



Active Fault Characterization in the Urban Area of Vienna

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The identification of active faults that lie beneath a city is of key importance for seismic hazard assessment. Fault mapping and characterization in built-up areas with strong anthropogenic overprint is, however, a challenging task. Our study of Quaternary faults in the city of Vienna starts from the re-assessment of a borehole database of the municipality containing several tens of thousands of shallow boreholes. Data provide tight constraints on the geometry of Quaternary deposits and highlight several locations with fault-delimited Middle to Late Pleistocene terrace sediments of the Danube River. Additional information is obtained from geological descriptions of historical outcrops which partly date back to about 1900. The latter were found to be particularly valuable by providing unprejudiced descriptions of Quaternary faults, sometimes with stunning detail. The along-strike continuations of some of the identified faults are further imaged by industrial 2D/3D seismic acquired outside the city limits.

The interpretation and the assessment of faults identified within the city benefit from a very well constrained tectonic model of the active Vienna Basin fault system which derived from data obtained outside the city limits. This data suggests that the urban faults are part of a system of normal faults compensating fault-normal extension at a releasing bend of the sinistral Vienna Basin Transfer Fault. Slip rates estimated for the faults in the city are in the range of several hundredths of millimetres per year and match the slip rates of normal faults that were trenced outside the city. The lengths/areas of individual faults estimated from maps and seismic reach up to almost 700 km² suggesting that all of the identified faults are capable of producing earthquakes with magnitudes $M > 6$, some with magnitudes up to $M \sim 6.7$.