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3D model of the Bernese Part of the Swiss Molasse Basin: visualization of uncertainties in a 3D model

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The Swiss Molasse Basin comprises the western and central part of the North Alpine Foreland Basin. In recent years it has come under closer scrutiny due to its promising geopotentials such as geothermal energy and CO_2 sequestration. In order to adress these topics good knowledge of the subsurface is a key prerequisite. For that matter, geological 3D models serve as valuable tools.

In collaboration with the Swiss Geological Survey (swisstopo) and as part of the project *GeoMol CH*, a geological 3D model of the Swiss Molasse Basin in the Canton of Bern has been built. The model covers an area of 1810 $km^2$and reaches depth of up to 6.7 km. It comprises 10 major Cenozoic and Mesozoic units and numerous faults. The 3D model is mainly based on 2D seismic data complemented by information from few deep wells. Additionally, data from geological maps and profiles were used for refinement at shallow depths. In total, 1163 km of reflection seismic data, along 77 seismic lines, have been interpreted by different authors with respect to stratigraphy and structures. Both, horizons and faults, have been interpreted in 2D and modelled in 3D using IHS's Kingdom Suite and Midland Valley's MOVE software packages, respectively.

Given the variable degree of subsurface information available, each 3D model is subject of uncertainty. With the primary input data coming from interpretation of reflection seismic data, a variety of uncertainties comes into play. Some of them are difficult to address (e.g. author's style of interpretation) while others can be quantified (e.g. mis-tie correction, well-tie). An important source of uncertainties is the quality of seismic data; this affects the traceability and lateral continuation of seismic reflectors. By defining quality classes we can semi-quantify this source of uncertainty. In order to visualize the quality and density of the input data in a meaningful way, we introduce quality-weighted data density maps. In combination with the geological 3D model, these contour maps serve as a good tool to define areas of sparse data and low data quality providing one way of visualizing uncertainty in 3D models.