

TOOLMAP – ‘SION’ method: development of a new GIS Framework for digital geological mapping

Lucien Schreiber⁽¹⁾; Pascal Ornstein⁽¹⁾; Mario Sartori⁽¹⁾ and Andreas Kuehni⁽²⁾

(1) CREALP – Research center on alpine environment, CH-1951 Sion. lucien.schreiber@crealp.vs.ch

(2) Swiss Geological Survey / Federal Office of Topography (Swisstopo). andreas.kuehni@swisstopo.ch

KEY WORDS: *geology, geological maps, digital mapping, GIS tool, Open source software.*

INTRODUCTION

With the constant development and the spreading of use of information systems as well as modelling, analysing and visualisation tools, the need for digital data is increasingly growing. During the last few years, this trend was strongly marked in geosciences especially in fields such as engineering geology and geological mapping.

Classically, a geological map gives a 2-D modelling of a complex 3-D environment. Mapped entities are defined by:

- A collection of geologic features which carry a geometry (point, line, polygon) in association with numerous descriptive attributes (e.g. lithological, chronological, structural, morphological ones)
- The relationships between these objects.

Handling information required to build digital geological maps implies of first analysing and extracting semantic content of the geologic objects and of identifying their spatial relationships.

THE ‘SION’ METHOD

Since a few years, CREALP has developed, in close collaboration with the Swiss Geological Survey (SGS), the ‘SION’ method, an innovative approach for implementing geological maps in digital format using GIS technology. This methodology aims at providing a consistent geological GIS fulfilling a number of strong requirements like:

- Storing and modelling geological objects in an exhaustive and accurate way through a robust data model
- Distributing the geologic features in relevant layers according to their geological meaning

- Developing an efficient method for geometrical construction of the digital map solving issues related to superposition of objects associated with multiple layers.
- Implementing a data model offering powerful capabilities of analysis (spatial and non-spatial).

TOOLMAP

As a natural extension of this technique, CREALP launched in 2006 the development of TOOLMAP a standalone software program that fully implements the principles that underlie the method (fig. 1). TOOLMAP provides tools that abstract, organize and transform field data to the relevant digital datasets used to generate the digital geological map and derived geothematic maps. This is achieved through the integration in TOOLMAP of:

- A versatile relational database that allows the handling of geospatial data (geometry and attributes) with various levels of complexity
- A GIS engine with the associated tools for editing, geoprocessing and validating data (topological and semantic rules).

This open-source and cross-platform (Windows, Linux, Mac) software is actually developed in coordination with the SGS in the framework of the production of maps of the Geological Atlas of Switzerland at 1:25 000 scale (GA25). The Beta version was recently tested for successfully implementing the new geological data model that underlies the geological information system of Switzerland being developed by the SGS. The first public release candidate of TOOLMAP is planned for April 2009.

Although initially dedicated to digital geological mapping, TOOLMAP is very suitable for handling other types of data because of its open design and its comprehensive functionalities.

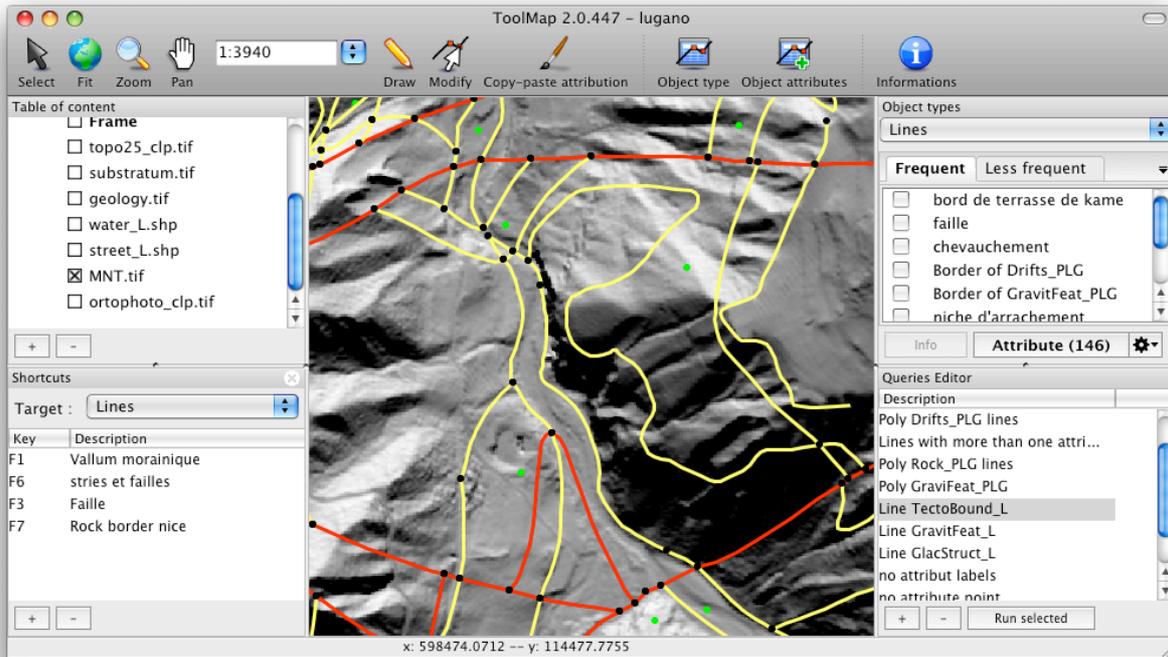


Figure 1 – An overview of the ToolMap User Interface.

CONCLUSION

TOOLMAP and its built-in concept offer a new technical framework for a full integration of GIS technology into the geological map production cycle (fig. 2). The close combination of a step-by-step process and dedicated tools is a pledge for ensuring constant quality and consistency in the production of digital geological maps. This GIS-centred approach offers the ability for the geologist to enhance field data acquisition and map accuracy by combining, at each stage of geological mapping, geological data with other geo-spatial datasets such as DEM, digital orthophotos, multi-scale topographic maps.

This way, geological surveys and geoscientists can increase use and usability of their data by providing more powerful digital cartographic products especially in terms of spatial analysis and geological data management.

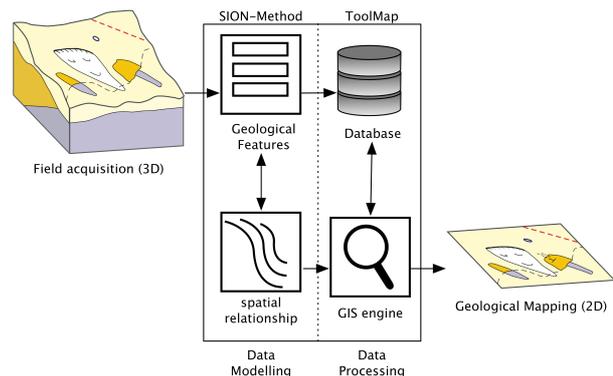


Figure 2 – GIS Framework for digital geological mapping consisting of two components: the SION-Method and TOOLMAP software

REFERENCES

- SCHREIBER, L., ORNSTEIN, P., SARTORI, M., and KUEHNI, A. 2008: TOOLMAP – 'SION' method: development of a new GIS Framework for digital geological mapping. In Abstract Volume 6th Swiss Geoscience Meeting, 324–325.
- SARTORI, M., ORNSTEIN, P., MÉTRAUX, C., SCHREIBER, L. & KUEHNI A. 2006: From geological cartography to digital maps : spatial data model and GIS tool. EONGEO 2006, Barcelona, proceedings, vol. II 189-191.
- TOOLMAP website, www.toolmap.ch