3D numerical model of the kinematics and dynamics of the Marmara Sea region for seismic hazard assessment

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The 1999 Izmit earthquake is supposed to be a precursor of an expected future earthquake beneath the Sea of Marmara about 20 km south of the city of Istanbul. During the last decade earthquake hazard in this region has been investigated by several approaches based on Coulomb failure stress changes, earthquake recurrence rates, geodetic analyses, seismic moment-frequency relationships, and others. In our work we present for the first time a geometrically complex 3D numerical model for the stress evolution (Finite Element). In a first step we focus on the impact of structural variations in the Marmara region on the stress field. The model includes the 3D fault system with Coulomb friction on these so-called contact surfaces, topography, bathymetry, basement and Moho structure. The model is driven by gravity and kinematic boundary conditions on the model sides and from below accounting for the tectonic loading. In order to validate our model we compare the model results with GPS data, fault slip rates, stress orientations and stress regime from earthquake focal mechanisms. We present preliminary modelling results in comparison with the aforementioned independent observations.