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A seismic gap at the central Vienna Basin Transfer Fault (Vienna Basin, Austria)?

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The Vienna Basin Transfer Fault (VBTF), a NNE-SSW striking left-lateral strike-slip fault, is the dominant active tectonic structure within the Vienna Basin (Austria), a pull-apart basin between the Alps and the Carpathians. Moderate seismicity (Imax/Mmax = 8-9/5.7) is focused along the southern and northern tips of the VBTF, whereas there are almost no earthquake records during the last $\sim$ 500 years for the central part of the basin, the so-called Lassee segment close to the cities of Vienna (Austria) and Bratislava (Slovakia). Therefore, seismic slip rates calculated from cumulative scalar seismic moments for different segments along the fault are quite heterogeneous, varying from 0.5-1.1 mm/a at the southern and northern tips to the apparently seismically locked Lassee segment. Geological and morphological data, however, document horizontal Quaternary slip rates of 1-2 mm/a for the VBTF.

In order to address the ambiguity between long-term and short-term slip rates at the Lassee segment, we concentrated on the tectonically controlled western margin of a Pleistocene Danube terrace (200-300 ka), where the VBTF has produced a $\sim$ 25 m high scarp. Research presented here include interpretation of a LIDAR-based DEM, and paleoseismological trenching. Results from 3D trenching show several faults within the trenches dissecting the Pleistocene Danube gravel terrace. Based on displaced layers, tension cracks and colluvial wedges, at least 3 major earthquakes since $\sim$ 20 ka can be determined, with the most recent one occurring after $\sim$ 2500 years BP and reaching almost the present-day surface. In addition, channels from a small stream crossing the fault almost perpendicular are horizontally offset by $\sim$ 2 m. Considering this offset being the result of the last earthquake, slip along the VBTF seem to be accomodated by earthquakes with estimated magnitudes of $\sim$ 7 and return periods of several thousend years.

Therefore, the apparently seismically locked Lassee segment might represent a seismic gap along the VBTF. This result, together with the fact that additional en echelon arranged faults as part of the flower structure are still not investigated, indicate that the seismic potential of the Lassee segment in particular, and the Vienna Basin in general, might be much higher than historical seismicity suggests, and that the seismic hazard for Vienna and Bratislava should be reconsidered.