



Cretaceous to Miocene fault zone evolution in the Eastern Alps constrained by multi-system thermochronometry and structural data.

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Fault zones that display both, ductile and brittle deformation stages offer perfect sites to study the evolution of the earth's crust over a wide range of temperatures and possibly over long time spans. This study combines structural-geo- and thermochronological data to evaluate the tectonic evolution of a fault zone to the southeast of the Tauern Window in the Eastern Alps. This fault zone comprises a mylonitic part, the so-called "Main Mylonitic Zone" (MMZ) that has been reworked by brittle faulting, the so-called "Ragga-Teuchl fault" (RTF).

Structural data of the MMZ demonstrate ductile deformation with top-to-the NW transport in the Late Cretaceous under greenschist facies conditions. Subsequent SE-directed extension occurred under semi-brittle to brittle conditions during the Late Cretaceous and Paleocene.

The Polinik Block to the north of the RTF revealed Late Cretaceous Ar/Ar ages, which reflect cooling subsequent to the thermal peak of Eo-alpine metamorphism. In contrast, the Kreuzeck Block to the south of the RTF shows early Permian Ar/Ar ages that reflect cooling related to both, late Variscan collapse in the late Carboniferous and post-Variscan extension in the Permian. Zircon and apatite fission track ages and thermal history modeling results suggest that the Polinik Block cooled rapidly to near surface temperatures in the middle Miocene. The Kreuzeck Block, in contrast, cooled and exhumed to near surface conditions already in the Oligocene and early Miocene.

Thermal history modeling and apatite fission track ages of 23.3 ± 0.8 and 11.5 ± 1.0 suggest that brittle deformation along the RTF occurred in the middle- and late Miocene. Our results demonstrate that one single fault zone may comprise information about the evolution of the Eastern Alps from Late Cretaceous to Miocene time and that low-temperature thermochronology is a viable tool to resolve the timing of brittle faulting and accompanied fluid activity.