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Fission track dating of fault rocks: Evidence from chemical composition, track length reduction and single grain ages of apatites

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Apatite fission track (AFT) results determined from drill cores transecting the Lavanttal fault and the western part of the Koralm complex (Eastern Alps) indicate that significant variations in apatite chemistry, single grain ages and track length distributions may indicate highly sheared domains. The annealing behavior of fission tracks in apatite is sensitive to chemical composition. Therefore chlorine-rich apatites are more resistant to track annealing than fluorine-rich apatites (O'Sullivan and Parrish, 1995). In order to quantify the chlorine and fluorine content of the apatite crystals Dpar values (diameter of etched spontaneous fission tracks measured parallel to the crystallographic c-axis) were measured on all samples (e.g. O'Sullivan and Parrish, 1995; Barbarand, et al. 2003). A small Dpar value (smaller than 2 μm) is typical for fluorine-rich apatites and a larger value (2-5 μm) is characteristic for chlorine rich apatites. For this study, the external detector method of fission track dating was used (e.g. Gleadow, 1981); this allows generation of both single-grain ages and a pooled sample age. Additionally, track length measurements and thermal modeling of these data will provide a general cooling and exhumation history of the fault zone and adjacent units. AFT ages range from 51.8 +/- 5.6 and 34.3 +/- 3 Ma both within the host rock and the related fault rocks along the Lavanttal fault. Mostly these ages do overlap within the 1sigma-error. However, in two cases they do not overlap, and show significant differences in single grain ages, chemistry and track length distributions. The mean fission track ages of two fault samples are 47.1 +/- 2.7 and 39.2 +/- 2.2, but single grain ages of both samples range between 10.6 and 55.3 Ma, thus failing the

chi^2 statistical test. The Dpar values from these samples clearly show that the older age groups contain higher chlorine content (Dpar 4.2-3.2) than the younger age group (Dpar 1.7-2.1). Additionally track length reduction detected in the younger apatites (11.5-12.3 μm) suggests that that these grains were affected at lower temperatures. According to thermal history modeling with fault-related samples we propose a thermal overprint between 10 and 6 Ma by heat transfer or dispersion of fluids within the fault zone.

References: BARBARAND, J., CARTER, A., WOOD, I., AND HURFOR, A.J., 2003. Compositional and structural control of fission track annealing in apatite. Chem. Geol. 198, 107-137.

GLEADOW, A.J.W., 1981. Fission track dating methods: what are the real alternatives? Nucl. Tracks 5, 3-14.

O'SULLIVAN, P.B., AND PARRISH, R.R. 1995. The importance of apatite composition and single-grain ages when interpreting fission track data from plutonic rocks: a case study from the Coast Ranges, British Columbia. Earth Planet. Sci. Lett. 132, 213-224.