

## **Repeated volcanic unrests at Fogo (Água de Pau) volcano, Azores, revealed by continuous and campaign GPS analysis**

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Fogo (Água de Pau) volcano, S. Miguel Island, Azores shows 452 years of eruption dormancy since 1563-1564. In the recent decades, Fogo and its east neighbor Congro volcanic system have exhibited three prominent unrest episodes (1989, 2003-2006, and 2011-2012). All were accompanied with seismic swarms. Except in 1989, when there was no monitoring device installed for ground deformation, GPS techniques were applied in the latter two episodes revealing the existence of volcanic inflation associated with the seismicity (e.g. Trota et al., 2009; Okada et al., 2015). Although there was a lack of geochemical and hydrothermal evidences for a magmatic intrusion during these three episodes, Fogo is considered to be geophysically active and restless. The volcano is located at the boundary between the Eurasian and Nubian plates. The immense geological, geophysical and geochemical studies have found that this boundary zone is tectonically diffuse and complex. The relation between regional tectonics and local volcanic activity is, however, poorly understood. Few attempts have been made to address the detailed spatial and temporal processes. The accumulation of continuous GPS data and the dense network around Fogo volcano have been making such attempts possible. We analyzed 9 CGPS stations data of the island for the period of 2008-2013 using Bernese5.0 software. By comparing with the current plate angular velocities (DeMets et al., 2010), we found a focused tectonic boundary zone with an expansion rate of 0.28 cm/yr in the east of Fogo volcano, which accommodates about 50% of the Eurasian–Nubian plate spreading. The analysis of both continuous and campaign GPS datasets reveals the existence of two different types of ground deformation sources associated with the seismicity. One is located beneath the summit caldera, and another is in the eastern flank where fluid diffusion process might exist as a key for asymmetric hydrothermal system of Fogo.