On 12 November 1999, an earthquake of moment magnitude 7.1, Io=X (MSK) occurred on Duzce Fault, in the eastern part of the Marmara Region just 3 months after Kocaeli (Mw7.4) Earthquake. We examined the source model of Duzce event using 3 strong motion data, taken place in eastern and western side of the fault rupture within the radius of 65 km. We performed the simulation by the method of Irikura (1986) which essentially uses the small events as empirical Green’s function and sums them up to follow the omega-squared scaling law. The best source model was decided by fitting synthetic acceleration, velocity and displacement traces to observed waveforms. Since there is no information about the mechanism of the element event used as green’s function, it is assumed that the source mechanism of the main and element events are the same.

Even though the length of rupture area was calculated as approximately 20km by 40 km based on surface rupture observation as well as aftershock distribution, the strong motion generation area might be relatively smaller compared to the previous estimations. The size of the asperity was calculated as about 10.5km x 17.5km. The rupture started at the western bottom of the asperity and propagated radially from the hypocenter. Regarding the S-P time calculation of the Bolu (BLU) Station data, the possibility of existence of super shear velocity in eastern side of the fault was suggested by Bouchon et.al. (2001). In the calculation, the asperity is treated in two parts and rupture propagation velocity were taken as 2.8km/s and 3.5km/s (equals to S wave velocity) for western and eastern parts, respectively. Since the best waveform fitting were obtained for BOL station using higher rupture velocity, the possibility of super-shear rupture propagation was considered. However there is no other eastern station to verify this phenomenon.

References: