3D Computer-Assisted Geological Mapping with FaultTrace: Results of the Richât Structure (Mauritania) and the Vineh Structure (Iran)

Robert Faber¹ and Gisela Domej²

¹TerraMath, Kaliam, Indonesia (robert.horst.faber@gmail.com)
²Gisela Domej, Università degli Studi di Milano–Bicocca, Dipartimento di Scienze dell’Ambiente e della Terra, Piazza della Scienza 1/U4, 20126 Milano, Italy

To evaluate the functionality of FaultTrace – a tool for semi-automatic structural geological mapping of faults and bedding planes within the software WinGeol by TerraMath –, we demonstrate its detailed use in two different case studies: The Richât Structure in Mauritania is characterized by a volcanogenic anticline with associated fault systems and shows relatively planar fault structures within low-relief topography; the Vineh Structure in Iran consists of complexly faulted sequences of sedimentary and igneous layers in high mountainous terrain affected by the fault systems of the Purkan-Vardij Fault and the North Tehran Fault. The studies discuss which structural geological settings let expect a satisfying performance of FaultTrace, and what factors limit the achievement of meaningful results.

Used data is freely available and consists of digital elevation models (e.g., SRTM or ALOS Data) and satellite imagery (e.g., Sentinel-2 or Landsat ETM+ Imagery). Where available, additional data such as, for instance, borehole logs and geological cross-sections were displayed to support the mapping process. Results from the structural geological assessments of both case studies were finally compared to previously published studies in order to validate the
performance of FaultTrace on the one hand, and to discuss differences on the other hand.

We show that FaultTrace aims to provide a virtual environment allowing for fast-track and optimized data generation for 3D geological models. It can be used for a first remote structural geological assessment without the requirement of being at the site. Therefore, it is well suited for inaccessible terrain - for instance, due to transportation, political restrictions, warfare, natural hazards, or lack of funding. Nevertheless, and to take full advantage of the software, users have to be aware of the limitations and strengths, which are discussed in this work based on two very different case studies.