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3-D Modelling of wave propagation in the Marmara Sea region resulting from M7+ events

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Wave propagation in the Marmara region (Turkey) due to the rupture of the Marmara Sea segments of the North Anatolian Fault is modelled in 3-D. The velocity model and the fault properties are the most important ingredients of wave propagation models. Detailed data about the fault geometry have recently been acquired as a result of a series of campaigns in the Marmara Sea following the Kocaeli earthquake of 1999. On the other hand, only 2-D tomographic seismic velocity images based on seismic refraction studies along NS and EW trending profiles exist for locations such as Eastern Marmara, Central highs, Cinarcik basin etc. Using available information, we have constructed a velocity model of the Marmara Basin. We focus on the Northern Marmara that includes Istanbul and vicinity, since it is there, where a future earthquake is expected to cause most of the damage. Seismic wave propagation around the fault is modelled using a 4th order staggered grid finite difference method. We consider several plausible fault geometry and rupture scenarios and look at the effect of the basin structure on wave propagation and on surface ground motion, which are in turn compared with the results from a 1-D velocity model. We study the variability of ground motion in the area resulting from different models of rupture propagation and from amplification due to basin response.