Geophysical Research Abstracts
Vol. 19, EGU2017-15865, 2017
EGU General Assembly 2017

Deciphering the Alpine Deformation History of a Potential Fossil Subduction Interface in the Depth of the Seismogenic Zone (Central Alps)

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We use here a potential fossil subduction interface preserved in the Central Alps (N. Italy) as a proxy to study and understand the variety of deformation patterns taking place at the transition between unstable and conditionally stable regimes in present-day subduction interfaces. Foliated cataclasites and mylonites occur discontinuously at the base of the overriding plate within the first tens of meters above the contact with the underlying ultramafics. These brittle and plastic features are crosscut by metamorphic veins which are later sheared during pressure solution creep and quartz dynamic recrystallization. We herein question the possibility to interpret the succession recorded by these microstructures as one piece of evidence for alternating transient slip events.
Microprobe results point to different episodes of phengite and garnet recrystallization of the inherited upper plate minerals. Quartz inclusions within garnets help determine the pressure conditions under which the new generations formed. Field observations, microfabrics and mapping revealed a wide range of deformation patterns in each locality studied, exposing segments corresponding to a depth range of 15-35 km (250°-450°C). A combination of these P-T estimates and a comparison to the results of thermodynamic modelling can independently validate the depth to which these rocks were buried. EBSD analysis on recrystallized quartz grains reveal lower differential stresses than those expected from the Byerlee law. Rb/Sr and 40Ar/39Ar deformation ages are being acquired from rocks of the interface to shed light on the time during which the individual shear zones were active.