Geophysical Research Abstracts
Vol. 15, EGU2013-10564, 2013
EGU General Assembly 2013

Influence of the Afar plume on the deep structure of Aden and Red Sea margins - Insight from teleseismic tomography in western Yemen

Félicie Korostelev (1), Clémence Basuyau (2), Sylvie Leroy (1,3), Abdulhakim Ahmed (3,4), Derek Keir (5,6), Graham Stuart (5), Frédérique Rolandone (1), Ismail Al Ganad (7), and Khaled Khanbari (8)

(1) ISTeP, Univ Paris 06, Paris, France, (2) Institut de Physique du Globe de Paris, Univ Paris Diderot, Paris, France, (3) ISTeP, CNRS, Paris, France, (4) Seismological and Volcanological Observatory Center, Dhamar, Yemen, (5) School of Earth and Environment, University of Leeds, Leeds, United Kingdom, (6) Department of Earth Sciences, Royal Holloway University of London, Egham, United Kingdom, (7) Yemen Geological Survey & mineral Resources Board, Sana'a, Yemen, (8) University of Sana'a, Sana'a, Yemen

Continental rupture processes under mantle plume influence are still poorly known although extensively studied. The Afar plume has been largely investigated in Ethiopia to study early stages of continental break-up. Here we imaged the lithospheric structure of western continental Yemen to evaluate the role of the Afar plume on the evolution of the continental margin and its extent towards the East.

A part of the YOCMAL project (YOung Conjugate MArgins Laboratory) permitted the deployment of twenty-three broadband stations in Yemen (from 2009 to 2010). Using a classical teleseismic tomography (Aki et al., 1974) on these stations together with a permanent GFZ station, we image the relative velocity variations of P-waves in the crust and lithosphere down to 300 km depth, with a maximum lateral resolution of about $\sim$20 km.

The model thus obtained shows (1) a dramatic and localized thinning of the crust in the vicinity of the Red Sea and the Gulf of Aden (2) the presence of magmatic underplating related to seaward dipping reflectors under those two volcanic margins (3) two granitic syn-rift intrusions on the border of the great escarpment (4) a low velocity anomaly in which with evidence of partial melting, just below thick Oligocene trapps series and other volcanic events (from 15 Ma to present). This low velocity anomaly could correspond to an abnormally hot mantle and could be responsible for dynamic topography and recent magmatism in western Yemen. (5) Finally, we infer the presence of hot material under the Southwestern corner of Yemen that could be related to Miocene volcanism in Jabal an Nar.