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# The kinematic evolution and tectonic geomorphology of the active Lavanttal Fault System, Austria

Angelika Popotnig and Kurt Decker

Department of Geodynamics and Sedimenology, University of Vienna, Austria; angelika.popotnig@chello.at; kurt.decker@univie.ac.at

The NW-striking Lavanttal Fault-System with a total length of about 160 km is one of the most significant fault systems of the Eastern Alps. It formed during Miocene eastward extrusion due to N-S-directed shortening between the European foreland and the Adriatic plate and accumulated about 12 km dextral and several km vertical offset. The fault system consists of several right-stepping fault segments and a major releasing bend, which hosts the intra-mountainous Lavanttal Basin between the crystalline massifs of the Koralm and Saualm in the East and West of the basin, respectively. Seismological data such as epicentres of historical earthquakes aligned with the fault, fault plane solutions and macroseismic data with fault-parallel isoseismals strongly indicate that the fault is active. It is consequently considered as a seismogenic source in the SHARE database of active European faults.

Kinematic data from microtectonic structures collected from outcrops within the Lavanttal Basin and along the fault system indicate a complex fault history including older dextral strike slip faulting, which is dated to the Miocene (c. 17 – 10 Ma) by the growth strata of the Lavanttal Basin, and a younger (Upper Pannonian to Pliocene) phase of fault inversion with sinistral slip. Active deformation is again characterized by dextral strike-slip faulting as indicated by fault plane solutions and the newly acquired geomorphological data described below.

Geomorphological analysis focused on the releasing bend of the fault system around the Lavanttal Basin. Quantitative indices show marked differences between the crystalline massifs and the mountain-piedmont junctions East and West of the basin. Data indicate that youngest faulting occurred on the fault delimiting the basin from the Koralm Massif to the East. Differences of morphological features between the two mountain fronts include the relatively shallow slope and long meandering streams of the Saualm Massif, which contrast from the Koralm Massif with its generally steeper slope, straight and short streams and broad triangular facets. This data is supported by other geomorphological parameters including mountain-front-sinuosities and hypsometric integrals showing both, active strike-slip and normal faulting of the Koralm Massiv and relative uplift of the massif in the footwall at the releasing fault bend. The transverse topographic symmetry factor indicates a chronology of eastward tilting of the Lavantal Basin in the hangingwall of the fault followed by the deposition of alluvial fans derived from the footwall of the fault, which deflected the main river of the basin (Lavant River). The measured data also show that erosion counteracts uplift efficiently over time.