A NEW APPROACH TO REGIONAL EARTHQUAKE CATALOGS THAT YIELDS MINIMAL LOCATION BIAS AND WELL-CHARACTERIZED UNCERTAINTIES: APPLICATION TO THE ISPARTA ANGLE IN SOUTHWESTERN TURKEY

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The Isparta Angle in southwestern Turkey is one of the most tectonically and geologically complex areas in the eastern Mediterranean and Middle East. It has experienced several destructive historical and instrumental earthquakes [1915 (M 7.0), 1957 (M7.1), 1971 (M6.2), 2000 (M6.0), 2002 (M6.5)], many of which have shallow extensional mechanisms, reflecting the influence of northward subduction of Mediterranean oceanic crust along the Hellenic trench and the Cyprus arc. However, these normal faults exhibit a puzzling variety of orientations from NW-SE, through N-S, to NE-SW, and the role of strike-slip or transtensional faulting is controversial, particularly along the western and eastern boundaries of the Isparta Angle. In this study, we investigate the seismicity in this region using a new two-step process. First, we relocate two (north and south Isparta clusters) sets of clusters of earthquakes (Figure 1) that are especially well-recorded, using a calibrated earthquake relocation method based on the Hypocentroidal Decomposition (HD) method. Preliminary results suggest that events in the northern cluster have absolute epicenter accuracies of 2-3 km, and hypocenter depths of 9-11 km with errors less than 2km. However, clusters to the south (Figure 2), have events with higher location errors (>5 km) due to the poor azimuthal coverage and also include much deeper events. After having stable locations for these best quality events, they will be used as calibration events to relocate less well-recorded older earthquakes.The calibrated epicenters from HD analysis are then used as prior constraints in a multiple-event relocation algorithm (Bayesloc) that is better suited to larger data sets spread over a greater area, to develop a seismicity catalog for the entire Isparta Angle region that has well-characterized uncertainties and minimal location bias. Our improved relocations provide insights into the kinematics of the faulting in the Isparta Angle and hence new constraints on the active deformation of western Anatolia, in turn providing a greatly improved basis for research into seismic hazards in the region.

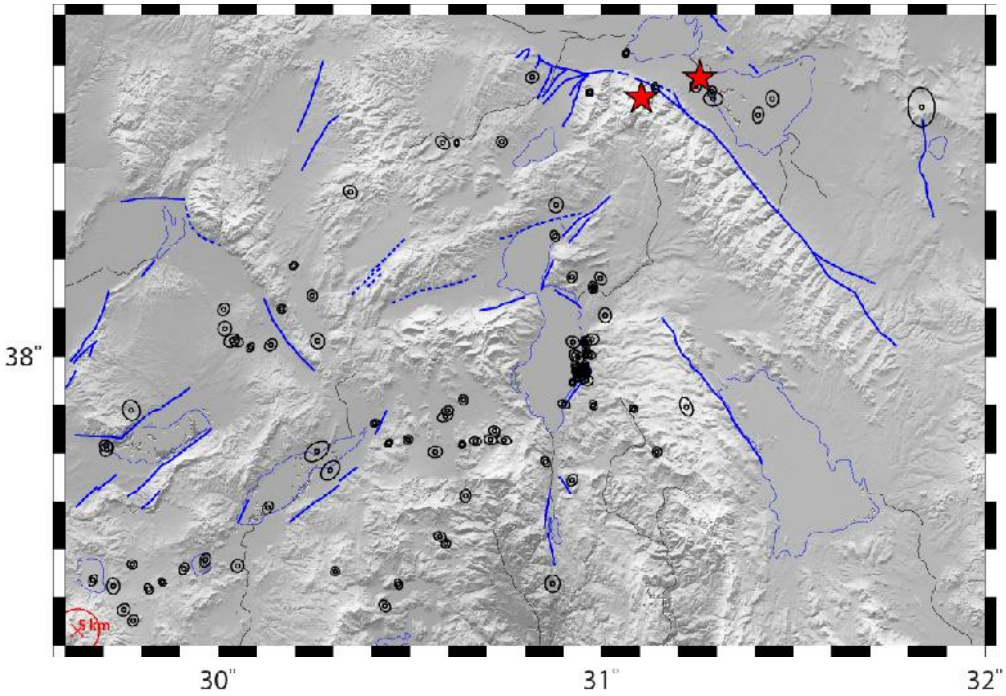

Figure 1. Epicenters of earthquakes in the northern Isparta cluster. Each location is shown with its 90 per cent confidence ellipse. Events with stars denote earthquakes with GCMT focal mechanisms. Arrival-time data is taken from International Seismological Centre (ISC)

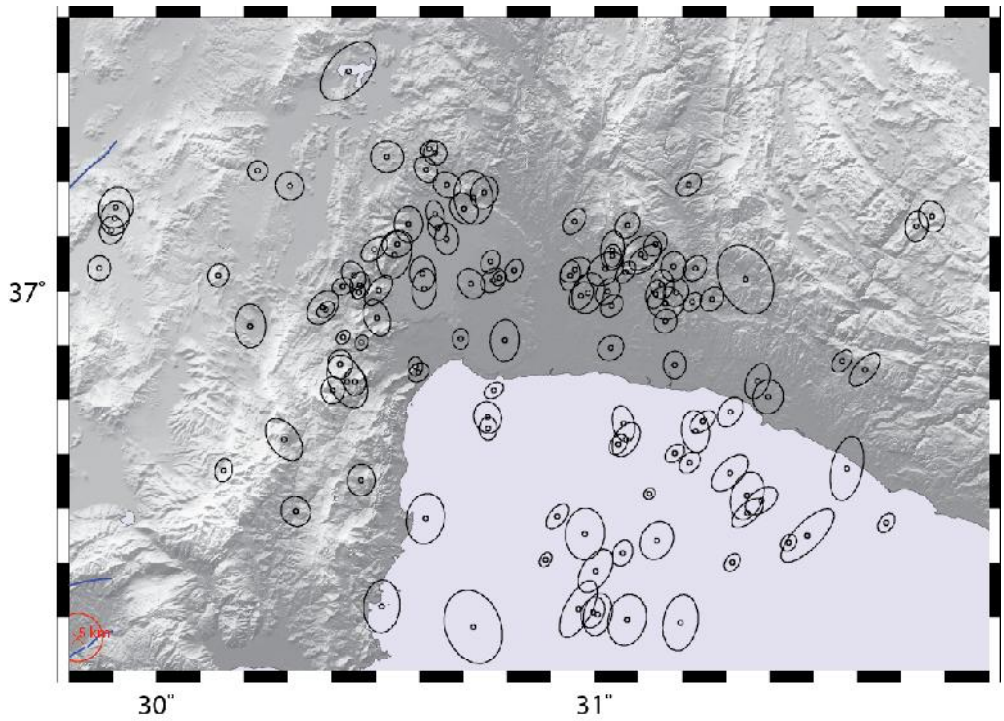

Figure 2. Epicenters of earthquakes in the southern Isparta cluster. Each location is shown with its 90 per cent confidence ellipse. Events with stars denote earthquakes with GCMT focal mechanisms. Arrival-time data is taken from International Seismological Centre (ISC)