

# POLITO – A new open-source, platform independent software for generating high-quality lithostratigraphic columns

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**Abstract.** POLITO is a free, open-source, and platform-independent software which can automatically generate lithostratigraphic columns from field data. Its simple and easy to use interface allows users to manipulate large datasets and create high-quality graphical outputs, either in editable vector or raster format, or as PDF files. POLITO uses USGS standard lithology patterns and can be downloaded from its Sourceforge project page (<http://sourceforge.net/projects/polito/>).

## INTRODUCTION

Sedimentology, sedimentary petrology, and stratigraphy are among the most important branches of geological sciences, as they deal with rocks of utmost importance to economical geology and to fundamental research in general. Hydrocarbon reservoirs, aquifers, and different types of ores are all hosted in sedimentary rocks, thus the importance of their meticulous study.

Among the most straightforward means available for the investigation of sedimentological records is the compilation of lithostratigraphic columns, based on data acquired in the field. Accurate measurements of outcrops, beds, and lithologic successions, as well as thorough description of lithologies, structures, and fossils found in the field are the key ingredients for high-quality, two dimensional lithostratigraphic representations (*e.g.*, Miall, 1984; Tucker, 1988; Anastasiu and Jipa, 2000). However, the process involving the construction of the lithostratigraphic column is no less important, because the accuracy of the graphical representation of field data is vital to its latter interpretation and spatial correlation.

Until recently, the entire process of field data processing (conversion of the measurements into scaled values, construction of patterns for different lithologies, etc.), compilation, and lithostratigraphic column construction used to be time consuming and by no means error proof.

The rampant development of computers and software applications in the last decades offered helpful solutions to these issues. However, numerous available software packages dedicated to the construction of lithostratigraphic

columns are proprietary, therefore can be prohibitively expensive. Most of these software were developed by hydrocarbon exploration (WellCAD from RockWare<sup>®</sup>; PRIZM<sup>™</sup> from Halliburton GeoGraphix<sup>®</sup> etc.) and engineering geology (STRATIGRAPHER from GeoStru Software; DBSOND from Geo&Soft International, etc.) companies and are bloated with features that the regular user does not need. The plethora of features often demands high system requirements, which in turn escalate the costs of operation. Another important drawback is the lack of platform-independent software solutions and consequently the user is often forced to adopt the operating system for which a specific software was designed.

The market of free software packages has its own disadvantages, as most of these programs do not use standardized map and lithologic symbols, therefore the output can be sometimes difficult to read if explanations are not readily available. Other times the free packages actually only work as independent modules for commercial software (*e.g.*, StratDraw, working with CorelDraw<sup>®</sup>).

We present here an easy-to-use, free, open-source and platform-independent software called POLITO, written in Python<sup>™</sup> released under GNU license (Galassi et al., 2009). It has the advantages of an intuitive and simple graphical user interface, the ability to save the output in vector (SVG), raster (PNG), and PDF formats, as well as the use of standardized USGS lithology patterns (FGDC, 2006; USGS, 2006). The software (binaries and self-extracting Microsoft<sup>®</sup> Windows executable file) is available for download from its Sourceforge project page (<http://sourceforge.net/projects/polito/>).

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## SOFTWARE DESCRIPTION

POLITO was written entirely in Python™, a general-purpose high-level computer programming language. It uses simple geometrical shapes (rectangles) to depict lithostratigraphic successions, as follows: each bed is represented by a rectangle with its width scaled from the grain size of the type of rocks comprising the bed, and its height scaled from the measured thickness (Fig. 1). The graphical user interface is used to input the data from which the output will be generated. There are four columns in which the user can input or select values from drop-down menus, each with self-explanatory names for ease of use (Fig. 1). The “Thickness” column requires numerical data (actual thickness of the bed, as measured in the field), while

the “Note” column is used to write short descriptions for each layer. There are two columns with predefined values: “Lithology pattern” and “Granulometry”. By clicking any of these columns (Fig. 2), the user is presented with a comprehensive list of options from which one can choose those that best fit the characteristics of the bed.

POLITO has the ability to save projects in its own file format (plain text document, with the extension “.pol”) or it can export the graphics either in vector (SVG – Scalable Vector Graphic), raster (PNG – Portable Network Graphics), and PDF (Portable Document Format). All these output types can be later edited using commercial or free vector or raster graphic editors (such as Adobe Illustrator® and Photoshop®, Corel Draw® and Photo Paint®, Inkscape, TheGimp, etc.) if needed.

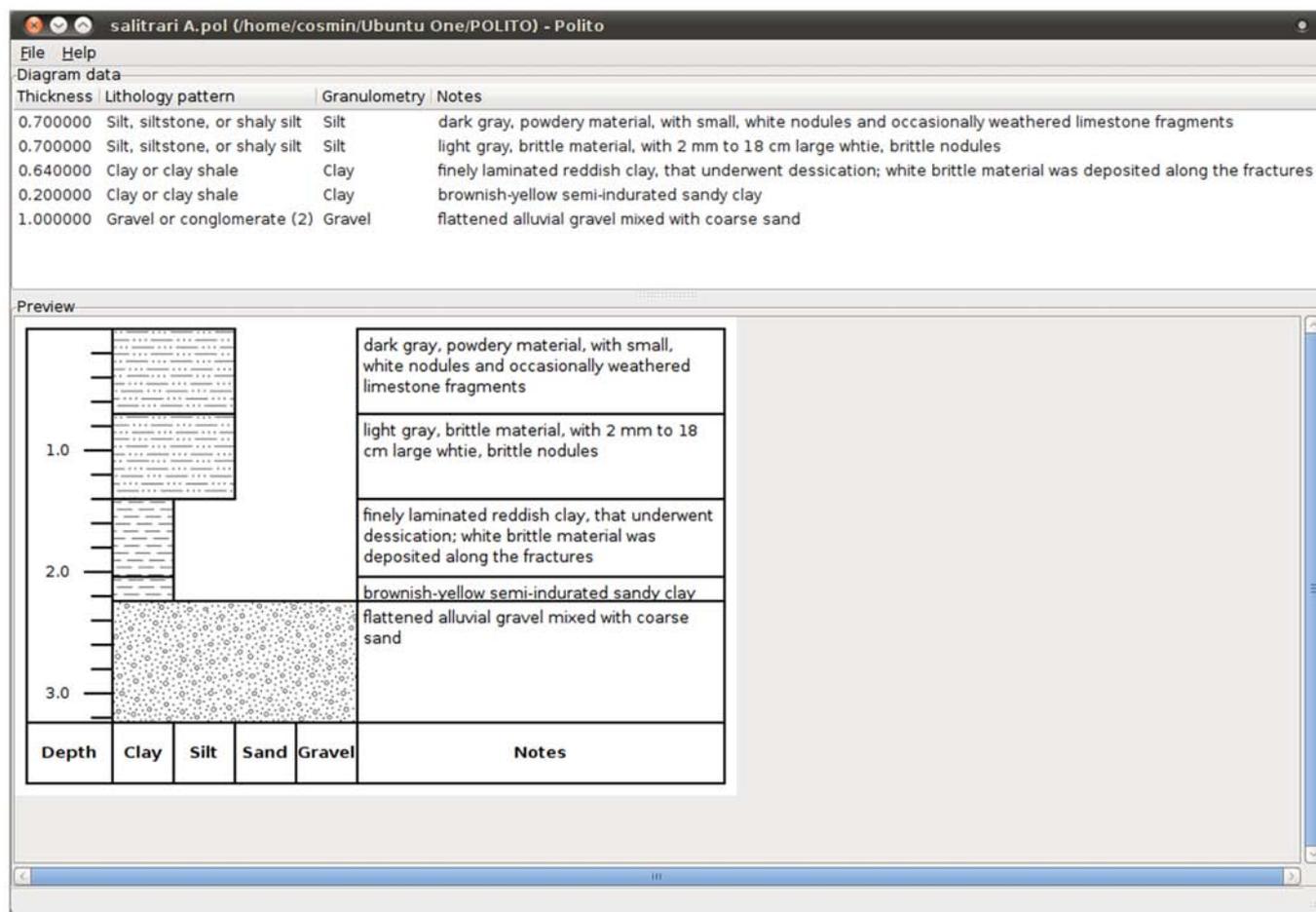


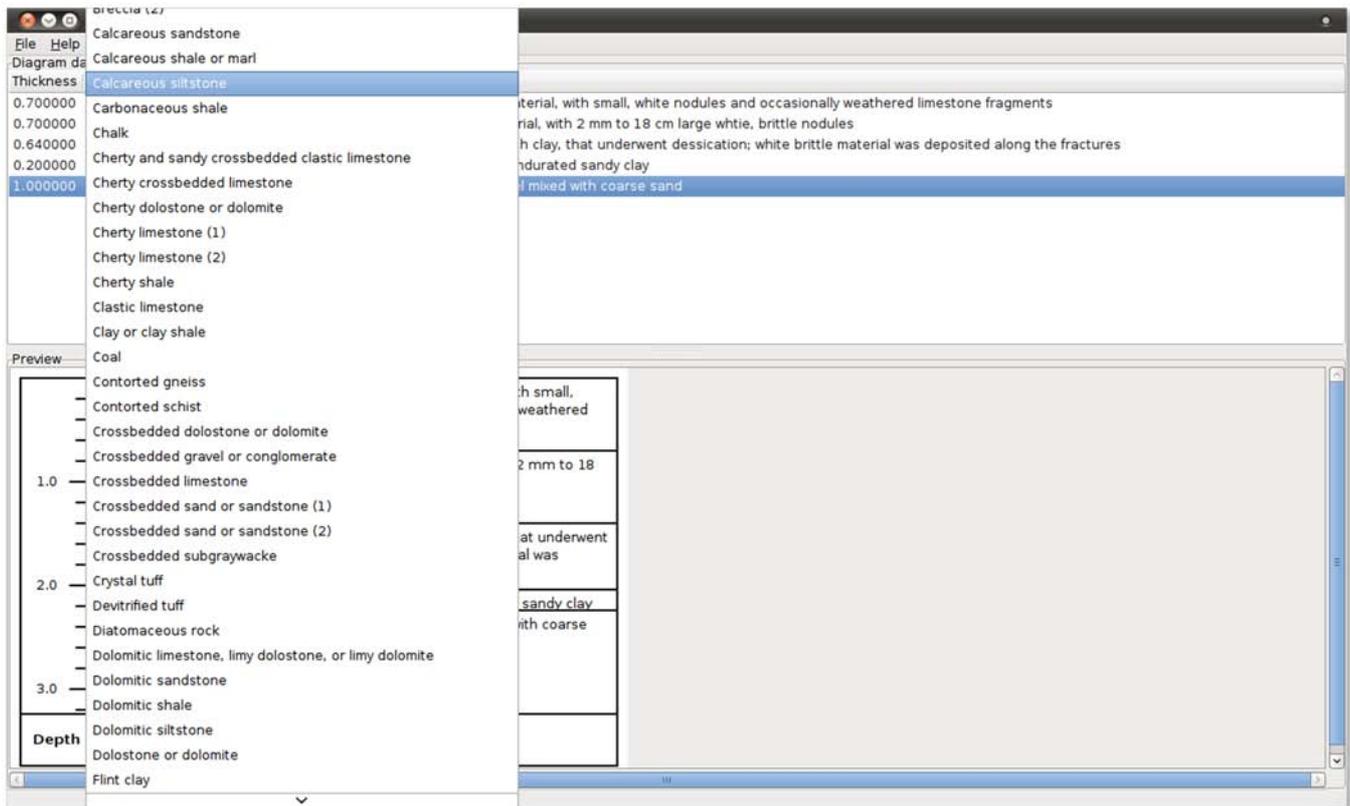
Fig. 1. Graphical user interface (GUI) for POLITO (running in Ubuntu 10.04 LTS), showing the main working area as well as the preview of the lithostratigraphic column in work. Example taken from Pușcaș et al. (2010b).

### Technical description

From an architectural point of view, POLITO is composed of two main modules: the renderer that actually draws the diagrams and its GTK+ (<http://www.gtk.org/>) based front end (GUI – graphical user interface; Figs. 1, 2). The renderer uses the Cairo graphics library (<http://cairographics.org/>) for drawing, a well-known piece of software used by many high profile open-source projects (GTK+, Firefox, Inkscape, and others). It is Cairo that enables POLITO to export the diagrams in all the different output formats. However, the main problem was reading and using in vector form the implementation of the USGS standard (FGDC, 2006; USGS, 2006) which is presented as Studia UBB, Geologia, 2010, 55 (2), 67 – 70

encapsulated PostScript (eps) files packaged for Adobe Illustrator®. Developing an embedded PostScript interpreter that allows POLITO to read the patterns directly from the standard implementation solved this inconvenience. This guarantees the adherence to the standard and allows POLITO to easily adapt to future changes or new versions of the reference implementation.

The storage of the raw diagram data is carried out through the usage of the YAML format (<http://yaml.org/>) (Ben-Kiki et al., 2009), an open-source, human readable data format that can easily be read/written in many programming languages or even with a simple text editor (*i.e.*, Notepad, Gedit, TextEdit, etc.). Thus, the user is safe in that POLITO data files (.pol) can be later reused with ease with other software tools as well as processed for data archive purposes.



**Fig. 2.** The drop-down menu presented to the user when “Lithology pattern” column is clicked upon. Note that the list of available patterns is far larger than what is visible in the figure. Example taken from Pușcaș et al. (2010b).

### System requirements

POLITO is a platform-independent software that can be used on any operating system that supports Python™ and Python™ libraries (GTK+, YAML and Cairo). So far it has been successfully tested on Microsoft® Windows XP SP3, Ubuntu Linux (8.04 LTS and 10.04 LTS), Debian Linux (5.0 Lenny), Red Hat Enterprise® Linux (5.4), Open Solaris (2009.06), FreeBSD (9). In Macintosh OS X, even though Python™ comes pre-installed, it is usually not the latest version, due to Apple’s release cycle. Also, some of the libraries used by POLITO do not run natively under OS X environment. This inconvenience can be surpassed by using MacPorts (<http://www.macports.org/>), a package management software that simplifies the installation of Unix and Linux software in OS X operating system. The installation of software packages using MacPorts is similar to that described in the README file available on POLITO’s Sourceforge webpage. The graphical frontend for running POLITO in OS X is handled by X11 Window System, included by default in the OS X operating system, starting with version 10.5 Leopard. POLITO comes with an easy to use installation script and straightforward instructions for running the script as well as obtaining and installing any additional libraries needed by the user. For Microsoft® Windows users, a precompiled self-extracting executable file is available for download as well.

### CONCLUSIONS

POLITO is a free, open-source, and platform-independent software which can automatically generate

lithostratigraphic columns from field data. Its simple and easy to use interface allows users to manipulate large datasets and create high-quality graphical outputs (see Fig. 3b in Pușcaș et al., 2010a), either in editable vector or raster format, or as PDF files. POLITO uses USGS standard lithology patterns (FGDC, 2006, USGS, 2006) and can be downloaded from its Sourceforge project page (<http://sourceforge.net/projects/polito/>).

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