

A Quaternary fault database for the Vienna Basin

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The compilation of a comprehensive Quaternary fault database for the Vienna Basin area relies on the integration and synoptic interpretation of multiple independent data. Data comprises of industrial 2D and 3D reflection seismic, regional isopach maps of Quaternary sediments, tectonic geomorphological data, high-resolution near-surface geophysical surveys, outcrop and trench analyses. The database is further backed up by a detailed kinematical model for active faulting derived from seismic fault plane solutions, in-situ stress measurements in deep industrial boreholes, and geodetic data (GPS and precise leveling). Due to the limited accuracy of earthquake locations historical seismicity data proved to be of limited value for the identification and location of active faults.

The Quaternary fault map depicts a rough sinistral strike-slip fault system with several releasing and a major restraining bend. The releasing bends are linked to normal splay faults which merge with the strike-slip fault in a common detachment as indicated by reflection seismic. The thin-skinned nature of the fault system is corroborated by analogue models. Available data put tight constraints on 3D fault geometries, fault dimensions, fault segmentation of the strike-slip fault system, slip directions, and slip rates. The database currently comprises of 8 major normal faults with fault areas between about 180 and 690 km² corresponding to M_{max} of about 6.0 to 7.1. The strike-slip system includes 8 geometrical fault segments with fault areas of 130 to 430 km². M_{max} for single-segment ruptures range from about 5.8 to 6.6. M_{max} for multi-segment ruptures are estimated to reach 6.8 to 7.2. Slip rate estimates for the strike-slip system and normal branch faults vary between 1.5±0.5 mm/a and 0.03 to 0.13 mm/a, respectively.