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Kinematics of the Sea of Marmara using GPS, InSAR and underwater geodetic data: Possible Influence of Crustal Heterogeneity

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Seismological studies on the western part of the North Anatolian Fault (NAF) revealed the possibility that it may constitute a bimaterial interface at various locations. One evidence for this came from Karadere and Mudurnu segments where Fault Zone Head Waves (FZHW) and Fault Zone Reflected Waves (FZRW) indicated bimaterial interfaces and damage zones of various depth ranges. These were often interpreted as factors affecting various aspects of rupture propagation velocities and rupture lengths. In addition, the difference in crustal structure between the northern shore of the Sea of Marmara and the deep basins may result in an effective rigidity contrast across the Main Marmara Fault, at least in its Eastern part from Kumburgaz Basin, to the entrance of Izmit Gulf. This could result in reduced elastic loading of the northern block, leading to an underestimation of slip deficit in geodetic models. However, the problem was never looked at using multiple constraints at the same time such as the GPS, InSAR and underwater geodetic data. In this study we use the interseismic slip distribution on the westernmost section of the NAF (comprising largely the Main Marmara Fault and the bifurcation zone to the east of the Izmit Gulf) obtained using a block model as a reference model and use a finite element model to test the perturbations to this model as a function of the elastic moduli contrasts across the fault. We are testing the case where there is a bimaterial interface all the way from Izmit Gulf to Kumburgaz and then a lack of such a contrast in the Central Basin. We are also investigating a scenario where the Ganos region also has bimaterial interface (but reverse in its nature).