Geophysical Research Abstracts
Vol. 21, EGU2019-1625, 2019
EGU General Assembly 2019

Preliminary Geologic Mapping of the Santorini Volcanic Group Submarine Geomorphology Using Planetary Geologic Mapping Methods

Alexandra Huff (1), Paraskevi Nomikou (2), Lisa Skinner (3), and Emilie Hooft (4)

(1) Fulbright Greece, Fulbright US Student Program, Greece (ahuff@usgs.gov), (2) Faculty of Geology and Geo-Environment, National and Kapodistrian University of Athens, Greece, (3) Division of Geosciences, Northern Arizona University, USA, (4) Department of Earth Sciences, University of Oregon, USA

The Santorini Volcanic Group (SVG) is the most volcanically active region within the Hellenic Volcanic Arc and is composed of a southwest-northeast trending series of Christiana-Santorini-Kolumbo volcanic centers. There is a range of volcanic, seismic, hydrothermal, and mass-wasting activity across the SVG, with modern activity concentrated on the seafloor [1]. Subsequently, risk assessments of volcanic activity and natural hazards derived from the SVG cannot be restricted to onshore evaluations but also requires the collection and analysis of high-resolution swath data. The Planetary Geologic Map Coordination Group at the United States Geological Survey (USGS) Astrogeology Science Center has developed and documented a methodology for using remotely-sensed data to produce geologic maps of planetary bodies that is rooted in mapping and interpreting planetary surface morphologies [2]. As part of a Fulbright Research Fellowship, we investigated the application of these planetary geologic mapping methods to bathymetric data in generating an onshore-offshore geologic map of the SVG to support future risk assessments of this area [1]. Herein, we present the preliminary application of planetary geologic mapping methods to the SVG submarine geomorphology.

We created a 1:100,000-scale offshore geologic map using a synthetic hillshade basemap generated from a 20 m/pixel resolution digital elevation model (DEM) [1]. For areas outside this DEM footprint we used 107 m/pixel resolution EMODnet bathymetry data. Supplemental data included published onshore geologic maps and observations from Remotely Operated Vehicle (ROV) surveys [3]. To map seafloor geology, we began by identifying and mapping features and units at a scale of 1:25,000 based on morphology and topographic expressions. We then interpreted lithology through a combination of (1) extending onshore lithology offshore, (2) incorporating established lithologies from previous submarine geologic investigations, and/or (3) extrapolating the lithology of known outcrops from 1-2 to similar geomorphologic features and units that were initially mapped. Based on preliminary mapping, we expect the offshore SVG geologic map to include, but not be limited to, the following linear features: ridge crests, troughs, scarp bases, scarp crests, channels, and faults. Additionally, we expect the geologic map to include units such as basement promontories, transitional sediments, debris aprons, basin infill, Christiana volcanics, Kameni lavas, Minoan pyroclastics, Kolumbo volcanics, and mass-wasting deposits. Per the planetary geologic mapping methodology, the geologic units used in this map will be based on primary and secondary characteristics observed in the DEM data, e.g., lithology, depositional facies, morphologic character, erosional or modificational features, and topographic expression.

The identified geologic unit names reflect different descriptive categories and future work will involve developing a consistent naming convention and unit organization that accurately and clearly represents the SVG geology. Additionally, the completed geologic map will be correlated with seismic profiling results to assess the accuracy and limitations of employing this planetary geologic mapping methodology in a submarine setting.

[1] Hooft E.E.E. et al. (2017) Tectonophysics, 712-713.
[2] Skinner J.A. et al. (2018) https://astropedia.astrogeology.usgs.gov/alfresco/d/d/workspace/SpacesStore/01e32dcd-3072-4ac2-8e41-7cc5029bd2cf/PGM_Protocol_March2018.pdf.
[3] Nomikou P. et al. (2012) Global & Planet. Change, 90-91.