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3D micro-imaging of fracture networks in a reservoir dolomite using micro-Computed Tomography

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The early Triassic Hauptdolomit in the Pre-Neogene basement of the Vienna Basin (Austria) contains a dense, multiscale fracture network caused by its deformation history. This property makes the Hauptdolomit a suitable gas reservoir, from which production is successfully ongoing. Standard (laboratory) methods for measuring porosity and permeability are however not always suitable for fractured reservoir rocks, whereas these properties are of great importance in assessing a reservoir.

We conduct micro-Computed Tomography (μCT) measurements on Hauptdolomit drill core samples provided by OMV LEP-FC. μCT provides radiograms, which by reconstruction can provide a 3D-Model and visualize the fracture network (hence the porosity), without destroying the samples. The measurements are performed on differently sized samples, with different parameters, to ensure the most complete information and best spatial resolution. With the reconstruction and proper calibration, it is possible to quantify and visualize the porosity and permeability using analysis software packages (Amira, ImageJ, Petrel, MATLAB). In addition, we investigate the microstructural features of the fractures and veins, using the Scanning Electron Microscope (SEM) and Cathodoluminescence (CL). These additional analytical methods provide important information about the deformation mechanisms and mineral growth, and the chemical composition of the cements filling part of the fractures.

In a next step, the porosity and permeability data acquired from μCT measurements are calibrated and compared with data from standard laboratory measurements on sample plugs (e.g. helium porosity and gas permeability experiments). The final goal is to get a 3D view of the porosity and permeability of various Hauptdolomit samples, on various scales (μm to dm), which can serve as an input for upscaling permeability to the reservoir scale.