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A preliminary 4D model of Neogene exhumation in the Central Alps

M. Campani (1), N. Mancktelow (1), Y. Rolland (2), D. Seward (1)

(1) Geological institute, ETH Zurich, Switzerland, (2) Géosciences Azur, UMR CNRS 6526, Université Nice-Sophia Antropolis, France (marion.campani@erdw.ethz.ch / Phone: +41 44-6328817)

The Simplon Fault in the Central Alps provides one of the best exposed and most accessible examples of a low-angle detachment system developed during continued convergence. However, despite the generally excellent outcrop conditions and more than 100 years of research, the geometry, kinematics and age of various components of this major fault system are still highly controversial. In particular, the relationship between the large-scale backfolds associated with the so-called Northern and Southern Steep Belts and the mylonites and brittle detachment of the Simplon Fault Zone remains unresolved. The Simplon Fault Zone cannot be viewed and studied as a 2D structure (i.e. a classic "normal fault") but has a truly 3D form and kinematics, reflected in its overall domal form and the clear decrease in the exhumation component both to the northwest and southeast. Field work has established a relative chronology of deformation structures that developed both prior to and during movement on the Simplon Fault. In the hanging wall, older structures are generally well preserved and only non-pervasively overprinted by brittle faults. In contrast, in the footwall the earlier deformation structures are progressively overprinted and transposed by Simplon shearing. Mylonites developed during this shearing are themselves overprinted by folds related to continued NW-SE shortening. A preliminary 3D model of these complex structural relationships is presented using 3D GeoModeller geometric modelling software. The timing of major movement on the Simplon Fault, as well as its trace and the amount of exhumation associated with its continuation to the NW (Rhone Valley) and SE (Val d'Ossola region) is currently not well constrained. Mineral ages (fission track on zircons and apatites, $^{40}Ar/^{39}Ar$ and Rb/Sr on white micas) can provide critical constraints in considering all of these problems. Preliminary new results

will be presented from the Simplon pass and the Rhone and Ossola valleys. In the Ossola valley to the SE, quartz-calcite-white mica veins are generally little deformed but clearly perpendicular to the stretching lineation in the footwall mylonites. They are therefore interpreted as forming late in the shearing history and new $^{40}Ar/^{39}Ar$ ages on white mica provide a minimum age for Simplon Fault ductile shearing. In the Rhone Valley near Brig to the NW, the footwall of the Simplon Fault is marked by a 1-2km wide zone of foliated phyllonites, developed from gneisses of the Aar massif. Obvious kinematic indicators point to a strong dextral component to the shearing and $^{40}Ar/^{39}Ar$ ages on sericite again provide a minimum age for phyllonite development. These first dating results combined with the 3D structural geometry form the basis for a preliminary 4D model of exhumation and cooling during orogen-parallel extension in the convergent Alpine orogen.