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Late Alpine to recent thick-skinned tectonics of the central Swiss Molasse Basin, Canton of Bern, Switzerland

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The Swiss Molasse Basin (SMB) forms part of the North Alpine Foreland Basin. It is a typical peripheral foreland basin, which developed in Paleogene and Neogene times in response to flexural bending of the European lithosphere induced by the orogenic loading of the advancing Alpine thrust wedge. The tectonics of the SMB and the role of Paleozoic and Mesozoic structures are still poorly understood. It is widely accepted that during the main deformation phase of the Jura fold-and-thrust belt, the SMB was riding piggy-back above a major detachment horizon situated within Triassic evaporites. In recent years it has been observed that the Jura fold-and-thrust belt is today deforming in a thick-skinned tectonic style. As for the western and central SMB, most authors still argue in favor of a classical foreland type, thin-skinned style of deformation.

Based on the geological 3D modeling of seismic interpretations, we present new insights into the structural configuration of the central SMB. Revised and new interpretations of 2D reflection seismic data from the 1960s to the 1980s reveal a major strike-slip fault zone affecting not only the Mesozoic and Cenozoic cover, but also the crystalline basement beneath. The fault zone reactivated late Paleozoic synsedimentary normal faults bounding a Permo-Carboniferous trough. Basement-involved thrusting observed in the southern part of the SMB seems to be controlled by the presence of slightly inverted Permo-Carboniferous troughs as well. These observations, combined with a compiled structural map and the distribution of recent earthquake hypocenters suggest a late stage, NNW-SSE directed, compressional thick-skinned and strike-slip dominated tectonic activity of the central SMB, post-dating the main deformation phase of the Jura fold-and-thrust belt. This still ongoing deformation might be related to the slab rollback of the European plate and the associated lower crustal delamination as recently suggested by Singer et al. (2014).

References:

Singer, J., Diehl, T., Husen, S., Kissling, E., Duretz, T., 2014. Alpine lithosphere slab rollback causing lower crustal seismicity in northern foreland. Earth Planet. Sci. Lett. 397, 42–56. doi:10.1016/j.epsl.2014.04.002