



Interactions between regional tectonics and volcanic deformations in the Azores

J. Okada (1), F. Sigmundsson (2), B. Ofeigsson (3), R. Rodrigues (4), and T. Ferreira (1)

(1) Center for Volcanology and Geological Risk Assessment, University of Azores, Ponta Delgada, Portugal (jun.okada@azores.gov.pt), (2) Nordic Volcanological Institute, University of Iceland, Reykjavik, Iceland (fs@hi.is), (3) Icelandic Meteorological Office, Reykjavik, Iceland (bgo@vedur.is), (4) Department of Geosciences, University of Azores, Ponta Delgada, Portugal (Rita.MM.Rodrigues@azores.gov.pt)

The Azores archipelago is located in the plate triple junction of Eurasia, Nubia, and North American. With this geologically peculiar location on the earth it represents intense seismic activities and active volcanisms. Space geodesy techniques such as GNSS, DORIS, SLR, and VLBI enable direct measurements of the current tectonic plate motions besides detecting local crustal deformation episodes in the volcanic fields. In this study, we report the recent new results of continuous GPS measurements in the Azores Triple Junction region. In the scope of monitoring both tectonic and volcanic activities, CVARG (Center for Volcanology and Geological Risk Assessment, University of Azores) has been operating 11 continuous GPS stations. All available data sets including the Azores government GNSS network and IGS (International GNSS Service) permanent network have been simultaneously processed using Bernese software v5.0. The site velocities are determined in ITRF2005 geodetic reference frame from the time series analysis for the period of 2008-2010. Estimated velocities are compared with tectonic plate motion models. Our results roughly agree with the previous geodetic studies by showing the following evidences; (1) the different opening velocities at MAR result in differential shear along Terceira Ridge, (2) south and western side of Pico and southwest and central part of S. Miguel Islands mimic stable Nubia plate motion. The pattern of the residual velocities in S. Miguel changes between Fogo and Furnas volcanoes. In this area, significant earthquake swarm episodes (e.g. in 1989 and in 2005) have been repeated at least during last few decades and some minor seismic swarms have been still ongoing. Our GPS station has captured an episodic crustal deformation that was accompanied with seismic jumps between NE flank of Fogo and Furnas and was followed by intense swarm activities in the area on late 2008. This seismic and deformation significances can be interpreted by mutual interactions between the regional tectonics and the local magmatic activities that might be resumed by the deep magmatic intrusions or the reactivation of the intruded magmas in the shallow crust. For mitigating seismo-volcanic hazards, we stress the importance of continuous and dense GPS observation network especially in such tectonically active volcanic fields. The comparative studies with seismology such as seismic tomography, evaluation of b-values, earthquake family are encouraged in the region.