Paper Number: 1866

The Continued Evolution of the Open Source PYGMI Project

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The PyGMI project (Python Geophysical Modelling and Interpretation) was started to find an innovative, cost -effective solution to the need to perform 3D potential field modelling [1]. From there, it expanded to include other interpretation techniques. These techniques include cluster analysis, raster manipulation and display, raster re-projecting, geophysical corrections such as the IGRF correction and vector tools such as rose diagrams.

The basic idea behind PyGMI is to create a flow chart- like interface. New interpretation techniques or filters are found in menus, and once activated they form the objects in the flow chart. Linking these objects creates the processing or interpretation flow. The PyGMI concept is a modular approach which allows data to flow safely from technique to technique. Each technique is self-enclosed into a module, represented graphically on the main interface. The module outputs can be queried, plotted and exported or just linked to other modules. The modular interface design is well suited to education purposes since it easily shows the flow of all processing and interpretation.

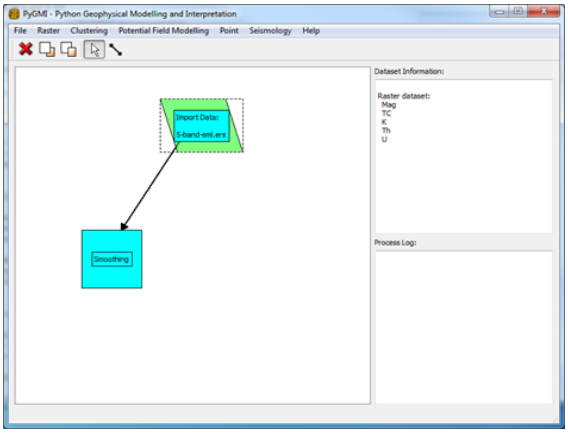

Figure 1 The main interface of PyGMI, showing the import of data connected to a smoothing module.

3D modelling is achieved by drawing in the model much like using a 'Paint' program. As such, it is extremely simple to use, while remaining powerful at the same time.

The maturation of this open source project has seen it migrate to Github – a web based system for the hosting of open source software projects - as well as a more comprehensive web site with online help. Assisting users in understanding the package has been further enhanced through offline help via the software interface.

Figure 2 Smooth 3D model of the Bushveld Complex

Mesh smoothing of 3D models [2] is a major new addition, allowing users to see their models in a more aesthetically pleasing manner. Speed improvements have been worked on as well. As a result of all this, PyGMI has evolved into a stable package, currently in use by the Council for Geoscience.

PyGMI is programmed entirely in the Python programming language and showcases the flexibility and

power of Python for scientific applications.

The PyGMI software is available for free download at: http://patrick-cole.github.io/pygmi/

References:

[1] Singh B and Guptasarma D (2001). *New method for fast computation of gravity and magnetic anomalies from arbitrary polyhedra*. Geophysics, 66(2): 521

[2] Lorensen WE and Cline HE (1987) *Marching cubes: A high resolution 3D surface construction algorithm.* ACM SIGGRAPH Computer Graphics, 21(4): 163-169