



Linking drainage patterns to orogen-scale tectonics: the updoming of the Tauern Window (Eastern Alps)

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The Tauern window is located in the central part of the Eastern Alps and exposes, within a metamorphic core complex (MCC), structurally deep tectonic units (Penininic ophiolites and European distal margin units). Previous studies addressed the updoming history and structural development of the metamorphic dome, whereas the evolution of the drainage system as consequence of the updoming and exhumation has only been sparsely investigated. In this study we exploit characteristic metrics of the drainage system in map and profile view to test conceptual models explaining the updoming of the Tauern Window. One of these models points to a tectonic overstep with southwest-northeast directed shortening and east-southeast and west-northwest directed crustal stretching as the principle cause of updoming and exhumation. We combine information on the sedimentological record retrieved from previous studies, with information on the drainage morphology and on stream length profiles in order to reconstruct the main development stages of the Tauern Window core complex since the middle Miocene. We additionally identify disturbances (e.g. glacial overprint) on stream length profiles and exclude them from our tectonic signal.

Our results reveal a multi-stage development model of the fault activity, which leads to the present day drainage pattern of the Tauern window area. The beginning of the tectonic activity is dominated by a left-lateral overstep along the Salzach-Enns-Mariazell-Puchtal (SEMP) and Defreggen-Antholz-Valles (DAV) faults during the early Miocene. Contemporaneously, eastward directed extrusion lead to sedimentation processes east of the Tauern window and the dominance of west-east directed drainage systems. In the following, an active phase of the Mölltal/Hochstuhl fault zone lead to indentation into the central Tauern window and a relative 30 degree-rotation between the eastern and western Tauern window area. This is documented in pronounced sedimentation in the southeast of the area. At a late development stage, dogleg structures in the drainage pattern along the SEMP imply a significant dextral reactivation of the fault zone.