Seismotectonic setting of Santorini-Amorgos zone and the surrounding area revealed from crustal earthquakes relocation and Vp/Vs distribution

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The Santorini-Amorgos zone represents right-lateral transtensional regime from NE of Santorini to the south of Amorgos which also hosts Kolumbo submarine volcano. A total number of 1869 crustal events from 2002 to 2019 were recorded by permanent and temporal seismic networks deployed in southern Aegean. Absolute locations of these events were obtained by utilizing the probabilistic nonlinear algorithm NonLinLoc. Precise relative relocation by using double-difference algorithm with catalog and cross-correlation differential times was later performed, resulting in 1455 locations with horizontal and vertical uncertainties of less than 0.3 km. Clusters of earthquakes relocated between Naxos and Paros as well as north of Astypalaia do not coincide with any fault in the area. Similarly, the relocated crustal events across Santorini-Amorgos zone show that most of the earthquake clusters do not coincide with any of the existing faults. The distribution of Vp/Vs ratios in the area were investigated based on the P and S-wave travel times of all the events. Vp/Vs ratios in the area vary between 1.67 and 2.03 with errors less than 0.04. The highest Vp/Vs values were found to be distributed in the area between Naxos and Paros. Other areas with notably high Vp/Vs ratio are north of Santorini, Anydros, west of Amorgos, offshore area south of the easternmost tip of Amorgos, and the island of Astypalaia. These mentioned areas were also rich in seismic activities during the period of study. The high Vp/Vs ratios in the region of high seismicity signifies that these events were likely related to the migration of magmatic fluids to the surface and may not be caused by the existing faults.