

Crustal deformation during the 2011-2013 volcanic activity of El Hierro, Canary Islands, monitored by continuous GPS observation

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Seismo-volcnic activity of El Hierro started in the middle of July of 2011 and resulted in the active submarine eruption after October 12 south off La Restinga, the southern tip of the island. We have been operating one continuous GPS site on the island (Valverde) since 2004. Responding to the activity, we quickly installed 5 more GPS sites. Including another site operated by the Canary Islands Cartographical Service (GRAFCAN), we have been monitoring 7 GPS sites equipped with dual-frequency receivers. After the submarine eruption, the volcanic activity gradually calmed down and the crustal deformation stopped in December 2011. However, in June 2012, the volcanic deformation resumed with active seismicity. In this second activity, deformation source moved to the southwest of the island, and it calmed down in July without a surface eruption. In January 2013, there was an additional inflation episode in the northern part of the island and the critical situation still continues. The whole sequence of activity has been monitored with continuous GPS in a quasi-real-time manner. Deformation data indicates that the magma first intruded in the central part of the island and migrated southward (first sequence) or southwestward (second sequence). We summarize the crustal deformation detected by our GPS network and propose a quantitative model of magma intrusion and migration during the whole seismo-volcanic activity. In addition, we discuss possible precursory deformation signal detected at Valverde at the northeastern part of the island before 2011.