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Tectonics and Quaternary sequence development of basins along the active Vienna Basin strike-slip fault

B. Salcher (1), J. Lomax (2), B. Meurers (3), J. Smit (4), F. Preusser (5), and K. Decker (3)

(1) ETH Zürich, Switzerland (bernhard.salcher@erdw.ethz.ch), (2) Justus-Liebig-Universität Gießen, Germany, (3) Universität Wien, Austria, (4) Université Pierre and Marie Curie, France, (5) Stockholm University, Sweden

The Vienna Basin strike-slip fault is a continent scale active fault extending over a distance of some 300 km from the Eastern Alps through the Vienna Basin into the Western Carpathians. Sinistral movement causes the formation of several tight Pleistocene strike-slip basins within the older Miocene Vienna Basin. These sub-basins not only have a high relevance for groundwater exploitation but their fault activities depict serious seismic hazards. Basins are filled with fluvial sediments from the Danube and, closer to the Alpine front, with thick alluvial fan deposits. However, knowledge on the stratigraphy and tectonics is sparse and rather limited to the Miocene part of the Vienna Basin as it hosts giant hydrocarbon fields.

This study tackles two major questions: (i) What is the effect of Quaternary climatic oscillations and subsidence on the sequence development of the alluvial fans and (ii) what is the deformation style of these basins? To answer (i) we present a series of new OSL ages and biotic data from both, surface and cores, to better constrain the timing of fan activity, fan abandonment but also to constrain the onset of Pleistocene basin formation. For (ii) we utilize information from unparalleled geophysical and geological data. Specifically we utilize industrial Bouguer gravity's derivatives to highlight shallow structures and to compensate for the lag of fault trace information.

The integration of geological and geophysical data highlights textbook-like models of strike-slip basins, with typical features like Riedel shears with intervening relay ramps, en-echelon sidewall faults and a cross-basin fault zone delimiting opposite depocenters. The infill reflects a distinct cyclicity with thick sequences of coarse sediments deposited during colder periods and thin sequences of paleosol and flood sediments deposited during warmer periods. Ages indicate main activity around the short peak glacial periods and basin formation starting c. 300 ka ago. The distinct sequence development and the strong contrast to the underlying marine deposits is a very suitable setting to apply geophysical methods constraining basins' deformation style.