Geophysical Research Abstracts
Vol. 17, EGU2015-4253, 2015
EGU General Assembly 2015

Understanding the role played by the basement in the eruptive dynamics combining fieldwork and geophysical surveys: the example of El Puig d'Àdri tuff cone

Dario Pedrazzi (1,2), Xavier Bolós (2), Stéphanie Barde-Cabusson (2), Joan Martí (2), and Adelina Geyer (2)

(1) Centro de Geociencias, UNAM, Campus Juriquilla, Querétaro, México, (2) Institute of Earth Sciences Jaume Almera, ICTJA-CSIC, Group of Volcanology.SIMGEO (UB-CSIC) Lluis Sole i Sabaris s/n, 08028, Barcelona, Spain

El Puig d'Àdri tuff cone is one of the most peculiar edifices of the Garrotxa Volcanic Field (GVF) (0.6–0.01 Ma), which is part of the Catalan Volcanic Zone (NE of the Iberian Peninsula), one of the Quaternary alkaline volcanic provinces associated with the European Cenozoic Rift System.El Puig d'Àdri volcano was emplaced in the northern sector of La Selva Basin, a Neogene tectonic depression bounded by ENE-WSW–and NW-SE–oriented normal fault systems, above Paleocene and Eocene materials (red sandstones, marls and limestones) covered by Neogene alluvial sediments. The area is bounded to the East by the Amer Fault and to the West by the Llorà Fault. These two regional conjugated Neogene normal faults with a transtensional component are responsible in the area for the distribution of volcanism, seismicity and the fluvial network as well.

The construction of this volcano involved various stages due to the periodic magma/water interaction that lead to the superposition of three volcanic vents. The main edifice is constituted by a tuff cone 850 m in diameter with a small scoria cone at the western side of the tuff cone and a new scoria cone further SE.

Geological and geophysical surveys (performed using Electrical Resistivity Tomography-ERT and Self-Potential-SP), were reliable tools to understand the eruptive dynamics of this volcano and the major role played by the basement.

5 different litostratigraphic units were identified in El Puig d'Àdri volcano where Strombolian and phreatomagmatic episodes alternated giving rise to complex stratigraphic sequences. A first explosive phreatomagmatic event was followed by a Strombolian episode of limited extent. The activity returned to a stronger phreatomagmatic phase, with dilute PDCs and explosion breccias, along with a concentrate PDC running southern for more than 3 km. A final Strombolian phase gave rise to the construction of the main scoria cone, with deposits covering most of the proximal phreatomagmatic products. The eruption ended with an effusive phase that generated two lava flows causing the breaching of the northwestern flank of the scoria cone. Most of these units were recognized as well through one of the ERT profiles that allowed distinguishing phreatomagmatic and Strombolian deposits at depth as confirmed by the SP as well.

Componentry analysis suggests that the explosions took place in the sandstones/marls basement although the second Strombolian phase of the eruption shows a notable increase of limestone fragments, suggesting a switch of the explosion locus. This is also suggested by the position of the second scoria cone respect to the tuff cone and the first Strombolian edifice. One additional ERT profiles helped to understand the continuation of the volcanic deposits at depth. The pre-volcanic basement, which is constituted of limestones, marls and sandstones with different hydrogeological characteristics was described highlighting the major role on the eruptive dynamics and, thus, confirming the preliminary hypothesis obtained through field survey.

These results can be extrapolated to other phreatomagmatic volcanoes alternating phreatomagmatic and Strombolian phases and built-up on hard basement, showing how a multidisciplinary approach is a useful tool to interpret the eruptive dynamics and the evolution of an eruption.