

# **Marine Sediment Trace Elements Record Past Hydrothermal Events in the Christiana-Santorini-Kolumbo (CSK) volcanic field, Greece**

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Volcanism along the Hellenic volcanic Arc has continued for 4.7 Ma and left an extensive marine sediment record of past eruptions. All the volcanic centres of the present-day arc have active hydrothermal systems, discharging metal(loid)-rich fluids into the marine environment. However, the history and evolution of these hydrothermal systems, and their relationships to episodes of volcanic activity remain unresolved. To better understand the relationship between volcanic eruptions and the activity of hydrothermal fields in the Christiana-Santorini-Kolumbo (CSK) volcanic field, we conducted lithological and chemical analysis of samples from sub-seafloor sediment drill-cores that were collected during International Ocean Discovery Program (IODP) Expedition 398 in 2023. Samples from three holes within Santorini's caldera (at one site U1595), and one hole (U1599C) that penetrated deep within the volcano-sedimentary fill of the Anafi Basin, were selected to obtain a record of hydrothermal and related volcanic activity, since the last caldera-forming eruption ca.1650 BCE, and earlier than 2.7 Ma, respectively. We present preliminary results for down-core concentrations of elements that are enriched in hydrothermal fluids<sup>[1]</sup>. In Santorini, Hg, As, Sb, Mo and Mn show enrichment factors (EFs) between 10 and 200, within a key horizon identified between 55 and 60 mbsf; this is consistent with intense hydrothermal activity preceding the large 726 CE Kameni eruption<sup>[2]</sup>. Elements highly enriched within a deep key horizon identified between 563 and 594 mbsf in Anafi, are Co, Sb, Cu, V and As with EF between 6 and 96, identified as a pre-2.7 Ma pumice-hosted hydrothermal field, which potentially records early submarine eruptive history of the CSK and coeval hydrothermal activity. We draw comparisons with the present-day hydrothermal fields on the caldera floor and Kolumbo active hydrothermal field and pumiceous host. The differences in the degree of hydrothermal metal(loid) enrichment in Santorini and Anafi, are crucial to detect in metalliferous sediments from

proximal and distal areas of hydrothermal discharge zones; contributing to the development of exploration tools for metal(loid)-enriched hydrothermal fields, and give insight into pre-eruptive conditions for the CSK.

[1] German et al. (1999) *Chemical Geology*, **155** (1), 65–75.

[2] Preine et al. (2024) *Nature Geoscience*, **17**, 323–331.