Geophysical Research Abstracts
Vol. 17, EGU2015-2511, 2015
EGU General Assembly 2015

Evaluating topographic effects on ground deformation: Insights from finite element modeling

Erika Ronchin, Adelina Geyer, and Joan Marti

Group of Volcanology. SIMGEO (UB-CSIC). Institute of Earth Sciences Jaume Almera, ICTJA-CSIC, Lluis Sole i Sabaris s/n, 08028 Barcelona, Spain (erikaronchin@gmail.com, ageyer@ictja.csic.es, joan.marti@ictja.csic.es)

Ground deformation has been demonstrated to be one of the most common signals of volcanic unrest. Although volcanoes are commonly associated with significant topographic relief, most analytical models assumed the Earth's surface as flat. In the last years, it has been confirmed that this approximation can lead to important misinterpretations of the recorded surface deformation data. Here we perform a systematic and quantitative analysis of how topography may influence ground deformation signals and how these variations correlate with the different topographic parameters characterizing the terrain form (e.g. slope, aspect, curvature, etc.). For this, we bring together the results exposed in previous published papers and complement them with new axisymmetric and 3D Finite Elements (FE) models results. First, we study, in a parametric way, the influence of a volcanic edifice centered above the pressure source axis. Second, we carry out new 3D FE models simulating the real topography of three different volcanic areas representative of topographic scenarios common in volcanic regions: Rabaul caldera (Papua New Guinea) and the volcanic islands of Tenerife and El Hierro (Canary Islands). The calculated differences are then correlated with a series of topographic parameters. The final aim is to investigate the artifacts that might arise from the use of half-space models at volcanic areas considering their diverse topographic features (e.g. collapse caldera structures, prominent central edifices, large landslide scars, etc.). Final conclusions may be also useful for the design of an optimal geodetic monitoring network. This research was partially funded by the European Commission (FP7 Theme: ENV.2011.1.3.3-1; Grant 282759: "VUELCO")and RYC-2012-11024.