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# Geodetic monitoring challenges using GPS for the active volcanic systems in the Azores: Overview and recent results from S. Miguel Island

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The Azores archipelago is located at the triple junction between the Nubian, North American, and Eurasian plates and has many active volcanic systems. Among them, the Congro area, located in the central part of S. Miguel Island, provides a good research field for understanding physical volcanic processes, focusing on close relations between seismic and ground deformation activities. This area has repeatedly suffered from significant earthquake swarms such as in 1989 and in 2005. The former event was observed seismometrically, but not geodetically. There is still room for argument if magma movement at depth was true. For answering this question, it is essential to execute ground deformation measurements besides seismic monitoring at this area (Tryggvason et al., 1989). The latter event was successfully observed both seismometrically and geodetically with permanent GPS stations operated by CVARG (Center of Volcanology, University of Azores). Presently 6 permanent stations are operating in the island. Since 2000 campaign GPS surveys have also been executed every year by CVARG. GPS data processing from Dec. 1999 to Jul. 2007 revealed that episodic magma injections from shallow magma chamber were evident during the 2005 earthquake swarm activity (Trota, 2008; submitted). Considering the strong similarities between 1989 and 2005 seismic activities (locations of epicenters and magnitudes), it is quite likely that a similar magma feeding system had activated at the shallow crust during the 1989 swarm activities (Trota et al., 2008). It is a very interesting theme to study how the shallow volcanic system sustains and how it develops toward future eruptions. Smaller earthquake swarms are still ongoing in S. Miguel Island mostly concentrating on the Congro region and its vicinity. The most recent GPS data sets have been analyzed up to present (from 2007 to 2008) to evaluate the evolution of the volcanic system if the similar volcanic process is still visible or not. Geodetic monitoring challenges using GPS together with the other geodetic techniques are vital for hazards assessment for future volcanic crisis in the Azores.