3D geological modelling of the western Aar Massif (external Central Alps, Switzerland)

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3D modelling of complex and irregular geological bodies is an expanding discipline that combines two-dimensional cartographic and structural data managed with GIS technology. This study presents a complete workflow developed to process geological information to build a 3D model of major stratigraphic, structural and tectonic boundaries. The investigated area is located in the western part of the Aar Massif (external Central Alps, Switzerland) characterized by pronounced topographic (600–<4000 m) relief, making it prone for surface based 3D depth constructions. The workflow comprises four major steps:

(1) **Generation of 2D polylines in a map view**: a two-dimensional dataset of sequences of polylines has been generated in ArcGIS (10.3.1) defining the starting dataset for the major stratigraphic and tectonic boundaries of the bedrock units. This dataset has been compiled and integrated by using: (i) GeoCover vector datasets 1:25 000 of the Swiss Geological Survey; (ii) The Geological Special Map 1:100 000 of the Aar Massif and the Tavetsch and Gotthard Nappes of the Swiss Geological Survey; (iii) data from literature; and (iv) additional field work conducted for this study in key-locations.

(2) **Projection of 2D information onto 3D digital elevation model**: with the 3D structural modelling software Move (Petex/Midland Valley; 2019.1) the boundaries have then been projected on a digital elevation model (swissALTI3D) with 2 m resolution.

(3) **Construction of tectonic cross sections**: the use of geometric arguments as well as structural measurements allows for projection of these boundaries into a dense regularly spaced network of 2D cross-sections.

(4) **Interpolation of 3D surfaces**: the surface and cross-sections boundaries can be interpolated by applying 3D projection and meshing techniques resulting in a final 3D structural model.

Generally, steps (2–4) require iterative adaptations particularly in the case of surface areas being covered by glaciers or unconsolidated Quaternary sediments. In the model, special emphasis is given to visualize the current structural disposition of the western Aar Massif as well as the relative geometric and overprinting relationships of the deformation sequence that shaped the
investigated area throughout the Alpine deformation. Finally, since in the investigated area underground data are scarce, an assessment of the relative uncertainties related to input data and is intended to be performed following the approach proposed by Baumberger (2014) and Ferrañandez (2005). The workflow presented here offers the chance to gain validation approaches for domains only weakly constrained or with no surface data available, by generating a 3D model that integrates all accessible geological information and background knowledge.

REFERENCES
