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Considerations on voxelization techniques for 3D geological and geophysical modeling using borehole data and seismic section interpretation - examples from Little Hungarian Plain, Pannonian Basin

Edina Bartakovics (1,2), Zsófia Koma (1), Balázs Székely (1,3), Gábor Kovács (1), András Zámolyi (4), and Gábor Tímár (1)

(1) Department of Geophysics and Space Sciences, Eötvös University, Budapest, Hungary (eleison15@gmail.com), (2) Department of Physical and Applied Geology, Eötvös University, Budapest, Hungary, (3) Research Groups Photogrammetry and Remote Sensing, Department of Geodesy and Geoinformation, Vienna University of Technology, Vienna, Austria, (4) OMV Austria Exploration & Production GmbH

Geological data is usually processed with the help of 2D maps and profiles. However, through the development of computational capabilities, the generation and analysis of 3D geologic models became widespread. They give us new opportunities for displaying and interpreting three dimensional geological data without having to use the above mentioned projections of space and their inherent simplifications.
We applied voxels (3D pixels) in three dimensional geological modeling. The study areas are located in the Little Hungarian Plain, NW part of the Pannonian Basin. Voxel models were created from borehole data and 2D seismic sections. The data cubes created have different databases as background that we compared before interpolation. Voxel creation included two different methods: classified point clouds (geophysical continuous data) and specification of different interpolation boundaries (bedrock, cover, fault). However, the interpolation techniques often create ambiguous results in certain geometries, therefore a combination of multiple voxelization software was found to be useful.
After the creation of the voxel models, another comparative analysis was conducted. The accuracy of the models and interpolation methods was assessed. With various types of data we could generate a 3D voxel model, and then we tested the software used in various artificial geological situations.
These methods were introduced to be able to overcome several problems occurred while generating the model: the presence of faults, interpolation errors, and the irregularity and scarcity of data etc.
We succeeded to create a space-filling 3D voxel database with different resolutions, which allows the visualization of a 3D geological interpretation. The different models provided well-matching results. We would like to give a robust estimate with these methods such areas, where borehole or seismic data is not available. It can help in the 3D geological interpretation.