



Development of the Central-Afar volcanic margin, mantle upwelling and break-up processes

Raphaël Pik (1), Nicolas Bellahsen (2), Sylvie Leroy (2), Martin Stab (1), Dereje Ayalew (3), and Gezahegn Yirgu (3)

(1) CRPG, CNRS - Univ. Lorraine, UMR 7358, Vandoeuvre, France (rpik@crpg.cnrs-nancy.fr), (2) ISTEP, CNRS - UPMC, UMR 7193, Paris, France, (3) School of Earth Sciences, Addis Ababa University, Ethiopia

Whereas the present day mantle dynamics is now well imaged by geophysical investigations, the long-term expression of mantle dynamics below rifted lithosphere is not directly recorded at the surface of the earth. Such information must therefore be extracted from non-direct manifestations of mantle upwelling, which are principally (i) the uplift of the upperlying lithosphere and (ii) the melts produced when the solidus of mantle mineral assemblages is crossed. These first order and unique evidences should therefore represent corner stones output of any geodynamic models used to deduce the interplay between mantle dynamics and surface deformations. For magmatism produced during extension of lithosphere, the dynamics of mantle upwelling can be recognized in the volumes of magmas and also in their geochemistry, which allow tracking the various types of mantle sources and the various types of mantle melting regime (P, T and intensity of partial melting). Volcanism has been closely associated with extension in the East African rift system. It is yet (and logically) heterogeneously distributed along the western, eastern and northern volcanic provinces. We have concentrated the efforts of a multidisciplinary team these last years in the northern Ethiopian volcanic province where the most important volumes of volcanism have been emplaced since 30 Ma, from Continental Flood Basalts episode to active extension along the Central Afar magmatic segment. These structural and geochemical data point out new constraints on the interplay between the upwelling of the Afar mantle plume and the style and mechanisms of extension, and imply to update and revise our understanding of the development of this volcanic margin.