

## **Paleoseismological constraints for fault linkage of strike-slip and normal faults in the Vienna Basin**

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The interaction and kinematic linkage of single faults within a fault system is an important issue for estimating the seismic potential of a given fault system, and therefore influences also the seismic hazard. Faults can be either linked directly by merging in greater depths or by lateral growth or indirectly by influencing each other by stress loading and unloading due to earthquakes.

The Vienna Basin in Central Europe between the Alps and the Carpathians is formed by a transtensional fault system consisting of a main strike-slip fault, which delimits the basin towards the east, and from which six secondary splay normal faults branch out and cross the entire basin. They seem to be geometrically linked with the main NNE-SSW striking left-lateral strike-slip Vienna Basin Transfer Fault (VBTF) via a E-dipping detachment, the Alpine thrust fault. Moderate seismicity ( $I_{max}/M_{max} = 8-9/5.7$ ) is focused along the southern and northern tips of the VBTF, whereas there are almost no earthquake records for the central Lasee segment and the splay normal faults during the last  $\sim 500$  years. Geological and morphological data, however, document Quaternary movement at very slow vertical velocities of  $< 0.1$  mm/a for the normal faults and at horizontal velocity of 1-2 mm/a for the VBTF.

The question therefore is if the normal faults within the Vienna Basin are linked kinematically to the VBTF, and if so, what consequences this fact has for the regional seismic hazard. In order to address this question, the number of large earthquakes along each fault, the amount of displacement during single earthquakes as well as the recurrence intervals for each fault are key parameters. Therefore, we did paleoseismological investigations at the Lasee segment of the VBTF as well as along one of the splay normal faults (Markgrafneusiedl Fault, MF).

Correlation between three paleoseismological trenches across the MF revealed evidence for 5-6 major surface-breaking events during the last  $\sim 120$  ka that cut and offset gravels of a Pleistocene terrace of the Danube ( $\sim 290-230$  ka) in the footwall of the fault. Displacement estimates based on colluvial wedges and displaced layers lead to magnitude estimates ranging between  $M_w = 6.3$  and  $M_w = 7.0$ . In sum, the recurrence interval of severe earthquakes with magnitudes  $> 6$  at the MF is determined to 20-30 ka. Trenching along the VBTF show several faults dissecting the same Pleistocene Danube terrace. Based on displaced layers, tension cracks and colluvial wedges, at least 3 major earthquakes since  $\sim 90$  ka can be determined, with the most recent one occurring after  $\sim 40$  ka.

We compare the paleoseismological results with Quaternary slip rates derived from geomorphic and geological constraints. Thus, we can show that our data supports the hypothesis of a strongly linked fault system with the VBTF as the main driving force. Therefore, the normal faults also contribute to the seismic potential in the Vienna Basin and should therefore be considered in seismic hazard assessments.