



Improving GNSS time series for volcano monitoring: application to Canary Islands (Spain)

Laura García-Cañada (1), Miguel J. Sevilla (2), Jorge Pereda de Pablo (3), and Itahiza Domínguez Cerdeña (3)

(1) Observatorio Geofísico Central, Instituto Geográfico Nacional, Madrid, Spain, (2) Facultad de Ciencias Matemáticas, Universidad Complutense de Madrid, Spain, (3) Centro Geofísico de Canarias, Instituto Geográfico Nacional, Santa Cruz de Tenerife, Spain

The number of permanent GNSS stations has increased significantly in recent years for different geodetic applications such as volcano monitoring, which require a high precision. Recently we have started to have coordinates time series long enough so that we can apply different analysis and filters that allow us to improve the GNSS coordinates results.

Following this idea we have processed data from GNSS permanent stations used by the Spanish Instituto Geográfico Nacional (IGN) for volcano monitoring in Canary Islands to obtain time series by double difference processing method with Bernese v5.0 for the period 2007-2014. We have identified the characteristics of these time series and obtained models to estimate velocities with greater accuracy and more realistic uncertainties. In order to improve the results we have used two kinds of filters to improve the time series. The first, a spatial filter, has been computed using the series of residuals of all stations in the Canary Islands without an anomalous behaviour after removing a linear trend. This allows us to apply this filter to all sets of coordinates of the permanent stations reducing their dispersion.

The second filter takes account of the temporal correlation in the coordinate time series for each station individually. A research about the evolution of the velocity depending on the series length has been carried out and it has demonstrated the need for using time series of at least four years. Therefore, in those stations with more than four years of data, we calculated the velocity and the characteristic parameters in order to have time series of residuals.

This methodology has been applied to the GNSS data network in El Hierro (Canary Islands) during the 2011-2012 eruption and the subsequent magmatic intrusions (2012-2014). The results show that in the new series it is easier to detect anomalous behaviours in the coordinates, so they are most useful to detect crustal deformations in volcano monitoring.