REASSESSMENT OF FIFTY YEARS OF SEISMICITY IN SIMAV-GEDIZ GRABENS (WESTERN TURKEY), BASED ON CALIBRATED EARTHQUAKE RELOCATIONS

Ezgi KARASOZEN
Department of Geophysics, Colorado School of Mines, Golden, CO, United States.
ekarasoz@mines.edu

Edwin NISSEN
Department of Geophysics, Colorado School of Mines, Golden, CO, United States.
enissen@mines.edu

Eric BERGMAN
Global Seismological Services, Golden, CO, United States.
bergman@seismo.com

Keywords: Seismicity and Tectonics, Earthquake Relocation, Interferometry, Normal Faults

ABSTRACT

Western Turkey is one of the most seismically active and rapidly deforming continental regions with a long history of large normal faulting earthquakes. However, the locations and slip rates of the responsible faults are poorly constrained. Here, we reassess a series of large earthquakes in the Simav-Gediz region, an area exhibiting a strong E-W gradient in N-S extension rates, from low rates bordering the Anatolian Plateau to much higher rates in the west. We start by investigating a recent Mw ~ 5.9 earthquake at Simav (19 May 2011) using Synthetic Aperture Radar interferometry (InSAR), teleseismic body-waveform modeling and field observations. This event provided the impetus to reassess older instrumental events in the region using a calibrated earthquake relocation method based on the hypocentroidal decomposition (HD) technique. These improved locations in turn provide an opportunity to reassess the regional tectonics. One interesting aspect of these earthquakes is that the largest (the Mw 7.2 Gediz earthquake, March 1970) occurred in an area of slow extension and indistinct surface faulting, while the well-defined and more rapidly extending Simav graben is associated with several smaller Mw 5.0 – 5.9 events. Since the faulting is so poorly characterized, the risks posed to nearby cities are also little understood. Whilst our geographical focus is on western Turkey, the strategy we employ in this study could potentially be exploited in other areas in which poorly understood, early instrumental events warrant reinvestigation.

1. INTRODUCTION

Western Turkey is a rapidly-extending continental region with a long history of destructive normal faulting earthquakes including several large instrumental events. It is bound by the right-lateral North Anatolian fault to the north, the Anatolian plateau to the east, the Cyprus Arc and Hellenic Trench to the south, and the Aegean Sea to the west. GPS velocities show maximum N-S extension rates of ~30 mm/yr along the Aegean coastline at a longitude of ~27°E, diminishing to zero east of ~32° E (Aktug et al., 2009).