

EGU21-1702

<https://doi.org/10.5194/egusphere-egu21-1702>

EGU General Assembly 2021

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



Chronostratigraphic Analysis of the Evolution of the Christiana-Santorini-Kolumbo Volcanic Field

Jonas Preine¹, Christian Hübscher¹, Jens Karstens², Paraskevi Nomikou³, Timothy Druitt⁴, and Dimitris Papanikolaou³

¹University of Hamburg, Institute of Geophysics, Hamburg, Germany (jonas.preine@uni-hamburg.de)

²GEOMAR - Helmholtz Zentrum für Ozeanforschung, Marine Geophysics, Kiel, Germany

³National and Kapodistrian University of Athens, Athens, Greece

⁴Laboratoire Magmas et Volcans, Université Clermont-Auvergne CNRS IRD, Clermont Ferrand, France

The Christiana-Santorini-Kolumbo (CSK) volcanic field in the South Aegean Sea is one of the most active volcanic-tectonic lineaments in Europe, having produced numerous explosive eruptions, catastrophic earthquakes, and disastrous tsunamis in the past 350,000 years. The present-day Santorini caldera is located in the centre of the NE-SW trending CSK field, which extends for more than 60 km from the extinct Christiana volcano in the southwest to the active submarine Kolumbo volcano northeast of Santorini. While the onshore architecture of Santorini has been well studied, little is known about its offshore architecture. Further, the past volcanism of Kolumbo is only known for its last eruption in 1650 AD and that of Christiana is completely unknown. Based on the available onshore datings of the volcanic formations, it has been proposed that volcanism in the CSK field initiated at Christiana, then migrated northeast towards Santorini and later to Kolumbo. This, however, has yet to be confirmed by offshore investigations. To fully constrain and understand the initiation and evolution of volcanism in the CSK field, we combine an extensive collection of high-resolution multichannel and vintage seismic data covering the entire zone.

With these seismic profiles, we are able to (1) correlate the seismo-stratigraphy of the Christiana basin west of Santorini with that of the Anhydros Basin east of Santorini, (2) identify major phases of extrusive and intrusive activity of individual volcanic vents, and (3) establish a regional chronostratigraphic framework in which we chronologically integrate these phases. We conclude that volcanism occurred repetitively during distinct phases of activity, which are separated from each other by periods with little or no volcanic activity. The onset of volcanism occurred without the generation of significant pyroclastic flows and was mainly characterized by shallow intrusions, clearly visible at Christiana, at its neighbouring volcanic cones, and at the southwestern flank of Akrotiri. The next phase saw the formation of the Kolumbo Volcanic Chain in the Anhydros Basin and the formation of sill intrusions in the Christiana Basin, which we find below a chaotic, presumably pyroclastic unit. This was followed by a major regional event on Santorini, during which a thick transparent subunit was deposited in all surrounding basins. The most recent phase was dominated by the volcanoclastic deposits from Santorini's eruptive cycles and the recent eruption of Kolumbo. Using estimates of sedimentation rates, we convert this chrono-stratigraphic

scheme into an approximate timeline, which implies that the initiation of volcanism occurred during Late Pliocene to Early Quaternary - much earlier than revealed by onshore dating.