



Deep Alpine Valleys - examples of geophysical explorations in Austria

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Results from geophysical explorations of three deep Alpine valleys will be presented and discussed. The first example is from the Ötz-valley in the central Eastern Alps, cutting crystalline rocks parallel to the N-S striking Brenner normal fault. The second example is from the upper Drau-valley, which separates crystalline rocks in the north from carbonates in the south along a strike-slip fault, active during tectonic escape in Neogene. The third example is the Oichten-valley, located at the Northern Alpine front, where Flysch overthrusts Molasse. Regional GPS data suggest ongoing deformation in the Eastern Alps, which may use the tectonic structures related to these valleys. However, seismic activity is low (Ötz- and Drau-valley) or practically non-existent (Oichten-valley) at the exploration sites. The three locations were covered by ice during the last ice age with ice surface elevations of 250 m (Oichten-valley) to 1700 m (Ötz-valley) above present elevation. The geophysical surveys comprised gravity profiling and mapping, 2D reflection seismology and geoelectric resistivity profiling, resulting in detailed cross-sections and by the integrated interpretation of gravity maps and seismic cross sections in 3D-models of the erosion basis of the valleys (Ötz- and Drau-valley). The maximum present valley depths vary from 300 m (Ötz- and Oichten-valley) to 700 m (Drau-valley). High resolution seismic cross sections, supported by information on density and resistivity allow for a detailed interpretation of the valley sediments. Several aspects of the evolution of Alpine valleys will be discussed on the basis of the topographic, geological, and geophysical data. One aspect concerns transverse and longitudinal valley sections in relation to ice dynamics and tectonic pre-design. Another aspect is slope stability of over-deepened valleys and damming by rockslides. A third interesting topic is the interpretation of deeper valley sediments,

which were classified as “old valley fill”, but were probably no unique interpretation can be achieved without boreholes.