Geophysical Research Abstracts
Vol. 12, EGU2010-12780, 2010
EGU General Assembly 2010

On the analysis of short- and long-term deformation processes at Tenerife, Canary Islands

Pietro Tizzani (1), Andrea Manconi (1), Giovanni Zeni (1), Antonio Pepe (1), Mariarosaria Manzo (1), Jose Fernandèz (2), and Riccardo Lanari (1)

(1) IREA–CNR, Via Diocleziano,328, 80124 Napoli (ITALY), (2) Instituto de Astronomia y Geodesia (CSIC-UCM), Ciudad Universitaria, Pza. de Ciencias, 3, 28040 Madrid, Spain

Tenerife is the largest shield complex among the Canary Islands, a volcanic hot-spot located off the West African coast. The edifice is built upon a basement of submarine extrusive rocks, which form the common sub-stratum of the island. In the last decades, several works about the geodynamic and tectonic processes of this island have been performed. These results propose a complex interaction between the sub-volcanic and the regional structures, which produced a large-scale flexure of the oceanic lithosphere beneath Canary Islands. Moreover, recent space-based geodetic observations of Tenerife, based on SBAS-DInSAR and GPS measurements, reveal that the short-term (10-20 a) deformation pattern is characterized by a broad subsidence, with maximum velocities of about 4 mm/a.

In this context, we performed a fluid dynamics dimensionless analysis, based on the Buckingham- theorem, which confirms the substratum flexure process characterizing the long-term (1-10 Ma) structural evolution of this large volcanic island. In addition, we re-analyzed the SBAS-DInSAR surface deformation results and performed an advanced numerical optimization procedure; this was done by considering finite element models that include vertical and lateral heterogeneities based on available gravimetric and seismic investigations. In particular, we simulated the behavior of the oceanic crust, of the upper mantle and of the volcanic edifice as incompressible Newtonian fluids in steady-state conditions. Our results show that the short-term ground deformation of Tenerife is the effect of the sagging of the denser core of the island (cumulitic complex) onto the weaker oceanic crust. This process might be considered as the driving mechanism that caused also the long-term flexure of the sub-stratum, in good agreement with the herein presented fluid dynamic dimensionless analysis.