

Fault sealing by isochemical cataclastic grain size reduction in arkosic sands: an example from the Eisenstadt-Sopron Basin, Austria

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Deformation bands and cataclastic faults may significantly reduce porosity and permeability in reservoir sediments. This study presents microstructural as well as bulk and mineral chemical investigations of such structures in uncemented, friable arkosic sands of Miocene age (Vienna Basin, Austria). The observed microstructures indicate grain size reduction by grain flaking in deformation bands with small offsets (0.5-8 cm), and increasing intragranular fracturing and clast disaggregation with larger displacements (10-60 cm) in cataclastic fault zones. At small displacements, increasing amounts of phyllosilicate grains (<20 µm) in the matrix can be detected. Detailed microstructural and mineral chemical analyses reveal that the phyllosilicates are released from disaggregating sericitised albite clasts. Both cataclasis of quartz grains and enrichment of phyllosilicates by mechanical expulsion from plagioclase result in grain size reduction within the fault rocks. The measured reduction in porosity of up to 40 % is associated with a permeability reduction, reflected in the retention of iron-oxide rich fluids along the deformation bands and fault zones. The observations indicate that these deformation bands and cataclastic faults formed at very shallow burial depths in unconsolidated sediments, and that fault sealing occurred in the absence of chemical alteration of the fault rocks. Such localized zones of low permeability are not recognized in seismic data due to their small displacement, but might create fluid barriers significantly reducing the connectivity of a reservoir.

The role of transhumance in the Inner Alps at the time of the Alpine Iceman

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Transhumance and alpine summer farming are traditional practices that play a great role in shaping the mountain landscape in the Alps, forcing the lowering of the timberline and causing the expansion of the grasslands. However, it has not yet been clarified when, and for what reasons, these subsistence strategies first developed. During the studies on the Alpine Iceman (3300-3100 cal BC)

palynological analyses, performed in the vicinity of his discovery site, indicated a possible local pasture activity starting 1000 years before the Iceman time. This led to the idea that the Iceman himself was possibly involved in the practice of transhumance. In order to scrutinize this hypothesis a multidisciplinary palaeoenvironmental and archaeological study has been developed. The analyses focus on several sites located along the traditional transhumance route that goes from the Vinschgau valley floor (Italy) up to the Ötztal pastures (Austria) crossing the main alpine ridge. This paper presents the results of the combined archaeological, palynological and fire history analyses performed on the Schwarzboden peat bog, one of the study sites located in the high altitude of the Vinschgau.

Ice thickness measurements with ground penetrating radar for a volume inventory of Austrian glaciers

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The ice volume stored in mountain glaciers determines the current and future glacier runoff and thus the contribution of these glaciers to sea level rise. More than 50 Austrian glaciers were surveyed with low frequency ground penetrating radar between 1998 and 2009 (SPAN et al. 2005, FISCHER et al. 2007). The pulsed radar system is based on the sensor of NAROD & CLARKE (1994) and operates at a central frequency of 4.5 to 6 MHz depending on the antenna length used. The resistively loaded dipole antennas (WU & KING 1965, ROSE & VICKERS 1974) have a half length of 10 to 20 m and are operated ground based. The low frequencies allow a penetration depth of more than 300 m even if melt water is present. The maximum ice thickness was measured on Pasterzenkees in Glocknergruppe with more than 300 m.

The GPR data covers more than 40 % of the Austrian glacier area. The data include most glaciers surveyed with seismic methods in the 1970s and 1980s (e.g., ARIC & BRÜCKL 1987) and earlier. Together with the topographic data from Austrian glacier inventory 1998 (LAMBRECHT & KUHN 2007), a world- wide unique glacier volume inventory is compiled for Austria.

The volume was calculated from the ice thickness data by manually constructing the contour lines of elevation of the subsurface topography (FISCHER 2009). This method includes additional information as the slope of the rocks near the glacier and the position of the crevasse zones, but does not include ice dynamical modelling as done by BRÜCKL (1970), and BINDER et al. (2009).

ARIC, K. & BRÜCKL, E. (1987): Ergebnisse der seismischen Eisdickenmessungen im Gebiet der Stubaier Alpen (Daunkogelferner), der Venedigergruppe (Schlatenkees und Untersulzbachkees) und der Silvrettagruppe (Vermunt - Gletscher). - Arbeiten aus der Zentralanstalt für Meteorologie und