Visualization of volumetric seismic data

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Mostly driven by demands of high quality subsurface imaging, highly specialized tools and methods have been developed to support the processing, visualization and interpretation of seismic data. 3D seismic data acquisition and 4D time-lapse seismic monitoring are well-established techniques in academia and industry, producing large amounts of data to be processed, visualized and interpreted.

In this context, interactive 3D visualization methods proved to be valuable for the analysis of 3D seismic data cubes - especially for sedimentary environments with continuous horizons. In crystalline and hard rock environments, where hydraulic stimulation techniques may be applied to produce geothermal energy, interpretation of the seismic data is a more challenging problem. Instead of continuous reflection horizons, the imaging targets are often steep dipping faults, causing a lot of diffractions. Without further preprocessing these geological structures are often hidden behind the noise in the data.

In this PICO presentation we will present a workflow consisting of data processing steps, which enhance the signal-to-noise ratio, followed by a visualization step based on the use the commercially available general purpose 3D visualization system Avizo. Specifically, we have used Avizo Earth, an extension to Avizo, which supports the import of seismic data in SEG-Y format and offers easy access to state-of-the-art 3D visualization methods at interactive frame rates, even for large seismic data cubes.

In seismic interpretation using visualization, interactivity is a key requirement for understanding complex 3D structures. In order to enable an easy communication of the insights gained during the interactive visualization process, animations of the visualized data were created which support the spatial understanding of the data.