



The 2011 submarine volcanic eruption of El Hierro Island (Canary Islands, Spain)

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On 10 October 2011 a submarine volcanic eruption began 2 km SW of La Restinga village in the South coast of El Hierro Island (Spain). It became the first submarine eruption reported in 500 years of historical record in the Canary Islands. The eruption took place after three months of intensive seismic activity and ground deformation. The first signal evidencing the eruption was a harmonic tremor signal, located somewhere in the South sector of El Hierro Island and registered in every seismic station on the island. On the following day, the tremor's amplitude increased up enough to be felt by the residents of La Restinga. The first visual evidence of the eruption was observed during the afternoon of 12 October, a large light-green coloured area on the sea surface, 2 km to the SW of La Restinga. Three days later, steaming lava fragments were observed floating on the sea, in the area where the vent was supposed to be located. These fragments had a bomb-like shape and their sizes ranged between 10 and 40 cm long. They were bicoloured, a black outer part with a basaltic composition, and a white inner part, highly vesiculated and rich in silica content (>60%). This type of fragments was only observed during the first days of the eruption. Within the next two months further emission episodes have been observed with turbulent water, foam rings and large bubbles on the sea surface. On the 27th of November new lava fragments were observed while floating and degassing on the sea surface. Most of them were "lava balloons" or hollow fragments of lavas, with sizes between 30 and 200 cm, and highly vesiculated outer crust of basaltic-basanitic and sideromelane composition. The emission of these products continues intermittently up to date (January 2012)

During the eruption, the GPS monitoring network detected episodes of inflation-deflation and a maximum vertical deformation of 4 cm. The horizontal deformation, which had reached up to 5 cm before the eruption, remains stable. The mean tremor amplitude oscillated considerably during the eruption including abrupt changes and short periods of almost no tremor. After nearly two weeks of relative seismic quiescence since the eruption began, a new seismic swarm started in the North of the island. The earthquakes were located at around 20 km depth, a few kilometres deeper than the pre eruptive hypocentres. This seismicity intensified and by the end of November it had released twice the energy before the eruption. This is, so far, the second longest historical eruption in the Canary.