Geophysical Research Abstracts
Vol. 20, EGU2018-17321, 2018
EGU General Assembly 2018
© Author(s) 2018. CC Attribution 4.0 license.

What is the structural information hidden in and along bedrock interface traces in geological maps?

Anna Rauch (1), Mario Sartori (1), Sébastien Castelltort (1), and Stefan Volken (2)

(1) Department of Earth Sciences, University of Geneva, Geneva, Switzerland (anna.rauch@unige.ch), (2) Federal Office of Topography swisstopo, Swiss Geological Survey, Wabern, Switzerland

Geological maps form the core of many geo-models (hydrogeological, hazard, structural etc.), which inform crucial decisions across industrial, civil and academic fields. Although geological maps depict the world as accurately as possible, everyone is aware that they are interpretations and constructions which are inherently comprised of subjective and non-verified geological concepts. It is therefore not always clear how to judge the quality and reliability of geological maps. This is especially difficult, since the geometrical information of drawn lines (such as bedrock boundaries and fault traces) is not easily extractable – at least not in an unambiguous way. What exactly does the drawn line tell us? Where might the information be reliable and where might it be structurally inconsistent?

Based on such thoughts, we are developing a tool that analyses bedrock and structural content in maps. By means of a high-resolution DEM, the tool numerically extracts geometric information from isolated stretches of bedrock interface traces in 3D. In a first step, the line will be divided in different convexities based on first order inflexion points. In a second step, the analysis incrementally runs through all points from one end of each convexity to the other and extracts, based on the relationship to other points of the same convexity, an orientation signal (calculated in angle degrees). Such signal merely translates the geometric content of a line in a readable and quantifiable manner. This can then be used to infer information, such as the planarity respectively the curvature of the bedrock interface that passes through the trace. Since the technique extracts a multitude of incremental orientations, it allows to understand the evolution of an interface geometry along the trace. Based on the extracted signal, the origin of the variability of incremental orientations, which can be fundamentally different (e.g. curved interfaces, oscillating traces or collinear traces . . .), is furthermore inferable.

Such quantification of structural information in geological maps enables a multitude of analyses such as a trace classification, the extrapolation of trace information or also a thorough trace consistency control. The results obtained can be visualised in a simple manner (e.g. additional map layers) so that the map user can quickly grasp the geometrical content of the map. We believe that such tool will help to manage the reliability issues of existing maps as well as to steer towards more accurate drawing of new maps.