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Introduction

The Cova de Paúl (CDP) Volcano is one of three main volcanic centres on the island of Santo Antao, the westernmost island of the northern group of the Cape Verde Islands, and shows evidence of recent (pre-1500 AD) volcanic activity although it has not erupted in historic times. The Cova de Paúl Crater, site of one of the most recent eruptions, is approximately 1km in diameter and 300m deep and is the source of a complex eruptive sequence of pyroclastic rocks. The 25 day field expedition was undertaken by R W Tarff and Dr. S J Day.

Overview of the investigation

When rising magma intercepts a source of water, volcanoes can produce violent phreatomagmatic eruptions. One aspect of these eruptions is the emplacement of low-temperature, water-rich ignimbrites by pyroclastic density currents. However, the conditions under which these distinctive ignimbrites are emplaced are not well understood. Dr S J Day in his 2002 – 2003 Geological Reconnaissance Report of Santo Antao indicated that a young and well exposed example of this type of phreatomagmatic volcanism, including low-temperature ignimbrites, was provided by one of the most recent eruptions of the CDP Volcano, which excavated the CDP crater.

After a reconnaissance of the CDP crater in 2008, I was able to establish an eruptive sequence for the eruption. However, it was recognised that a far more extensive investigation was needed to complete the field work aspect of my PhD research into the emplacement mechanisms of low temperature ignimbrites. In collaboration with Dr Day, it was decided that 25 field days on Santo Antao would be needed to comprehensively log, map and sample CDP pyroclastic outcrops from the crater to the more distal southern plain including the outskirts of Porto Novo, the main town of the island, which appears to be built on top of CDP deposits.

Field investigations

Comprehensive logging of the CDP crater walls provided a population of lithic types, including a very distinctive heterolithic breccia, which is found throughout CDP ignimbrites and breccias. Further logging of the rim and road cuttings leading to the south produced a better understanding of the areal distribution of the pyroclastic deposits. Dr Day produced a GPS map of the crater area that, together with the logs and aerial photographs provided by Instituto Nacional de Meteorologia e Geofisica of the Cape Verde Republic, will enable us to construct a geological map of the crater eruption.

Re-investigation of an early Strombolian phase of the eruption also produced a distinct population of strongly banded, low-vesicularity clasts with strongly prolate vesicles and a notably glassy appearance. These clasts occur through the upper part of the Strombolian sequence but are larger and more abundant in a layer at the top, just below the transition to the phreatomagmatic pyroclastic deposits.

The working hypothesis for these clasts is that they represent fragments of flow-banded chilled margins, which formed on the walls of the eruptive conduit in the early stages of the eruption. Thermal shattering and disruption of these margins may record the onset of groundwater flow into the conduit and the triggering of the phreatomagmatic explosive phase of the eruption.

Outcrops of pyroclastic material from the CDP crater eruption were identified by the presence of the heterolithic breccias and fragments of the glassy blocks from the crater to Porto Novo. Although sparse, these outcrops will enable the construction of a volcanic hazard map for the Porto Novo area.

These preliminary findings were presented at MAKAVOL 2010 Oceanic Island Volcanic Hazard Conference, 4th – 6th December 2010, Praia, Cape Verde Islands and the VMSG Conference, Queens College, Cambridge, 5th – 7th January 2011.