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Debris Avalanches along the South Aegean Volcanic Arc

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Several hummocky deposits have been discovered along the Aegean Volcanic Arc using multibeam bathymetric mapping, airgun seismic profiling, side scan sonar survey and ROV dives. In particular, these hummocks have been discovered on the submarine flanks of Antimilos, Santorini and Nisyros volcanic islands:

(i)The seabed morphology of the area northeast of Antimilos exhibits a rather irregular small-scale rough relief and an assembly of three hills in the form of volcanic domes with decreasing size eastwards. The seabed topography and the character of the backscattered intensity of the small scale morpho-bathymetric features, led us to interpret them accordingly as submarine volcanic debris avalanche, flows, domes or dikes, analogous to the on-land outcropping volcanic features.
(ii) Analysing of geophysical data shows that hummocky seafloor features on the eastern flank of Santorini volcano cover an area 6 Km wide by 20 Km long and up to 75m in thickness in the central region where the highest concentration of hummocky deposits occur. The hummocks are composed of several individual blocks that are a few meters to hundreds of meters in diameter and protrude up to tens of meters from the surrounding seafloor. The total volume of the deposit is estimated to be approximately 4.4×109 m3 as a result of multi-stage landslide event.
(iii) The hummocky topography on the sea bottom in front of the southeastern Nisyros coastline is characterized by numerous hills and longitudinal ridges which cover a tongue-shaped area in plan view (about 16 km2), elongated towards SE. The overall morphology of this area can be viewed as a large deposit from a volcanic debris avalanche with a seaward termination displaying an irregular pattern characterized by elongated lobes. The source of these hummocks may be found in Nikia lava flow in the south-eastern flank of Nisyros volcano.

The above described hummocks are the result of debris avalanches that were triggered during Holocene either by large earthquakes or volcanic eruptions. Debris avalanches are one of the most significant causes of dangerous hazards in coastal volcanic environments. Understanding how these events are triggered and the potential dynamics of future events is of utmost importance, particularly in highly populated regions such as the Aegean.