

USE OF GEOID, LEVELING AND GPS FOR VERTICAL DEFORMATION MONITORING

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Abstract: Faial island on the Azores archipelago have been the subject of several tectonic-volcanic events as the Capelinhos eruption and more recently the 1998 M_w 6.1 Pico-Faial earthquake. For this reason, from 1937 to 2006 several geodetic surveys have been performed including relative and absolute gravity measurements, azimuthal and zenithal observations and more recently, GPS observations. A high precision geoid model has been recently developed for Azores area with an estimated accuracy ranging from 2 to 4 cm on Faial. This geoid model was used to integrate into a common vertical reference the old trigonometric heights and the most recent GPS height data. Therefore, the vertical deformation time series on some geodetic vertices of Faial, over more than 60 years and 8 surveys, was assessed. On the first period 1937-1987 it was verified a subsidence on the west side of the island with a maximum of 1.7 m at Faja vertice and a maximum uplift of 1.5m on the north caldera. The coseismic vertical deformation due to the 1998 earthquake was evaluated showing the subsidence of 0.13 m on the summit caldera. In the following period, 1998-2006 an uplift of the volcanic edifice was determined with a maximum value of 0.061m on the summit. The estimated vertical deformation is the result of persistent tectonic and volcanic activity on Faial and surrounding area confirmed by intense seismic activity, although irregular in time, registered in this period. In this paper, the usefulness of an accurate geoid model to integrate old geodetic data with GPS data is evaluated and the resulting vertical deformation time series accuracy assessed from independent geodetic data.

Key words: vertical monitoring, geoid, GPS, Faial.

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