



Mantle dynamics and volcanism emplacement in the Azores

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The Azores plateau is a triangular shaped topographic feature encompassing the boundary zone where three major tectonic plates (EU, NU and NA) meet. The eastern side of the plateau is delimited by two major tectonic discontinuities: the Mid Atlantic Ridge, and the Terceira Rift, a recently formed ultra-slow-spreading ridge. The origin of the plateau is still under debate. One hypothesis argues that the plateau would have been formed by successive NE jumps of the oblique spreading axis, where the present TR is the latest stage. Other hypotheses invoke the northward jump of the Azores triple junction, during which the Azores region would have been transferred from the Eurasian plate to the Nubian plate. For some authors, the presence of the Azores plume, a low seismic velocity zone in the mantle beneath, is required to explain the observations: the anomalously shallow seafloor depth as well as the geochemistry of the basaltic lavas erupted within the plateau. Here we use a highly resolved tomography model to quantify the influence of this plume and the surrounding mantle. We model the convection pattern, the induced dynamic topography and stresses, and compare them with the surface observations. The dynamic topography shows two maxima: one northwest of St. Miguel, the other encompassing the Terceira, Graciosa, S. Jorge, Faial and Pico islands. Both swells are approximately located on the Terceira Ridge. The convection pattern displays two distinct upwelling towards these two groups of Islands. This may explain the difference in the geochemical signatures, in particular the unique isotopic ratios observed in some lavas from S. Miguel. The stresses induced by the underlying mantle convection are compared with the surface observations (topographic features, seismic and GPS velocities). The modeled and observed stresses fairly correlate west of our study area but their directions depart east.