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A 500-km long active extensional fault system in central Italy: defining a model of 3D seismogenic sources for PSHA applications.

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Geology-based methods for Probabilistic Seismic Hazard Assessment (PSHA) require information on the geometric, kinematic and energetic parameters of the major seismogenic faults. In this paper, we define a model of 3D seismogenic sources for a regional extensional fault system which extends for about 500-km across northern Italy from Lunigiana, in northern Tuscany, to Val di Sangro in southern Abruzzo. The fault system mainly consists of SW-dipping normal faults developed within the hanging wall of an east-dipping low-angle detachment system, which has been named Etrurian Fault System. Our approach is structural-seismotectonic: we integrate surface geology data (trace of active faults, i.e. 2-D features) with seismicity and subsurface geological–geophysical data (3-D approach). A fundamental step is to fix constraints on the thickness of the seismogenic layer and deep geometry of faults: we use constraints from the depth distribution of aftershock zones and background seismicity; we also use information on the structural style of the extensional deformation at crustal scale (mainly from seismic reflection data), as well as on the strength and behaviour (brittle versus plastic) of the crust by rheological profiling. Geological observations allow us to define a segmentation model consisting of major fault structures separated by first-order (kilometric scale) structural-geometric complexities considered as likely barriers to the propagation of major earthquake ruptures. We name "seismogenic boxes" the plan projection of such major active structures. For each of them we evaluate the maximum magnitude of the expected earthquake (M_{max}). We compare three different estimates of M_{max}: (1) from association of past earthquakes to faults; (2) from 3-D fault geometry and (3) from geometrical estimate "corrected" by earth-

quake scaling laws. From northern Tuscany to southern Abruzzo we have identified and parameterised more than 35 boxes which are responsible or capable of experiencing earthquakes with M$\geq$5.5. These boxes lie within the boundary of the EFS extensional seismogenic province, whose background and moderate seismicity (M$\sim<$5.5) is also considered.