Different deformation patterns using GPS in the volcanic process of El Hierro (Canary Island) 2011-2013

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Ground deformation is one of the most important parameter in volcano monitoring. The detected deformations in volcanic areas can be precursors of a volcanic activity and contribute with useful information to study the evolution of an unrest, eruption or any volcanic process. GPS is the most common technique used to measure volcano deformations. It can be used to detect slow displacement rates or much larger and faster deformations associated with any volcanic process. In volcanoes the deformation is expected to be a mixed of nature; during periods of quiescence it will be slow or not present, while increased activity slow displacement rates can be detected or much larger and faster deformations can be measure due to magma intrusion, for example in the hours to days prior a eruption beginning.

In response to the anomalous seismicity detected at El Hierro in July 2011, the Instituto Geográfico Nacional (IGN) improved its volcano monitoring network in the island with continuous GPS that had been used to measure the ground deformation associated with the precursory unrest since summer 2011, submarine eruption (October 2011-March 2012) and the following unrest periods (2012-2013). The continuous GPS time series, together with other techniques, had been used to evaluate the activity and to detect changes in the process. We investigate changes in the direction and module of the deformation obtained by GPS and they show different patterns in every unrest period, very close to the seismicity locations and migrations.