Geophysical Research Abstracts
Vol. 16, EGU2014-15418-1, 2014
EGU General Assembly 2014


# A new approach to the unrest and subsequent eruption at El Hierro Island (2011) based on petrological, seismological, geodetical and gravimetric data

Stavros Meletlidis (1), Alessio Di Roberto (2), Itahiza Domínguez Cerdeña (1), Massimo Pompilio (2), Laura García-Cañada (3), Antonella Bertagnini (2), Maria Angeles Benito Saz (3), Paola Del Carlo (2), Sergio Sainz-Maza Aparicio (3), Carmen Lopez Moreno (3), and David Moure García (1)

(1) IGN, Centro Geofísico de Canarias, Santa Cruz de Tenerife, Spain (smeletlidis@fomento.es), (2) INGV, Sezione di Pisa, Pisa, Italy (diroberto@pi.ingv.it), (3) IGN, Observatorio Geofísico Central, Madrid, Spain (clmoreno@fomento.es)

A shallow submarine eruption took place on 10th October 2011, about 1.8 km off the coast of La Restinga, a small village located in El Hierro (Canary Islands, Spain). The eruption lasted for about four months and ended by early March 2012. The eruption was preceded by an unrest episode that initiated about three months before, in July 2011, and characterized by more than 10,000 localized earthquakes accompanied by up to 5 cm of vertical ground deformation.
In the Canary Islands, this event represents the first case of an eruption that was monitored since the unrest to the end by the monitoring network of IGN (Instituto Geográfico National), providing a huge dataset that includes geophysical (seismic, magnetic and gravimetric), geodetic, geochemistry and petrological data.
In this work we use the seismic, GPS and gravity records collected by IGN along with the petrological data derived from the study of various lava balloons, scoriaceous fragments and ash.Geophysical and geochemical monitoring tools provide a variety of information that need to be interpreted in terms of magma movement and/or interaction of magma with host rocks.
We present a model, based on this data, which describes the intrusion and ascent of the magma. According to this model, a major intrusion beneath and around preexisting high-density magmatic bodies, localized in the central sector of the island, led to an eruption in the Southern sector of the island. After a failed attempt to reach the surface, while various dykes were emplaced, through a low fractured area in the Central and Northern parts of the island, the ascending magma finally found its way in the submarine area of La Restinga, in the South rift zone, at a depth of 350 m below sea level. Feeding of the eruption was achieved by the ascension of an important volume of material from the upper mantle which was emplaced near the crust-mantle boundary. However, the very energetic post-eruptive unrests - we had five episodes up today with high magnitude earthquake sequences and higher ground deformation than the one occurred during the eruption - suggest that only a small part of the material was emitted. And probably are due to new dyke or sill emplacement with material provided from the same intrusion in the base of the island.