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GPS surveying in S. Jorge, Azores, reveal volcanic unrest?

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The island of S. Jorge, Azores, a ∼55-km-long, ∼7-km-wide WNW-ESE trending volcanic ridge that rises ∼1050 m above sea level, is a natural volcanic-tectonic laboratory. The island is the result of basaltic fissural volcanism along WNW-ESE to E-W fault zones, is volcanically active (3 eruptions since settlement in mid XV century) as well as tectonically (active faulting and seismicity). Its western region is dominated by two fault zones (F.Z.), the WNW-ESE Picos F. Z. and the E-W Pico do Carvão F. Z., along which volcanism occurred during the Upper to Middle Pleistocene (Rosais Volcanic Complex) and the Holocene (Manadas Volcanic Complex). Its eastern region, formed during the Middle to Lower Pleistocene, though currently volcanically extinct contains a major WNW-ESE active fault (Urze-S. João F.Z.), whose surface expression is a 10-km-long continuous scarp, and several other secondary fault zones.

A network of 17 geodetic markers for high-precision GPS survey was established in 2001, as part of the DISPLAZOR project to monitor volcanic and tectonically-induced surface deformation. Designed by project members and installed in bedrock whenever possible, the markers allow easy antenna setup, ensure proper centering, and provide high stability. Similar networks were established in the neighbouring islands of Faial and Pico to monitor intra- and inter-island deformation. The network was occupied in 2001, 2004, and 2010, the last as part of the SHA-AZORES project. The GPS observations from all campaigns were analyzed using the latest geophysical models and geodetic procedures to generate a new velocity field for S. Jorge. While the older, eastern half region of S. Jorge remains undeformed at the mm/yr level, a zone of surface deformation is detected on the western-central area of the island. This pattern of deformation, expressed by differential horizontal velocities in the order of 2 mm/yr towards NE, is not compatible with the current knowledge of neotectonic structure and kinematics for that region. It is suggested here that such deformation pattern may be related to some volcanic process occurring on this particular sector of the island where active volcanic structures are also located. Future occupations planned for 2011 and 2012 will help investigate this working hypothesis. Here we will present the GPS observations and discuss the results in the context of volcanic activity and deformation.
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