



Early signs of geodynamic activity before the 2011–2012 El Hierro eruption

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The potential relation between mantle plume dynamics, regional tectonics and eruptive activity in the Canary Islands has not been studied yet through the analysis of long-time series of geophysical observational data. The existence of highly reliable seismic and GNSS data has enabled us to study from 1996 to 2014 the geodynamic evolution of the North Atlantic Azores-Gibraltar region and its relationship with recent volcanic activity in El Hierro (Canary Islands, Spain). We compiled a new and unified regional seismic catalog and used long time-series of surface displacements recorded by permanent GNSS stations in the region. A regional- and local-scale analysis based on these data enabled us to identify signs of anomalous tectonic activity from 2003 onwards, whose intensity increased in 2007 and finally accelerated three months before the onset of the volcanic eruption on El Hierro in October 2011. This activity includes a regional extension and an uplift process that affects the southern Iberian Peninsula, NW Africa, and the Canary Islands. We interpret these observations as early signs of the geodynamic activity, which led to El Hierro eruption and the subsequent episodes of magma intrusion. Results point to the significant contribution of the mantle plume dynamics (i.e. external forces) in this renewed volcanic activity in the Canary Islands and emphasize the role of mantle dynamics in controlling regional tectonics.