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Development of an Alpine over-deepened valley (Upper Enns valley) – a test for application of geomorphic indices in a cyclically glaciated area

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The focus of the paper lies upon modelling the possible development of an overdeepened valley (Upper Enns valley, Styria) and to test geomorphological indices, which are considered to monitor neotectonic activity (e.g., Burbank and Anderson, 2001). The formation of the Enns valley covers the time span from Early/Middle Miocene to Recent (e.g. Frisch et al., 2000). The ENE-trending Salzach-Enns strike-slip fault is supposed to follow the course of the Enns River, and Pleistocene glaciers cyclically scoured the valley. The Enns River separates the crystalline basement of the Niedere Tauern in the south from the Greywacke zone and the Northern Calcareous Alps in the north. The Upper Pleistocene Ramsau Conglomerate covers the Greywacke zone on the northern valley slope and is suggested a rich source to reconstruct the overdeepening of the Upper Enns valley. The differences in geology and geomorphology of the northern and southern valley flanks do not only record Pleistocene to Recent tectonic deformation but also climate fluctuations between glacial and interglacial ages. The composition of clasts of the Ramsau Conglomerate (61 % crystalline rocks, 24 % carbonates, 15 % sandstones) indicates primarily the provenance from the basement terrain of the Niedere Tauern. This transport from the southern side of the valley allows the assumption that the Enns valley was filled up to the present elevation of about 1100 meters; this also implies some northward tilting of the whole region. The channels of the southern tributaries change between flat and steep reaches. A suggested continuity of the southern planation surfaces and the top of the Ramsau Conglomerate (ca. 1100 m) presents a relictic former valley bottom. A planation surface of suggested

Riss/Würm interglacial age at altitudes of about 1100 m above sea level on northern and southern slopes of the Enns valley, allow estimating a surface uplift of about 2.5 mm/a. The steep slopes along the southern mountain front could be the consequence of neotectonism and glacial overdeepening. Morphological features like mountain front sinuosity, triangular facets, alluvial fans as well as geomorphic indices describing the shape the Enns valley (V–ratio, stream gradients, marked knickpoints) used to indicate the valley geometry, suspect evidence of active faulting and long-term tectonic activity. However, over-deepening can produce a geomorphology, which is quite similar to such of tectonically active areas. Our data call, therefore, for care on interpretation of geomorphological indices in formerly glaciated areas.

Palaeostress tensors deduced from slickensides and striae indicate the evolution of the valley from NW–SE strike–slip compression to N-S extension, from Oligocene to Late Miocene. Quaternary deformation of the Ramsau Conglomerate indicates NE-SW contraction and ESE-WNW extension consistent with recent seismicity.

References

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