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Fission track ages and Exhumation mechanisms of the Tauern Window, Eastern Alps

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The Tauern Window (TW) is a thermal and structural dome which exposes Penninic basement, its cover units as well as parts of the overlying Austroalpine basement in the central part of the Eastern Alps. The peak of metamorphism was attained approximately at 30Ma (Selverstone et .al, 1992), followed by cooling and exhumation throughout Miocene time. Most of the tertiary exhumation of the Eastern Alps was localized in the TW, from Early Oligocene to late Miocene time.

A current debate centers on the exhumation mechanisms of Penninic rocks in the core of the TW, namely to assess whether orogen-parallel extension (e.g., Selverstone, 1988) or a combination of folding and erosion (eg., Rosenberg et al., 2004) with subordinate extension were the controlling processes. E-W extension is well documented at the western (Brenner Fault) and eastern (Katschberg Fault) margins of the window (e.g., Behrmann, 1988; Selverstone, 1988; Genser and Neubauer, 1989). In contrast, upright folding dominates the internal structure of the dome, and in particular along its western part, where fold amplitudes, mostly eroded during folding, attained up to 10 km. This study attempts to assess the relative importance of folding and erosion and of orogen-parallel extension during exhumation by analyzing the spatial and temporal cooling patterns of apatite and zircon fission track ages.

The compilation of published apatite and zircon fission track ages indicates a concentric younging of both the apatite and zircon ages toward the core of the TW. The concentric isochrones follow the map trace of the axial planes of the upright folds of the western and eastern TW. This cooling pattern is in contrast to the one expected by a process of extensional unroofing, which in map view would results in isochrons parallel to the extensional faults and progressively younging towards them (e.g., Foster et al., 2001). We therefore propose that folding and erosion were primarily responsible for exhuming the Penninic units in the core of the TW and that orogen-parallel extension played a subordinate role during unroofing.

New fission track ages, complementing the published ones, will be used to obtain a detailed 3D pattern of cooling, especially in the central TW. This pattern, combined with a thermal model, will allow us to discuss the relative importance of the afore mentioned two end-members exhumation mechanisms and to relate them to the temporal evolution of the exhumation processes.

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