



Historic hydrovolcanism at Deception Island (Antarctica): eruptive dynamics and hazards implications

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Deception Island is the southernmost island of the South Shetland Archipelago in the South Atlantic. The island, located at the south-western end of the Bransfield Strait close to the Antarctic Peninsula, consists of a horseshoe-shaped volcanic edifice, as result of three main eruptive phases: pre-, syn- and post-caldera. The latest is characterised by monogenetic eruptions forming cones and various types of hydrovolcanic edifices, most of them classified as VEI 2 or 3 magnitude events. Historical post-caldera volcanic activity (1829-1970 AD), along with the latest volcanic unrest episodes in the twentieth and twenty-first centuries, demonstrates that the volcanic system is still active and that future eruptions are likely.

The scientific stations on the island were destroyed, or severely damaged, during the eruptions in 1967, 1969, and 1970 mainly due to explosive activity triggered by the interaction of rising (or erupting) magma with surface water, shallow groundwater, and ice.

This issue is socio-economically relevant because the South Shetland host several research stations and three summer field camps and the archipelago is an important touristic destination during the austral summer. In addition, Deception Island is one of the most visited localities in Antarctica with almost 20,000 visitors per year. A detailed revision (field petrology and geochemistry) of the historical hydrovolcanic post-caldera eruptions of Deception Island was carried out. The primary purpose of this work was to better comprehend the potential evolution of a future eruption and therefore to improve the volcanic hazard assessment. The work focused on the Crimson Hill (estimated age between 1825 and 1829), and Kroner Lake (estimated age between 1829 and 1912) eruptions and 1967, 1969, and 1970 events by describing the eruption mechanisms related to the island's hydrovolcanic activity. Data suggest that the main hazards posed by volcanism on the island are due to fallout, ballistic blocks and bombs, and subordinate, dilute PDCs. In addition, Deception Island can be divided into five areas of expected activity due to magma-water interaction, providing additional data for correct hazard assessment on the island.

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