# Source Modelling of the 2010 Elazığ / Turkey Earthquake

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Source modelling of the March 8, 2010 Elazığ/ Turkey Earthquake (Mw:6) was performed by the Empirical Green's Function Method to estimate size and location of an asperity and average rupture velocity inside the asperity. This is the largest earthquake that occurred at the Bingol-Elazığ Segment of the East Anatolian Fault Zone since 1971 Bingöl Earthquake (Mw:6.8). Elazığ Earthquake affected mainly rural areas of the city. 30000 people were affected from the earthquake and 42 people lost their lives.
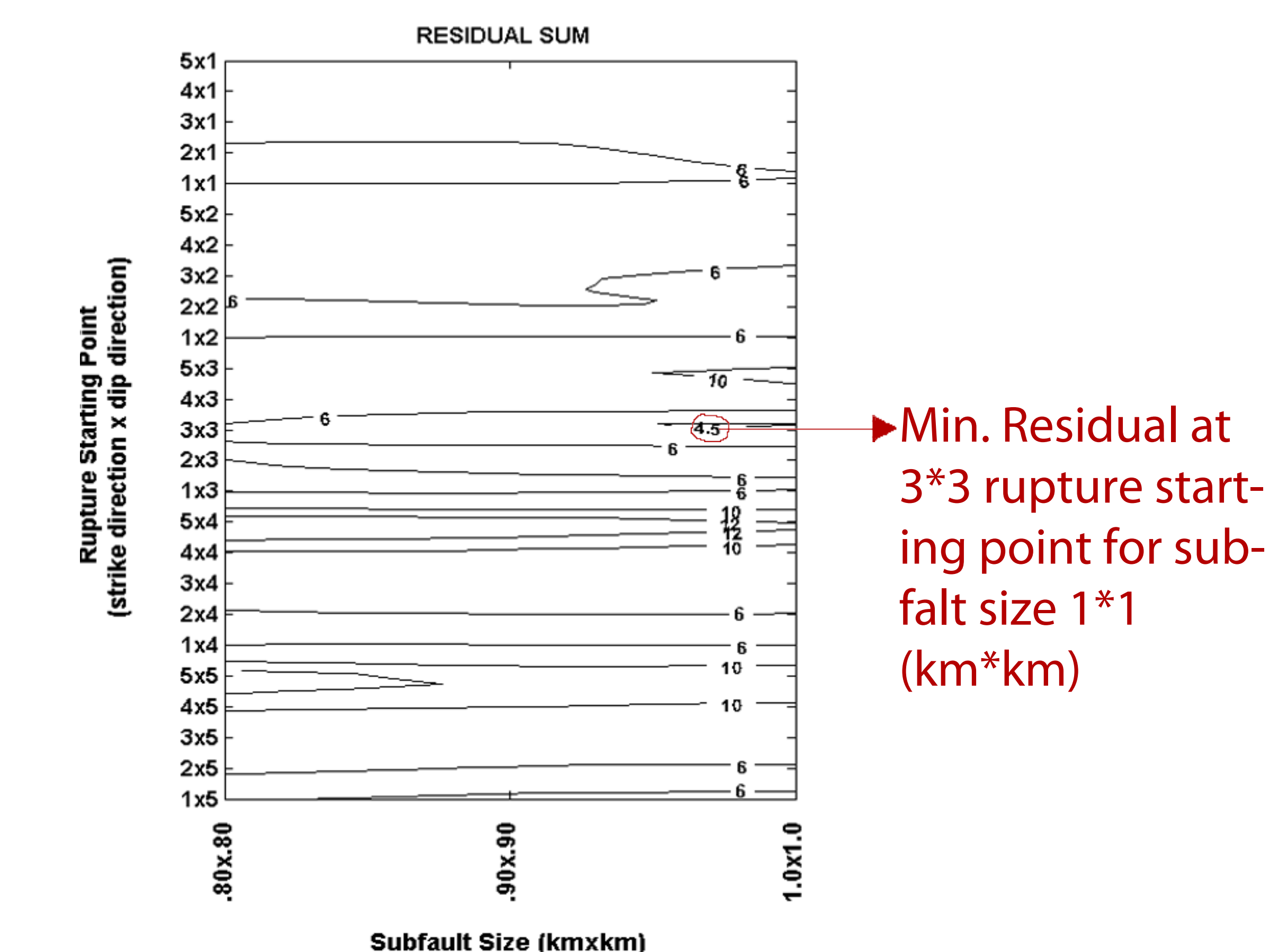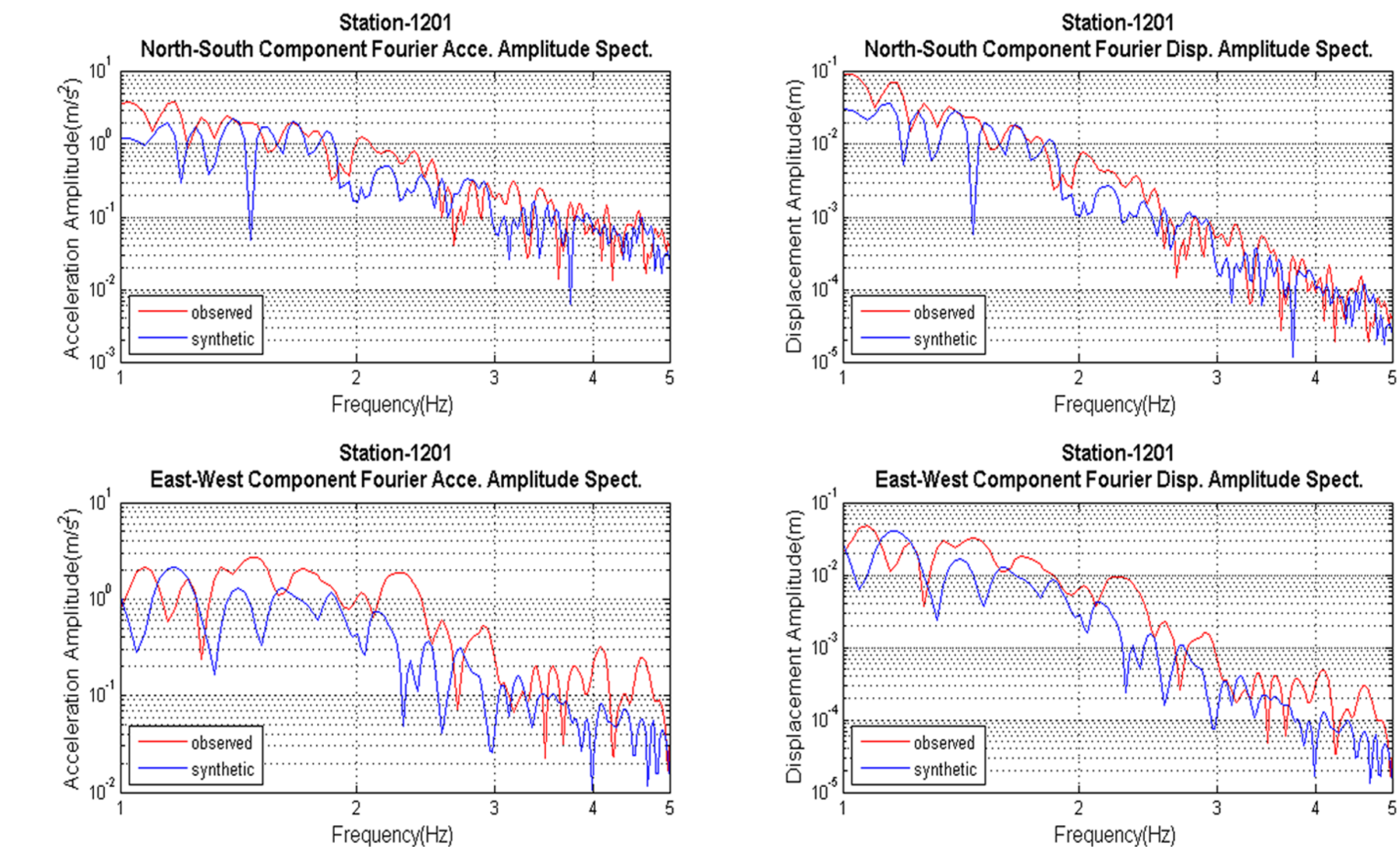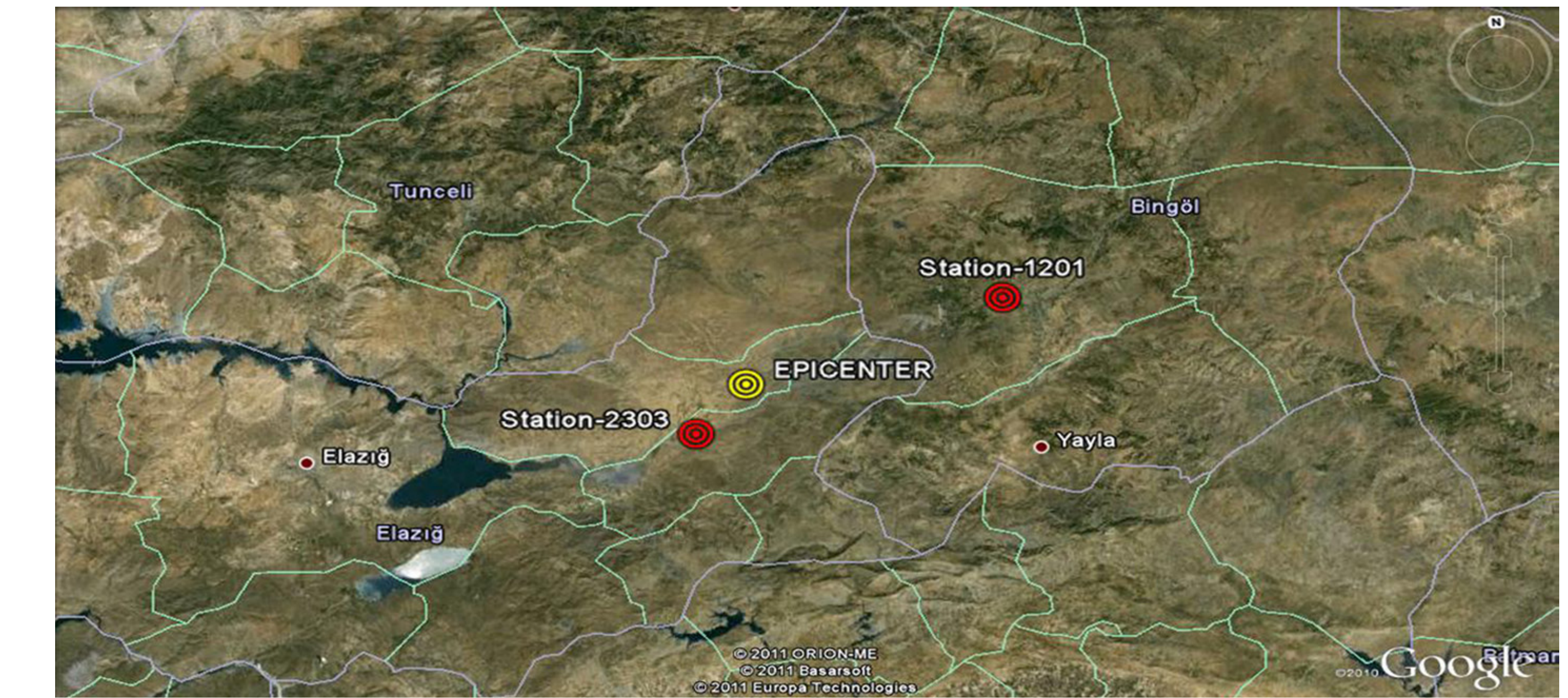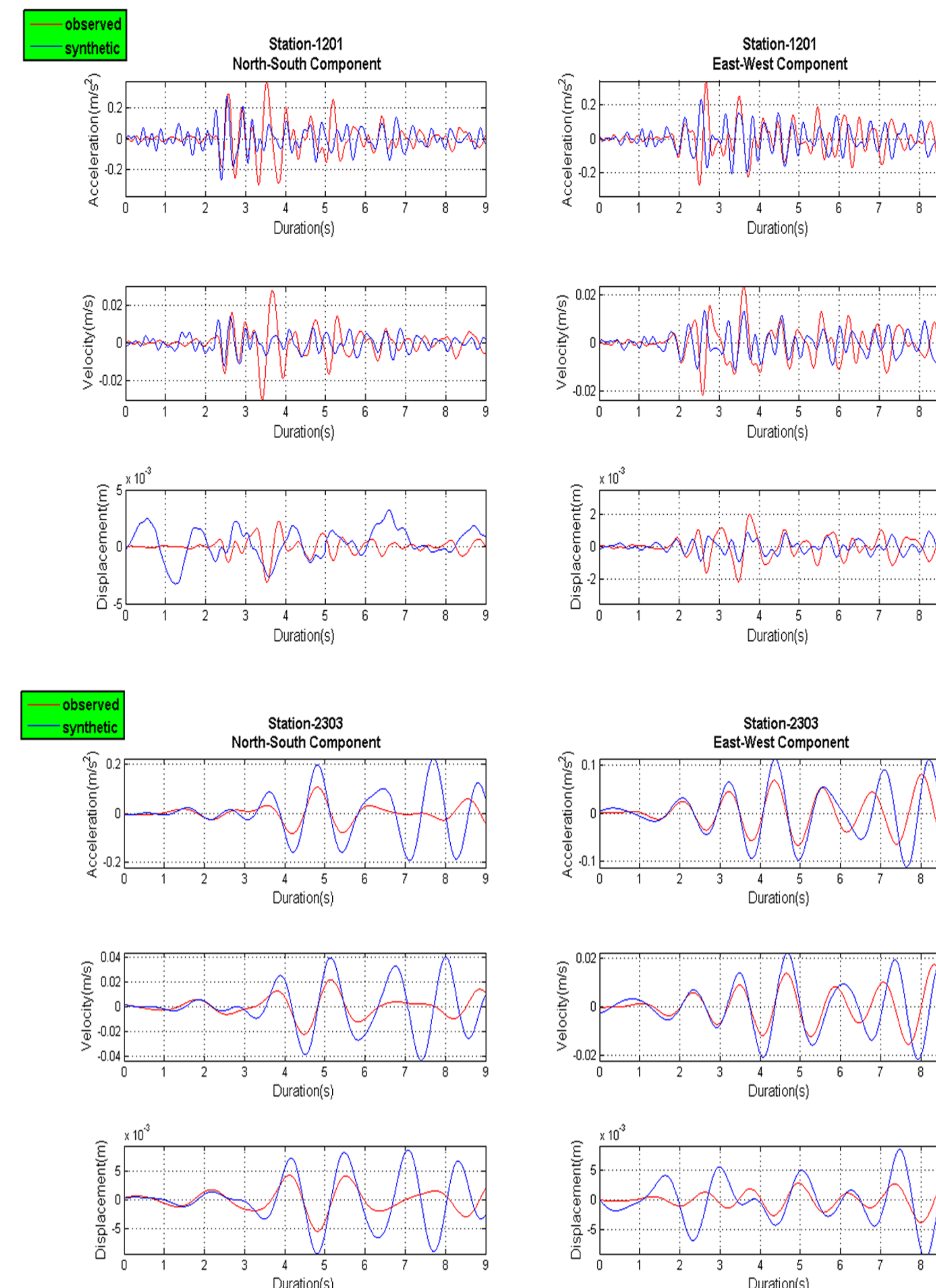
In order to simulate mainshock of Elazığ Earthquake, strong motion records of one aftershock (Mw:4.9) recorded at 1201 and 2303 stations were utilized. The depth of the target and element events is 4 km and 6 km, respectively. N and C values which are seismic moment scaling parameter and stress drop ratio between mainshock and aftershock are calculated 5 and 2, respectively through spectral analysis of S-wave portion of records. Due to the noise contamination on the records, simulation was carried out for different frequency intervals for stations. Frequency range of the simulation wass limited to 1 Hz - 5Hz for 1201 station and 0.5 Hz-1 Hz for 2303 station. A single asperity area was assumed throughout the calculation.

Asperity size, rupture starting point and rupture velocity inside the asperity has been changed by performing several simulation and final values were decided based on minimum residual values of synthetic and observed displacement time series. Results indicated that rupture propagated inside the asperity with sub-shear velocity that equals 2.8km/s. The asperity area was calculated as 25 km2 and hence, rupture area of the earthquake was estimated as 114 km2 from self similar source scaling relationships. Those values are in line with the Somerville's self similar scaling relationship (asperity area and rupture area are 20.125 km2 and 124 km2, respectively).

|  | Target Earthquake | Aftershock |
|---|---|---|
| Longitude | 40.02950E | 40.00600E |
| Latitude | 38.77520N | 38.74680N |
| Depth | 4 km | 6 km |
| Mw | 6 | 4.9 |
| Mo | 1.30E+25 dyn.cm | 2.20E+23 dyn.cm |

| Source Model of Target Earthquake | |
|---|---|
| Asperity Area | 25 $km^2$ |
| Rupture Area | 114 $km^2$ |
| Vr | 2.8 km/s |
| Rise Time | 1.5 sec. |









→Min. Residual at 3*3 rupture starting point for sub-falt size 1*1 (km*km)

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