



Small Scale Fault Interactions: The 2017 Ula (Muğla) Earthquake sequence

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In 2017, a series of earthquakes affected southwestern Turkey with the July 21, 2017 Mw 6.6 Bodrum-Kos earthquake to the west of the Gökova Bay being the largest one. Within the same year, three separate moderate sized events took place on the eastern edge of Gökova Bay near the town of Ula (Muğla). This area is a part of an extensional regime and characterized by normal fault systems. The first and the easternmost of the earthquakes which occurred on April 13 (Mw 5.0) and 178 aftershocks were recorded until the end of this month. The second earthquake occurred on November 22 (Mw 5.0) about four months after the Bodrum-Kos earthquake, 4 km west of the previous earthquake. The last event of the sequence took place two days later on November 24, 2017 (Mw 5.1). Until the end of 2017, a total 465 aftershocks were recorded. Based on their locations, the last two events occurred to the west of the April event and the preliminary analysis showed that this sequence can be related with propagation of the seismic activity from east to west.

In this study, we first analyzed the aftershocks belonging to this sequence by relocating them using the double difference algorithm using both catalog travel times and waveform correlation. Source mechanisms of the events are then estimated by utilizing the generalized Cut and Paste method (gCAP) for regional body and surface waveform inversion. Surface deformations of April and November earthquake sequences were obtained from both descending and ascending orbits of the Sentinel-1 A/B satellites. But, the 22-24 November earthquakes cannot be observed separately, because of the 11 days repeat cycle of the Satellites. The modeling results show that the events occurred on a south dipping EW trending fault, at shallow depths (<5km) and the dip angles of the 22-24 November events are 74 and 56 degrees, respectively.

In order to assess the role of stress transfer between 2017 earthquakes, Coulomb stress analysis was performed and the possibility of any stress transfer effect between Bodrum-Kos earthquake and Ula earthquake zones were explored. Space and time correlations show that stress interaction can be possible.

Results from seismology and geodesy both indicate that the 2017 activity occurred along a previously unknown normal fault instead of the southeastern branches of the nearby Muğla Fault as proposed earlier. The new fault structure, which was recently mapped by Akyuz et al. (2018) on the surface follows the trend of active faults in Gökova Bay to the east and could shed light on the active tectonics of the Gökova fault zone.

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