Anisotropy along a N-S profile of mica rich lithologies in the western Tauern Window (Eastern Alps, Austria)

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Anatomy and internal structure of the Alpine orogens are difficult to decipher as structural information is usually limited to surface and seismic data. Seismic results very much depend on the elastic wave velocity model of the rocks. Simple velocity models depend strongly on the rock composition. Seismic properties are directionally dependent. Anisotropy can be subdivided into intrinsic (CPO of minerals and alignment in rock/texture) and extrinsic (compositional layering or fractures) anisotropy. In the investigated rock samples, phyllosilicates are by far most decisive for the elastic anisotropy due to their platy shape. We present here the first results of fabric analysis in a N-S profile of phyllosilicate-rich samples (mainly Innsbruck quartzphyllite and Bündner schist) from the Brenner Base Tunnel Project in order to obtain a refined anisotropy and velocity model.

Phyllosilicate-rich sections were selected from borehole and tunnel samples, from which 1.5 – 3.5 mm wide columns were drilled out from layers of different composition and structure. The CPO of phyllosilicates and graphite was measured using high energy X-ray diffraction at German Electron Synchrotron (DESY) and European Synchrotron Radiation Facility (ESRF). Pole figure data were directly extracted using single peak evaluation and compared to the optical microstructure and compositional distributions using µXRF measurements.

Texture strength is variable along the section with peak values at the transition from the Innsbruck quartzphyllite to the upper Bündner schist. The texture strength correlates positively with the content and distribution of phyllosilicates and graphite. By measuring the smallest representative volume element, we estimate the upper bound of expected intrinsic velocity anisotropies. The effect of (micro)structure-based upscaling on these anisotropies will be discussed.