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New thermochronological constraints on late Miocene thrusting in the Subalpine Molasse: Local vs. orogen-scale observations

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The sedimentary archives and the tectonic history of foreland basins can be used to resolve the influence of deep-seated processes on mountain building. Its well-established history makes the northern Molasse Basin of the European Alps especially suited to chronicle the late stages of this collisional orogen. In this study, we present new low-temperature thermochronological data from the Subalpine Molasse in the Lake Thun area (Switzerland), which we compare to published age constraints from along the Alps in order to investigate the young exhumation history of the Subalpine Molasse of the European Alps.

Based on apatite (U-Th-Sm)/He thermochronology, we constrain events of thrusting in the Subalpine Molasse between 12 Ma and 5 Ma, thus occurring coeval to the main deformation phase in the adjacent Jura fold-and-thrust belt (Becker 2000) and to the main NW-directed thrusting phase in the Aar Massif (Herwegh et al. 2017). A comparison to similar studies from the Subalpine Molasse of eastern Switzerland and Bavaria (e.g. Ortner et al. 2015; von Hagke et al. 2012) show that this pattern of tectonic activity is, however, not unique to areas which are bordered by External Crystalline Massifs (ECMs; e.g. Aar Massif), but is consistent along the entire front of the Central Alps. This means that regardless of the hinterland's architecture, which is highly non-cylindrical along the Alpine chain, the foreland experiences major thrusting in the late Miocene and that thrusting in the Subalpine Molasse is through going. Hence, this late stage of deformation is therefore not necessarily spatially and kinematically restricted to the extrusion of ECMs. The orogen-scale occurrence of this late Miocene thrusting event thus suggests a driving force acting on a large wavelength, i.e. at the lithospheric scale. Despite this large-scale tectonic control, the locus of deformation on the local scale is strongly governed by the distribution of mechanically weak Molasse lithologies.

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