For more informations about the processing functions, see the GeophPy documentation.

Peak filtering

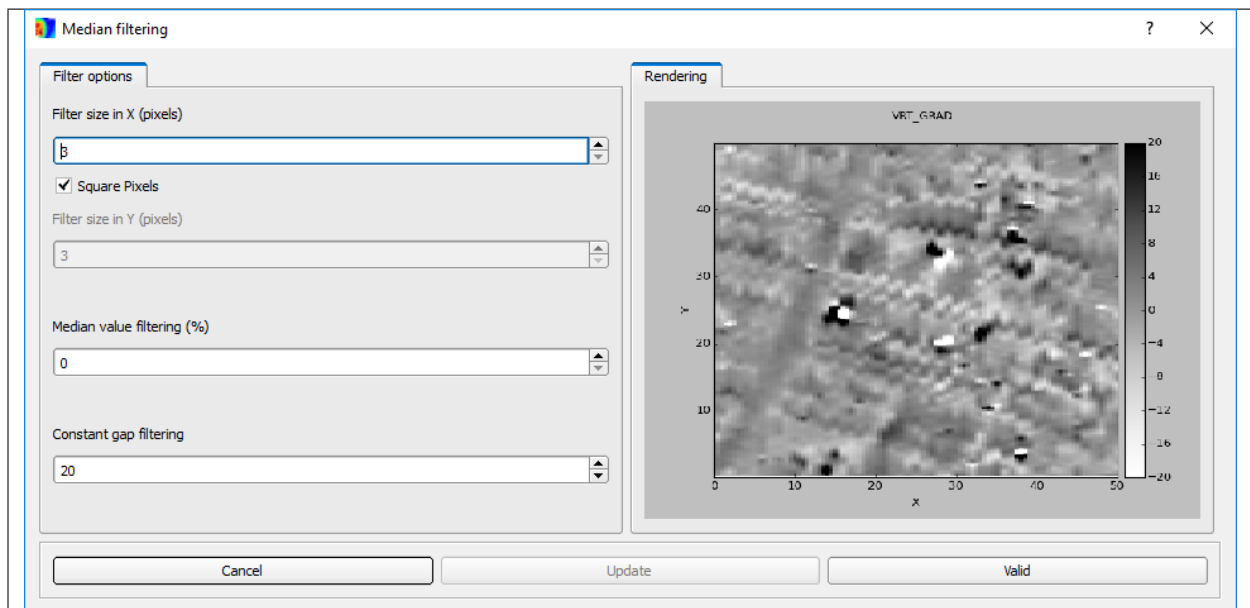
Data thresholding for values outside of the [*Minimal value*, *Maximal value*] interval.



Note: For more details, see the GeophPy package documentation.

Median filtering

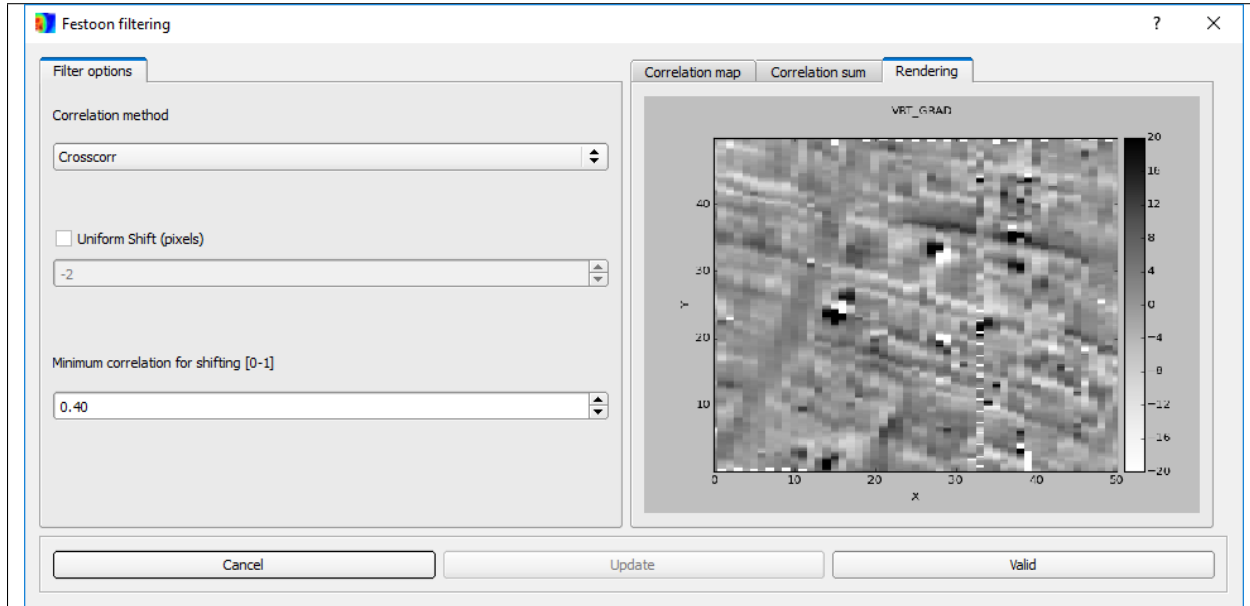
Classic median (salt-and-pepper) filter.



Note: For more details, see the GeophPy package documentation.

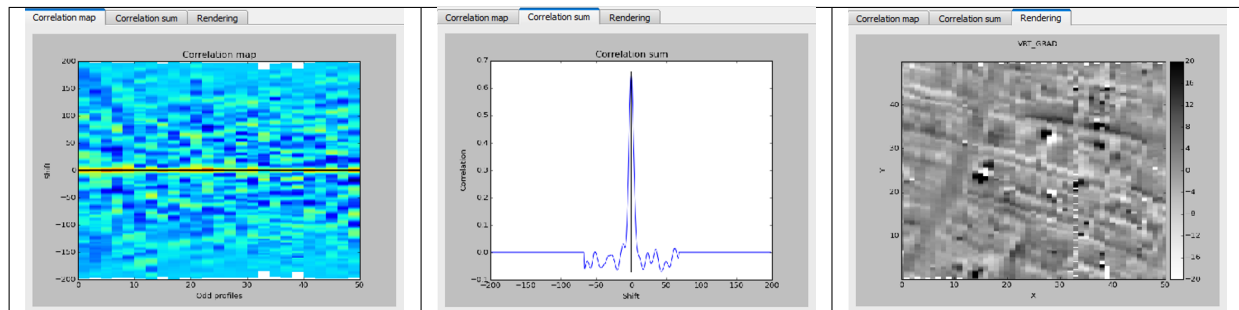
Festoon filtering

The festoon filter (destagger filter) reduces the positioning error along the survey profiles that result in a festoon-like effect.



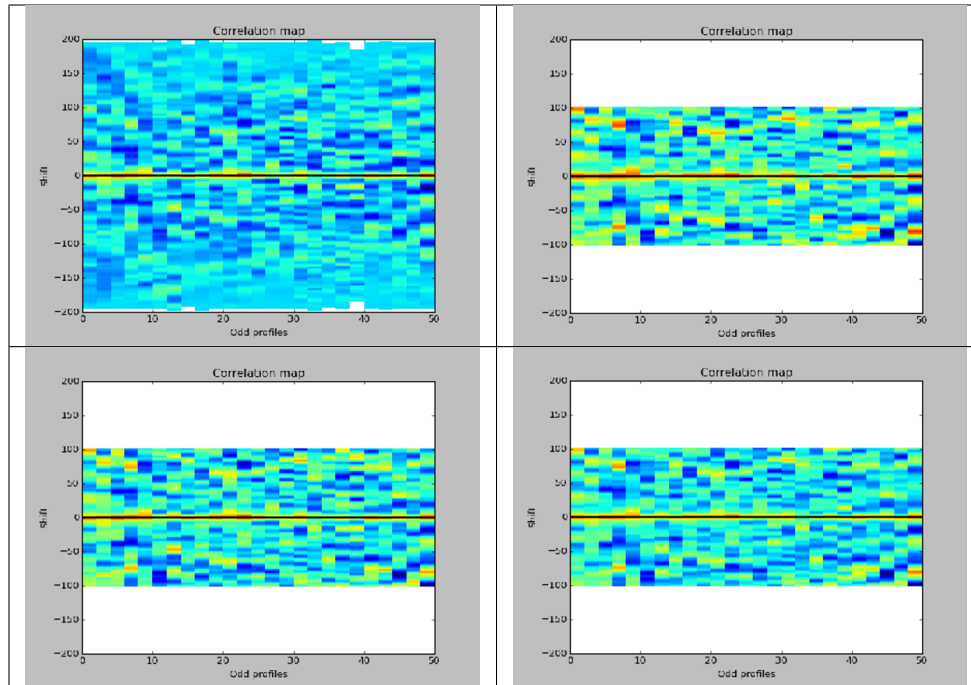
An optimum shift is estimated based on the correlation of a particular profile and the mean of its surrounding profiles. The filter's windows display 3 different tabs :

- the correlation map,
- the correlation sum profile,
- and the filtered data.



Different options are available:

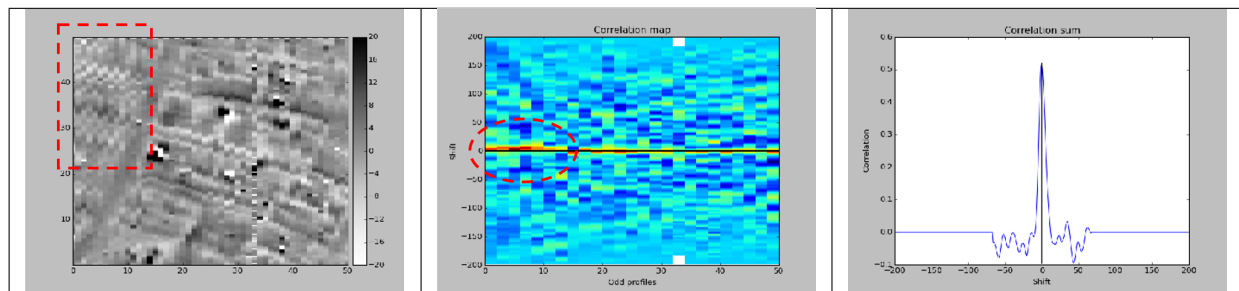
- **Method** for correlation calculation (Cross-correlation or Pearson and Spearman or Kendall correlation):



Due to the extensive computation time, Pearson, Spearman and Kendall correlation method are not computed over the whole shift domain.

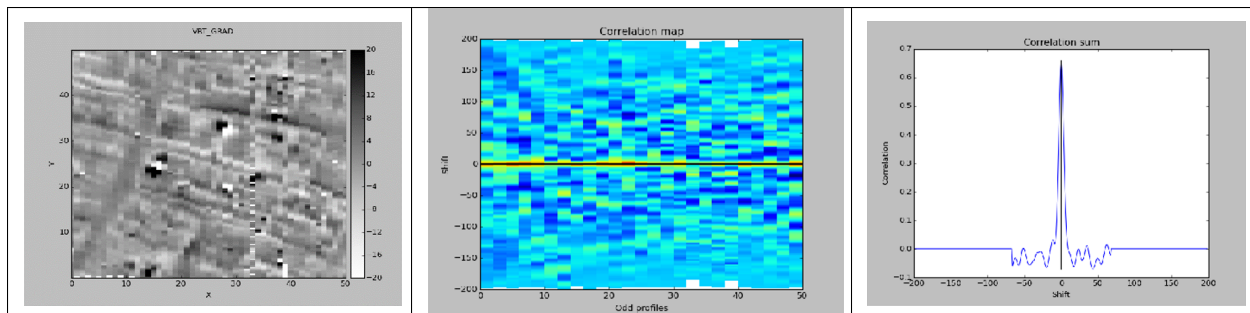
The usage of Cross-correlation is hence recommended.

- **Uniform** shift throughout the data:



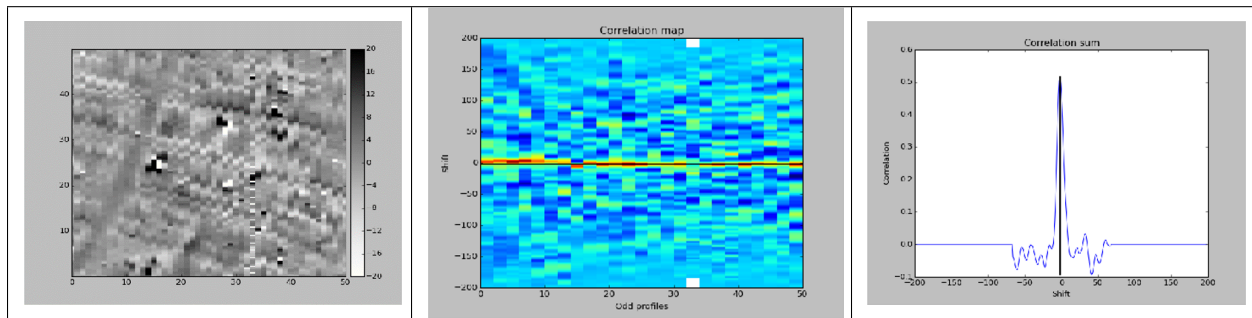
Return the best average shift for the dataset (based on the correlation sum off the dataset). Can be problematic when the position error is not regular over the dataset.

- **Non uniform** shift (different for each profile):



Return the best shift for each profile of the dataset (based on the correlation map).

- and required **minimum correlation** value:

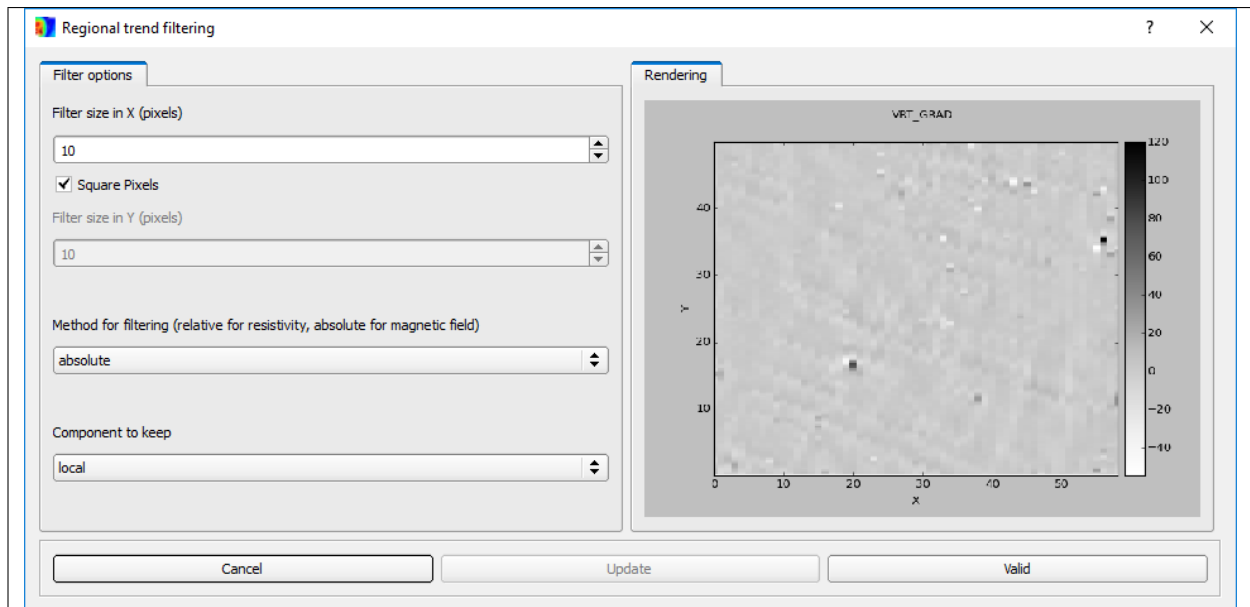


Prevents shifting profiles if correlation value is too low, here is an example for 1 (i.e. no shift allowed).

Note: For more details, see the GeophPy package documentation.

Regional trend filtering

Remove the background (or regional response) from a dataset to enhance the features of interest.

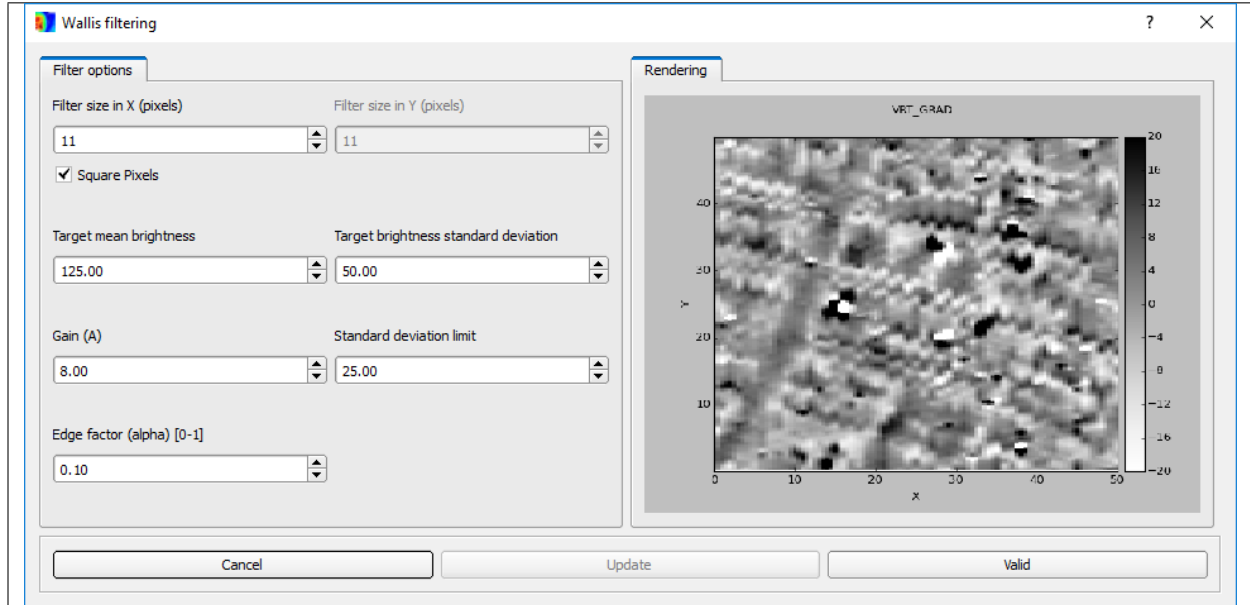


Note: For more details, see the GeophPy package documentation.

Wallis filtering

The Wallis filter is a locally adaptive contrast enhancement filter. It is based on the local statistical properties of sub-window in the image. It adjusts brightness values (grayscale image) in the local window so that the local mean

and standard deviation match target values.



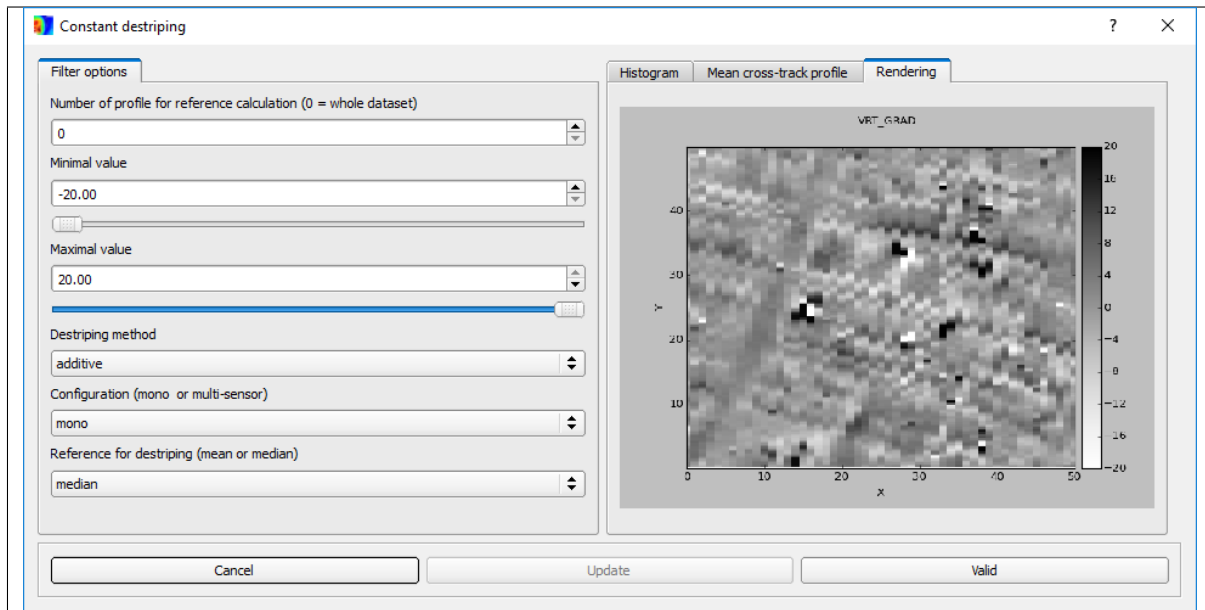
Note: For more details, see the GeophPy package documentation.

Anti-ploughing filtering

... To Be Developed ...

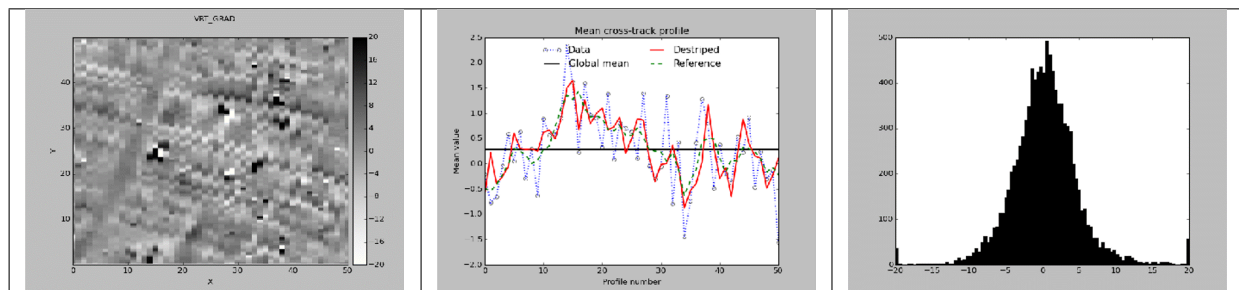
Constant destriping

Remove from the dataset the strip noise effect arising from profile-to-profile differences in sensor height, orientation, drift or sensitivity (multi-sensors array). Constant destriping is done using Moment Matching method.



The filter's windows display 3 different tabs:

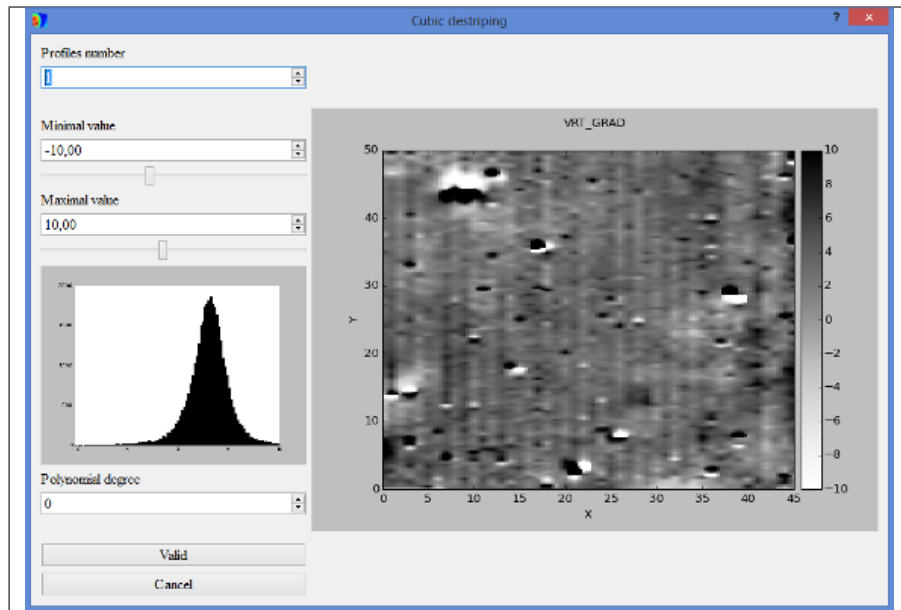
- the filtered dataset,
- the mean cross-track profile,
- and the dataset histogram.



Note: For more details, see the GeophPy package documentation.

Curve destriping

Remove from the dataset the strip noise effect by fitting and subtracting a polynomial curve to each profile on the dataset.



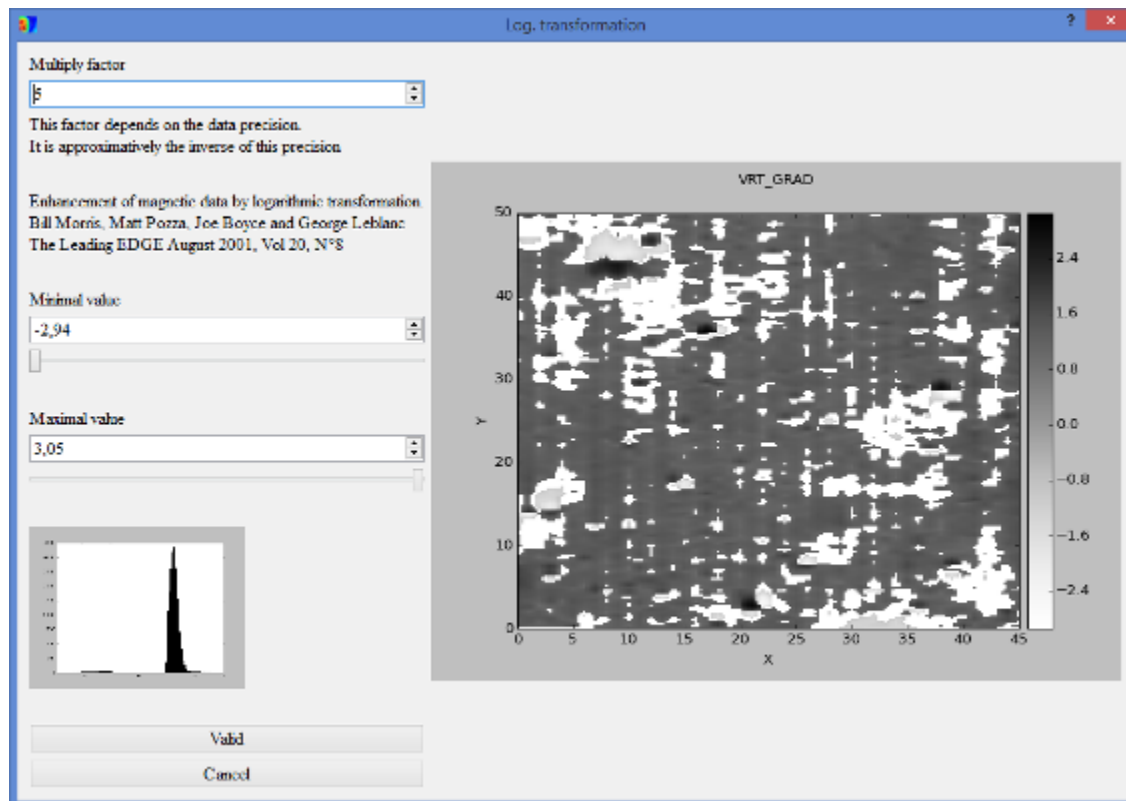
Note: For more details, see the GeophPy package documentation.

5.4 Magnetic Processing

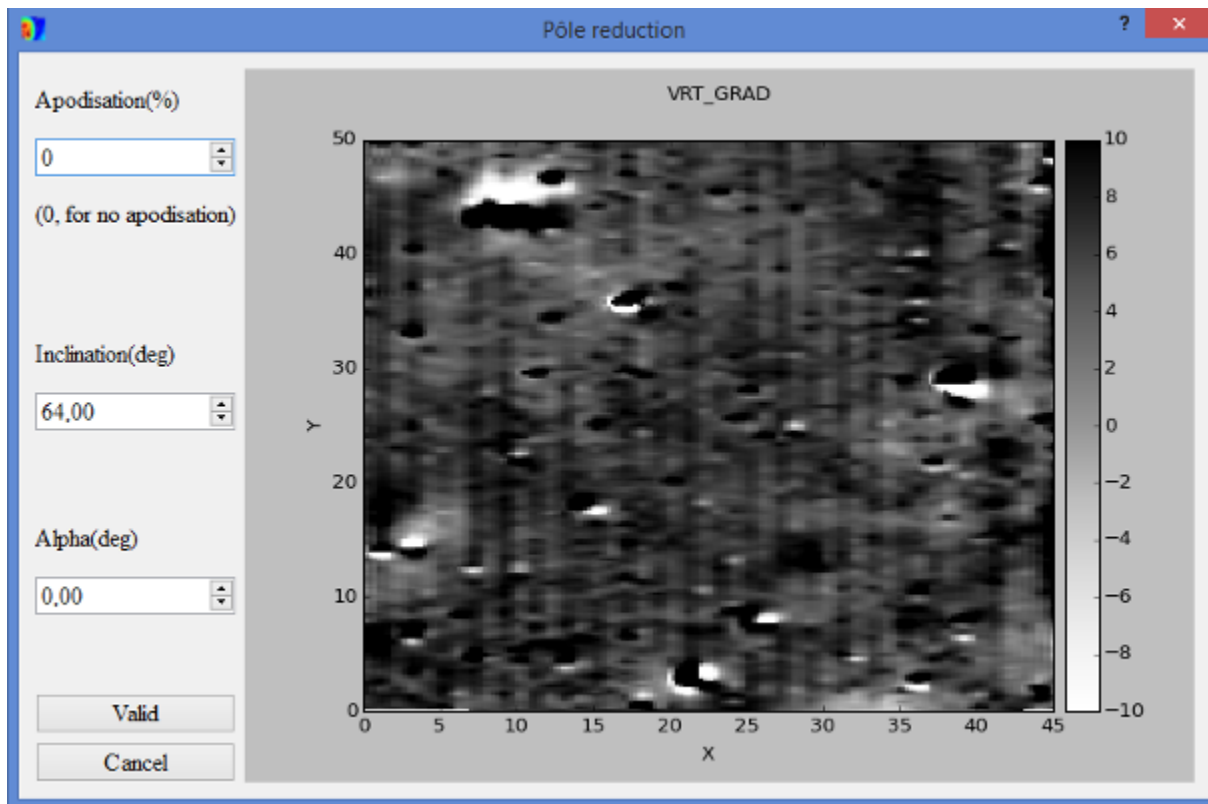
The following magnetic processing are available:

- *Logarithmic transformation*
- *Pole reduction*
- *Continuation*
- *Analytic signal*
- *Equivalent stratum magnetic susceptibility*
- *Gradient <-> Total field Conversion*
- *Euler deconvolution*

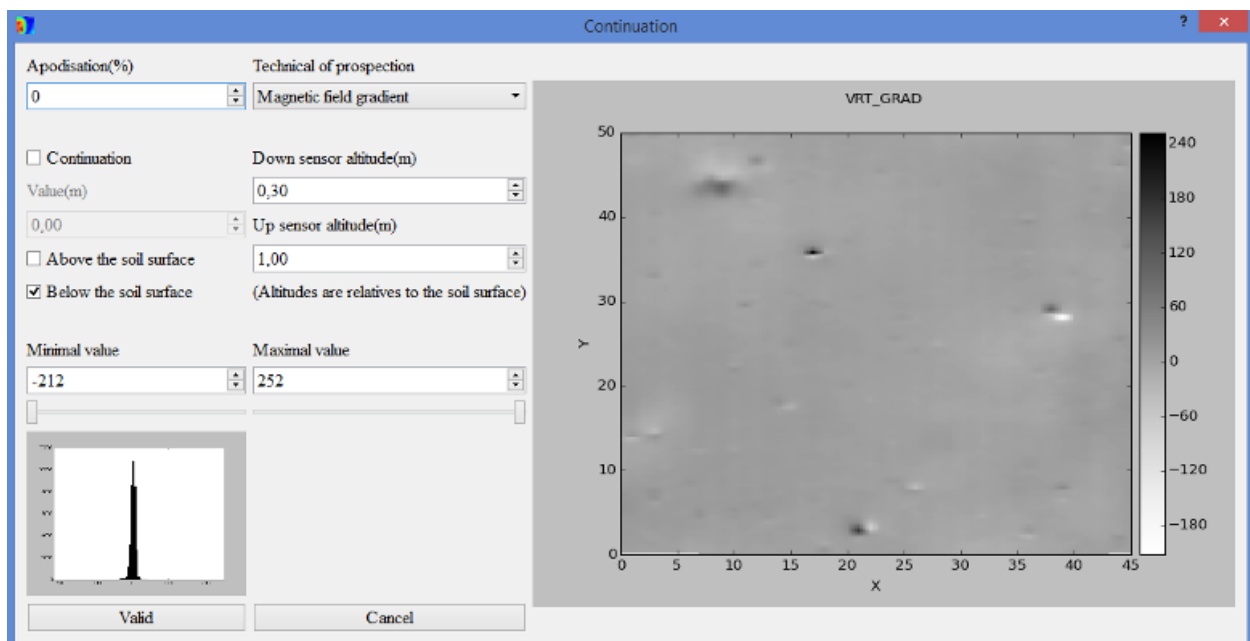
Logarithmic transformation



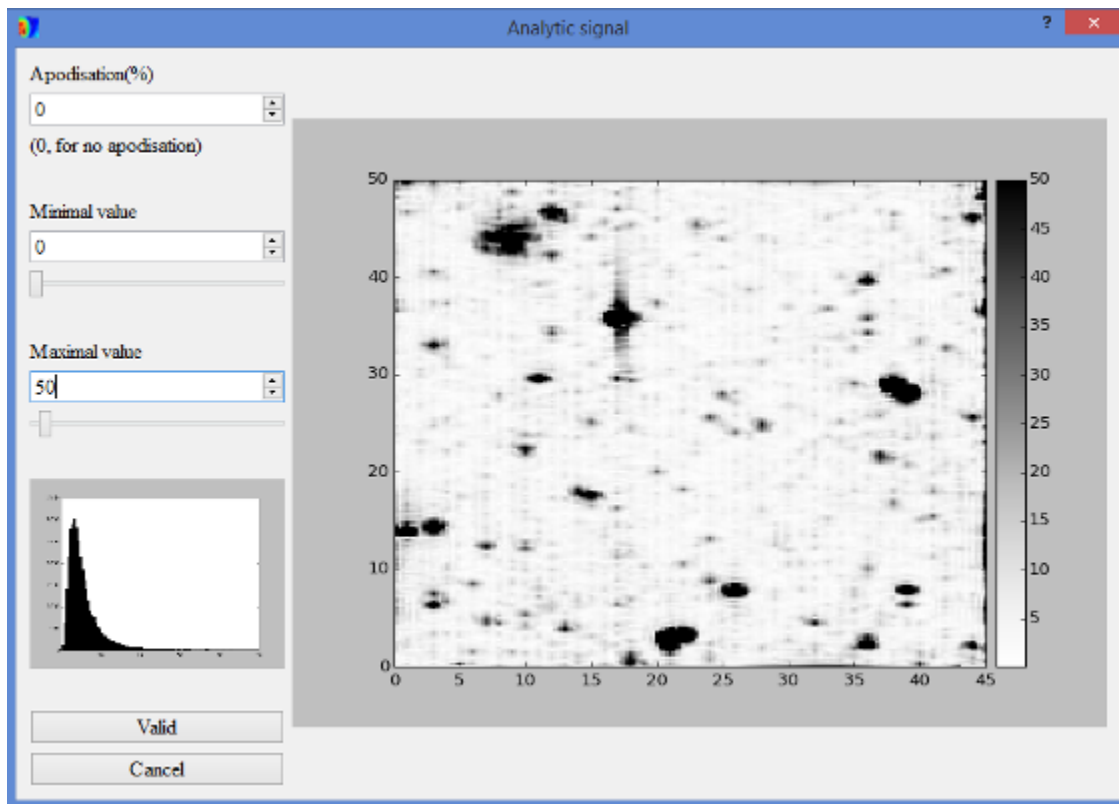
Pole reduction



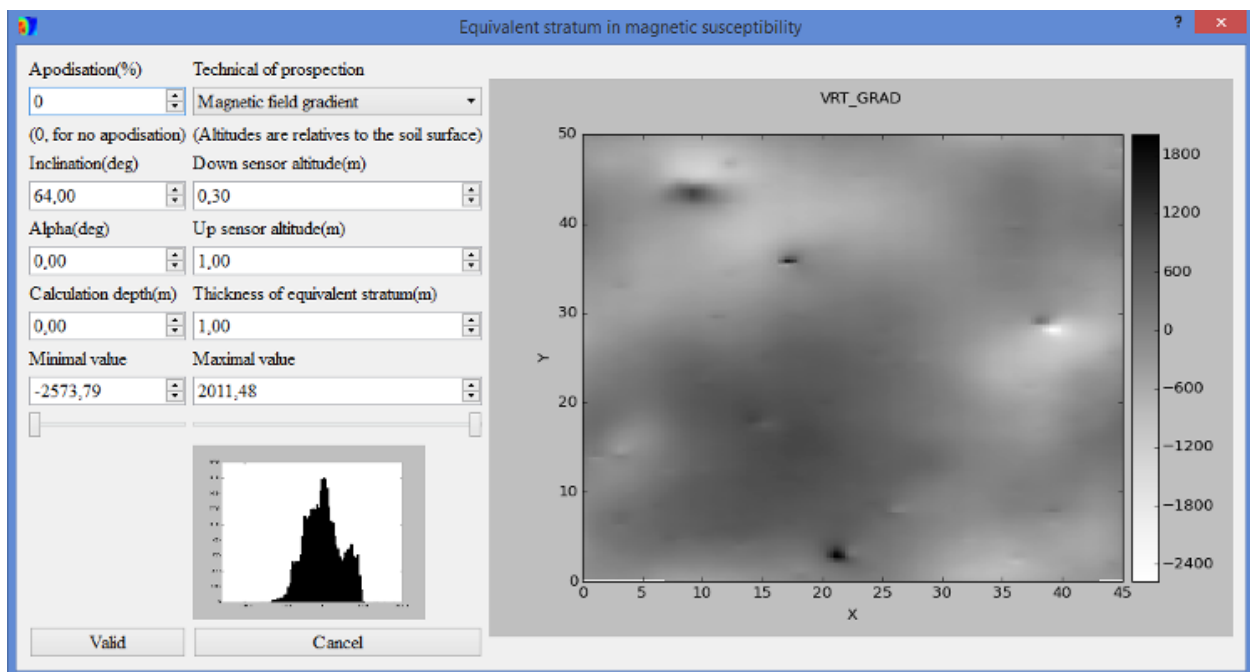
Continuation



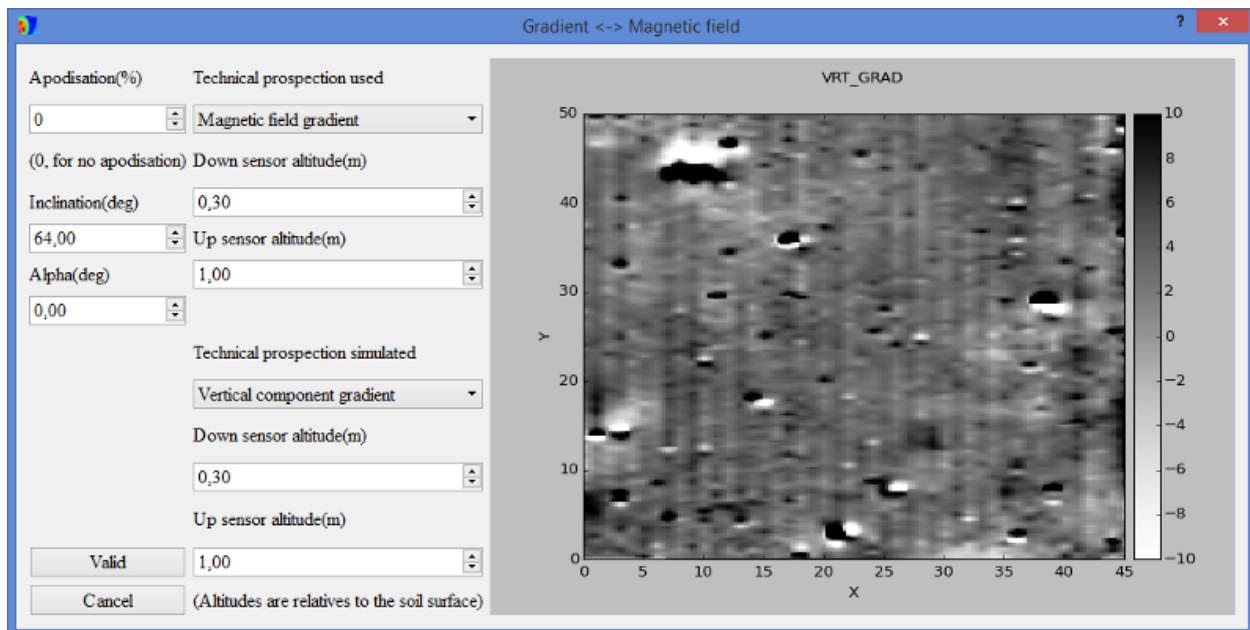
Analytic signal



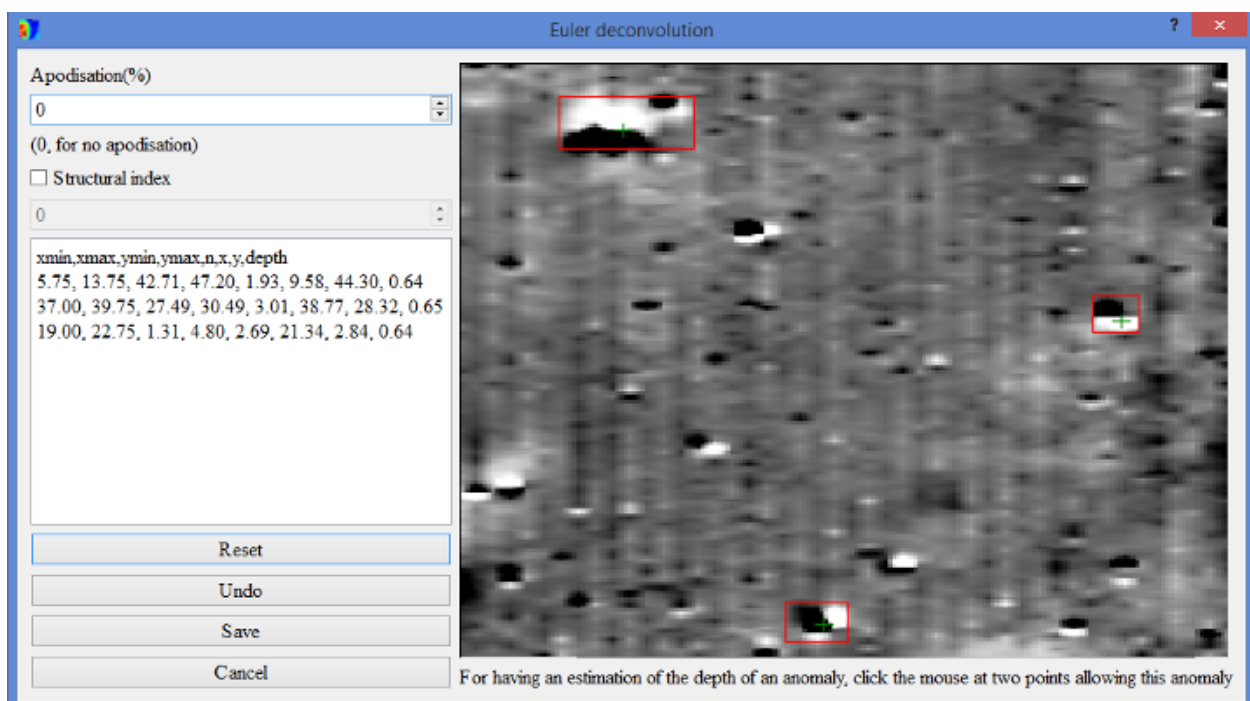
Equivalent stratum magnetic susceptibility



Gradient <-> Total field Conversion



Euler deconvolution

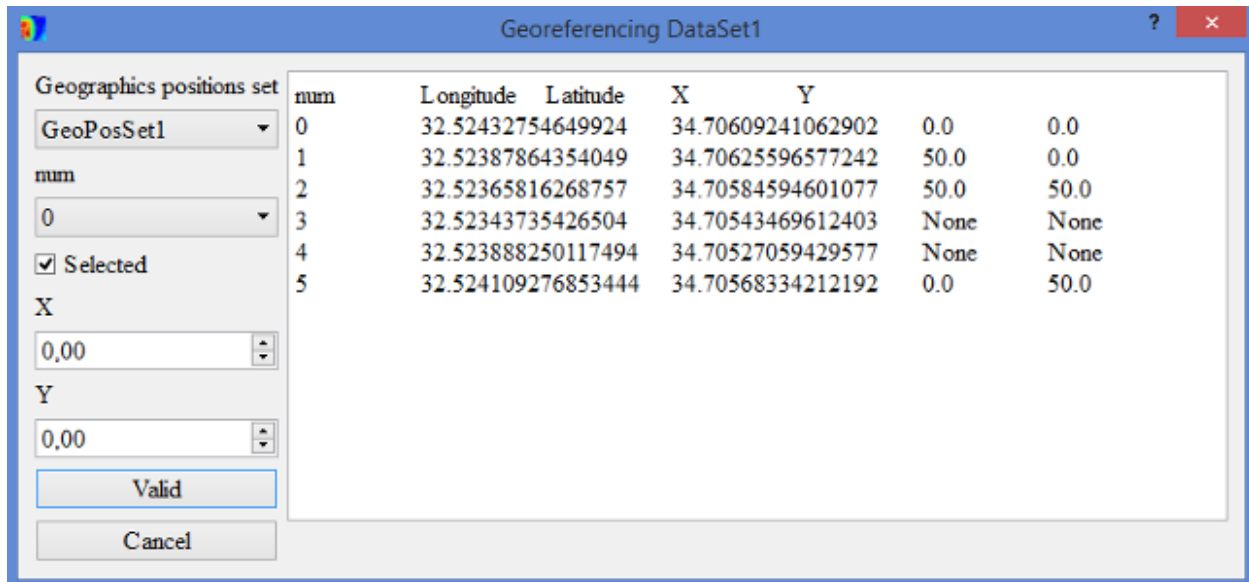


The “Undo” Button allow to cancel the last action. After having calculated Euler deconvolution for severals zones, it’s possible to save these data in a “csv” file (with ‘;’ as delimiter) by clicking on the “Save” button.

(For more informations about the magnetic processing functions, see GeophPy documentation.)

5.5 Georeferencing

This item is available only if a geographic positions set is ever opened and displayed.

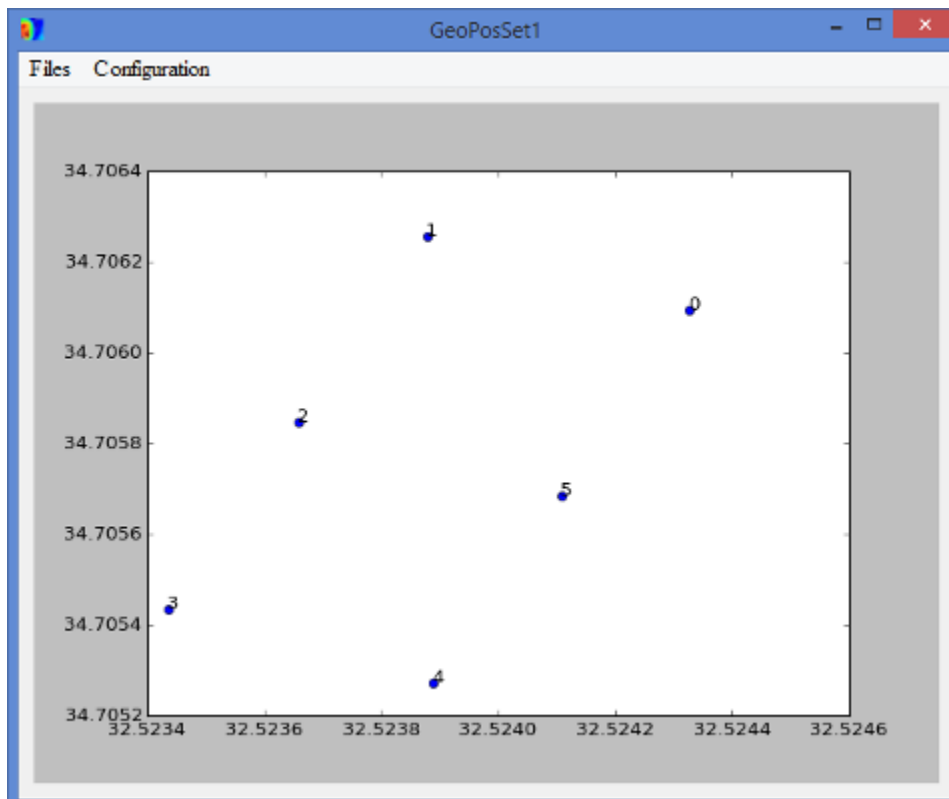


The Georeferencing DataSet1 dialog box is shown. It features a 'Geographics positions set' dropdown menu set to 'GeoPosSet1'. Below this is a 'num' dropdown menu set to '0', a checked 'Selected' checkbox, and input fields for 'X' and 'Y' both set to '0,00'. At the bottom are 'Valid' and 'Cancel' buttons. A table on the right displays the following data:

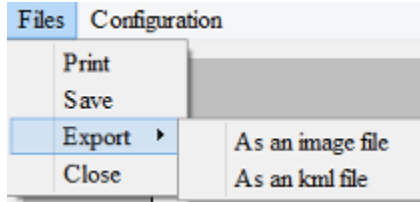
num	Longitude	Latitude	X	Y
0	32.52432754649924	34.70609241062902	0.0	0.0
1	32.52387864354049	34.70625596577242	50.0	0.0
2	32.52365816268757	34.70584594601077	50.0	50.0
3	32.52343735426504	34.70543469612403	None	None
4	32.523888250117494	34.70527059429577	None	None
5	32.524109276853444	34.70568334212192	0.0	50.0

6 Geographic Positions Set Window

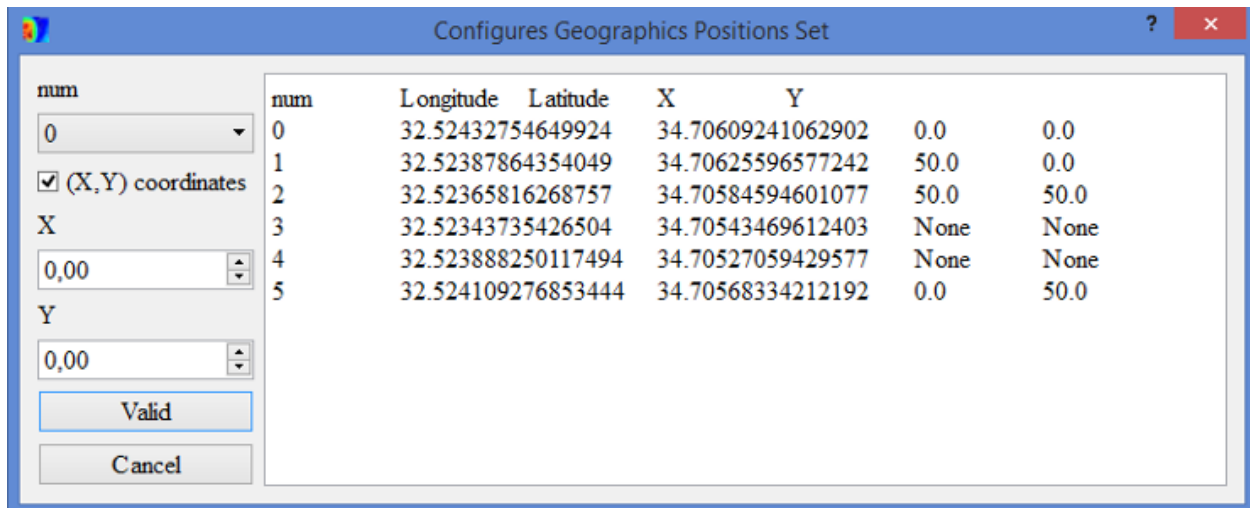
Files | Configuration



6.1 Files



6.2 Configuration



This item allows to georeference geographic positions with (x,y) local positions.

7 Feedback & Contribute

Your feedback is more than welcome.

Write email to lionel.darras@mom.fr, philippe.marty@upmc.fr or quentin.vitale@eveha.fr

To cite this software : “Marty, P., Darras, L. (2015). WuMapPy. Graphical User Interface for sub-surface geophysical survey data processing (version x.y) [software]. Available at <https://pypi.python.org/pypi/WuMapPy>.”

8 Changelog

8.1 Version 0.30

Released on 2017-12-01.

- Updated WuMapPy documentation.
- Fixed Georeferencing GUI.
- Fixed Euler deconvolution GUI.
- Implemented Wallis filter.

- Added Mean cross-track profile plot for destripping filters.
- Added options for constant destripping filter.
- Added non uniform shift for Festoon.
- Updated Peak Filtering GUI.
- Fixed cancel button behavior in the import from ASCII files menu.
- Added color map preview in Display settings menu.
- Fixed reading delimited file issues.
- Fixed GUI group boxes' names.

8.2 Version 0.21

Released on 2016-06-30.

- Graphical User Interface Theme changed to 'Cleanlooks'.
- Text Font modified.
- Horizontal Layout TabWidget added.
- Design of all dialogbox modified.
- Bug correction for the Histogram in none real time update.
- Matplotlib navigation toolbar (zoom, pan, save) added.

8.3 Version 0.20

Released on 2015-09-10.

- Initial version.