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Monitoring the unrest of El Hierro Island before the onset of 2011 submarine volcanic eruption.

M. J. Blanco, C. López, and the IGN Volcanic Team
Instituto Geográfico Nacional, Spain (mjblanco@fomento.es)

On October 10, 2011 a submarine volcanic eruption started 2 km south from El Hierro Island (Spain). It was the first eruption in Canary Islands in 40 years, and the first in El Hierro in, at least, 200 years. Since the first geophysical evidences of a possible unrest on early July 2011, a dense multiparametric monitoring network was deployed all over the island by the Instituto Geográfico Nacional (IGN) including seismometers, GPS stations, geochemical stations, magnetometers and a gravimeter. By the time the eruption started, almost 10000 earthquakes were located, most of them at depth lower than 10 km, and a total energy release of 8E11 J, 80% of it in the last two weeks. However, no other seismic signals related to volcanic activity like tremor or LP events were observed until the day of the eruption. GPS deformation analyses showed a maximum deformation of 5 cm measured during the pre-eruptive period. Earthquake migration from the North to the South of the island and acceleration of the seismicity are in good correlation with changes in the deformation pattern at the GPS stations as well as with some anomalies in geochemical parameters. InSAR interferometry measurements also revealed an apparent global uplift in El Golfo area during this period which reaches its maximum in the western part of it. There were some anomalies detected by the magnetometers and the gravimeter as well. On 8 October 2011, a magnitude 4.3 earthquake was located close to the South coast of the island at 13 km depth which probably triggered the subsequent shallower seismicity and the imminent start of the eruption. Finally, at 05:15h (GMT) 10 October 2011, the appearance of a clear volcanic tremor signal recorded by all the seismic stations placed on the island suggested the beginning of the submarine eruption. All this data will be very useful to understand future reawakening processes in the Canaries since it has been the first volcanic eruption fully monitored from the very beginning in the area.