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Present-day Azores Triple Junction configuration based on geodetic measurements and elastic dislocation models

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The Azores Archipelago is located in the boundary area between three major tectonic plates: Eurasia, Nubia and North America. While the divergent boundary between the North American plate and the Eurasian and Nubian plates is well identified by the Mid Atlantic Ridge (MAR), the transtensive boundary between Eurasian and Nubian plates, along the Azores region, has been much more difficult to characterize up to the present, with a consequent ambiguity on the present-day location of the Azores Triple Junction (ATJ).

GPS observation campaigns have been carried out in this region since 1988. The initial network of 9 stations (one per island) has been densified with some tens of new sites since 1999, with a particular emphasis on the Central Group of the Azores Archipelago. In addition, data from three continuously-operating stations are also available since 2000/2001.

We investigate the configuration of the ATJ using the derived regional GPS velocity

field. Two different segmentation patterns (using geophysical and geological data) of the Eurasia–Nubia plate boundary are evaluated yielding different Triple Junction locations: 1) a single plate boundary along the Terceira axis intersecting the MAR at the North Azores Fracture Zone. 2) two major plate boundary segments, one from Gloria Fault to West of Terceira Island, and a second one from Faial-Pico alignment to the MAR. Geodetic predictions of the motions of the three plates are used to model continuous viscous inter-seismic dislocation and consequent elastic dislocations on the overlaying brittle layer. The comparison of the modeled dislocations with the derived GPS velocity field allows one to constrain the actively deforming area in this plate boundary.

The results from the modeling favor the two segments configuration for the Eurasia–Nubia plate boundary in the Azores region, and imply that a tectonically complex transfer zone is bound to exist between both modeled segments.