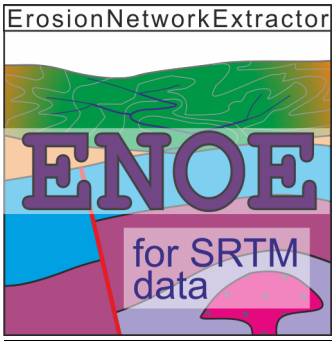

ENOE (Erosion network order extraction) in Python v. 0.5a

Analytical GUI SRTM data analysis software for flow orders detecting

About ENOE Software

Erosion network order extraction (ENOE) software was written for identification and exporting of erosion network with available SRTM images automatized processing.

It identifies stream order (Strahler number) and outputs corresponding Geotiff file. Possible applications include analysis and description of erosion network, geotectonic reconstruction and more. Erosion network detecting uses "gradual flooding method" (Shevyrev, 2018).

About the author

The Author, Dr. Sergei L. Shevyrev is researcher and associate professor. Research and teaching interests include regional geology, geotectonics and geodynamics, remote sensing, modeling and computer programming.

System Requirements and Third party tools

***Hardware*:**

PC with 500 MB RAM

***Software*:**

ENOE was tested with the Microsoft Windows (tm) 7; 8.1 and expected to be compatible with the newer versions. Windows XP isn't supported.

Data sources:

Program could be used for analysis of SRTM data affordable from the relevant Internet repositories. QuantumGIS (QGIS) software is recommended for *geotiff* output stacking and projecting.

User's obligations

This software can be used for any purpose, disassembled and. In any case reference and link to software website and author should be saved (look "How to cite" section. If you are opposed or disagree, please remove this software from your computer immediately.

How to cite this software

If you have used *ENOE* software in you research or study, please, put this link in your references:

Sergei Shevyrev, 2018 LEFA GIS Tools. http://lefa.geologov.net

Or, please, cite article below:

Shevyrev, S. Neotectonics, remote sensing and erosion cut of ore-controlling structures of the Mnogovershinnoe gold-silver deposit (Khabarovsk Krai, Russian Far East). Ore Geology Reviews, https://doi.org/10.1016/j.oregeorev.2018.11.016

Disclaimer

Being of free experimental software, *ENOE* comes with NO warranty for its output and productivity. You are using it AT YOUR OWN RISK. Author is not responsible for any harm, loses of profit and inconvenience. If you are disagreeing with that, please, remove *ENOE* from your computer immediately.

Contents:

1. Interface description

ENOE is distributing for Windows with Setup wizard 

, which will help you pass through installation procedure.
In order to run ENOE after installation, click *ENOE.exe shortcut* in the start menu group. Program window should appear (fig. 1).

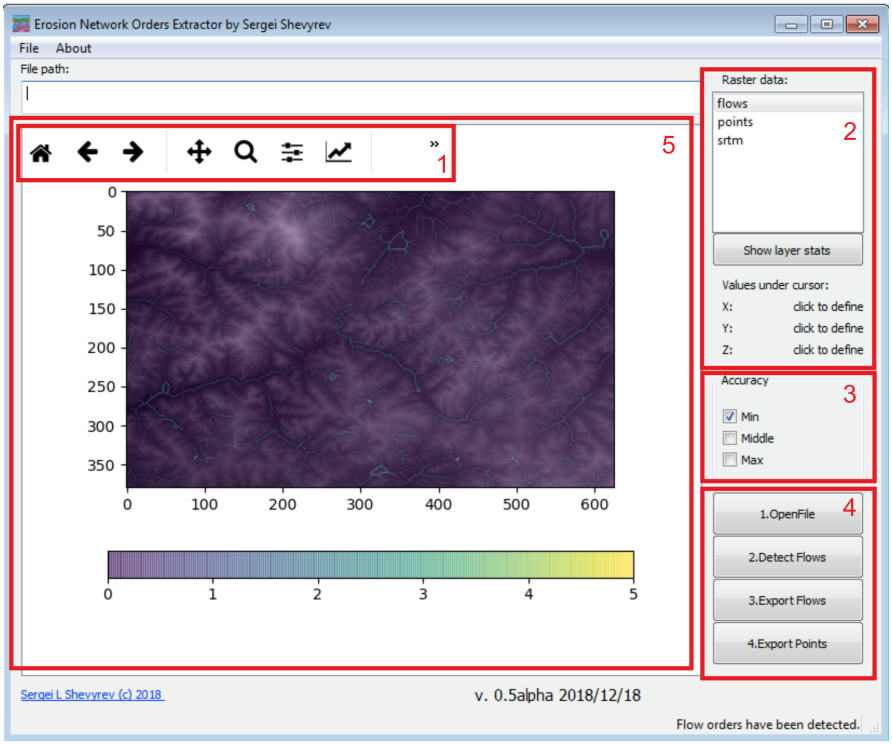

Fig. 1. Interface of the ENOE program window. Sections: 1 – navigation bar; ; 2 – data layers and image statistics with cursor data values; 3 – analysis accuracy adjustment; 4 - buttons for analysis workflow; 5 – image browser.

Window sections (fig. 1) are relevant to the steps of data analysis including input, analytical processing and output (4), switching between data layers (2), map visualization and navigation (1,5), coordinate cursor information (2), method adjustment (3).

2. How to work

Program workflow includes sequence of simple steps, according to the workflow button group (fig. 2):

Fig. 2. Workflow button group.

There are several steps:

1. Opening of single band georeferenced *tif* SRTM image, button 1, fig. 2.
2. Detect flows (mind the algorithm adjustment area (fig. 1, section 3)) by pressing button 2, fig. 2.
3. Export flow orders *tiff* into georepherenced file, button 3, fig. 2.
4. Export intersection points into georepherenced file, button 4, fig. 2.

We recommend compose results and continue work in the free QGIS software. Additional abilities in visual assessment and browsing could be provided by the Navigation bar (fig. 3).

Data layers and image statistics (fig. 1, section 2) is for selecting data layer and further picking up data value by mouse pointer. “Show layer stats” button will output basic information according values distribution within selected data layer.

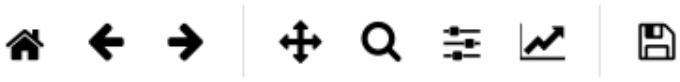

Fig. 3. Navigation bar of the image browser.

3.Method description

For detailed information according to theory of used method of erosion network orders detecting, please look **Reference** section.

4. Representing results

Finally, computing results can be composed in GIS software as follows (fig. 4). Layer overlay and legend could be added in QGIS desktop.

Software outputs Geotiff file of integer type, where pixel value fluctuates from 0 (no flow) to N (highest order of flow). Please, mind that absence of vegetation height’s correcting may produce considerable errors in flow recognition, especially in wide floodplains.

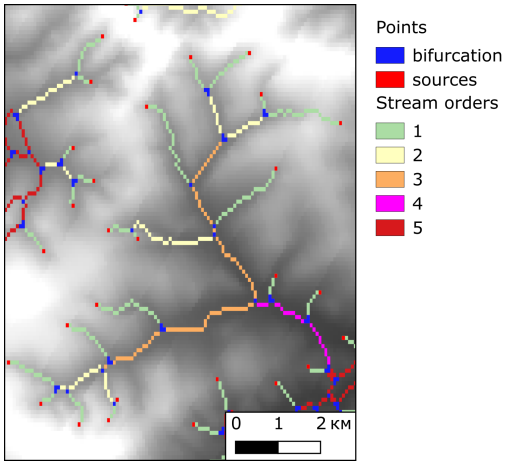

Fig. 4. Results of testing datasets processing steps: 1– initial data (SRTM); 2 – Canny edge detecting algorithms; 3 – Flooding edge detecting algorithm; 4 – line detecting; 5 – fault detecting; 6 – density map of lines.

Reference

1. Shevyrev, S.L. ALGORITHM OF MORPHOLOGICAL ANALYSIS AND IDENTIFICATION OF STREAM ORDER IN DEM FOR DEVELOPMENT OF OPEN-SOURCE GEOINFORMATIC SYSTEMS. Advances in current natural sciences. 2018. 12. In press. (in Russian).