



FORMATION OF A COMPLEX TUBE NETWORK: THE 1999 ETNA ERUPTION

Sonia Calvari ^{*}, *Marco Neri* ^{**} and *Harry Pinkerton* ^{***}

^{*} Istituto Internazionale di Vulcanologia, Piazza Roma 2, 95123 Catania - Italy

^{**} Istituto Nazionale di Geofisica – Sistema Poseidon, Via Vigna Murata 6, Roma - Italy

^{***} Environmental Science Department, Lancaster University, Lancaster LA1 4YQ – United Kingdom

Abstract

The 1999 Etna eruption began on the 4th February, and is still going on as of August 26, 1999. The eruption started with strombolian activity at the South-East Cone (SEC), and with the opening of a fissure on the southeastern flank of this cone. Lava discharged from the lower part of the fissure flowing E and SE towards the Valle del Bove (VDB). The 35-65° slope of the western VDB wall decreased the advance rates of the lava flows. Flow fronts into the VDB propagated until the 10th March, when they attained 1970 m asl and the maximum length of 2.8 km.

The resulting lava flow field can be subdivided into two parts: the upper flow field, from the base of the SEC to the VDB rim, and the lower flow field, beyond this margin. The emplacement of the lava flow field during the 1999 eruption can be subdivided into at least five phases on the basis of the observed morphological changes.

The first phase was between February 4 and March 10, 1999, and was essentially characterized by lengthening of the lava flow field. During this phase there were few ephemeral vents in the upper and middle flow field, and tube systems developed along arterial aa lava flows.

The second phase lasted between March 11 and April 15, causing widening and little thickening of the flow field. Flows were active both on the upper and lower flow field. Flow fronts in the lower part widened, and the entire flow thickened through overflows. Many ephemeral vents formed in the upper and lower flow field.

During the third phase, which lasted between April 16 and May 15, the active lava flows were confined to the Valle del Bove, causing a considerable increase in thickness of the lower flow field. Lava tubes remained apparently stable without increasing in length.

This trend was interrupted by the start of the fourth phase, between May 16 and June 6, when activity resumed on the upper flow field through new breakouts along the chain of hornitos. Thickening of the upper flow field and lower flow field was marked by formation of many tumuli both on the upper flow field and along the western wall of the Valle del Bove. Due to a decrease in effusion rate, previous tubes have been deactivated and new, smaller tubes formed at an upper level into the flow field giving a stacked tube system.

A probable decrease in the effusion rate produced the start of the fifth phase, from June 7 onwards. Flows and vents beyond the western wall of the Valle del Bove disappeared completely. Only the upper flow field was active, producing many new tumuli, which increased the thickness of the upper flow field. Effusion rate decreased from previous 3-5 m³/s to 0.07 m³/s.