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The topography of North Namibian Margin during the Meso-Cenozoic

Olivier Dauteuil (1), Francois Deschamps (1), Francois Guillocheau (1), and Olivier Bourgeois (2)

(1) (olivier.dauteuil@univ-rennes1.fr) UMR CNRS 6118 Géosciences Rennes, Université de Rennes 1, Campus de Beaulieu F-35042 Rennes Cedex, (2) UMR CNRS 6112 Planétologie et Géodynamique, Université de Nantes, 2 rue de la Houssinière 44322 Nantes

The south African plateau remains an abnormal high topographic feature that affects one quarter of the continent. Several processes have been proposed to explain it, however the main debate concerns the genesis timing: during the Eocene, at the end of Cretaceous, or later? We propose to reconstruct the topographic evoution since the lower Cretaceous thanks a study in the North Namibian margin including onshore and offshore domains.

The Namibian margin belongs to the southern African margins that border the elevated south African plateau. Its eastern side displays a high topography with an average elevation around 1200 m. A coastal scarp that reaches locally 2200 m borders this high plateau from the coastal plain and offshore domain. This scarp is discontinuous and disappears when the Damara belt crosses the coast. We analyse this transition from inner continental domain to offshore domain thanks to a synthetic crustal cross-section based on data compilation and field observations. The palaeotopography is estimated by combined vertical motions and cover thickness evolution.

Vertical motions of the basement were estimated thanks to subsidence curves in offshore domain and with the combination of several markers as the depth of magmatic intrusion and AFT. Three domains are determined along the margin: a subsiding oceanic domain, an uplifted continental domain and the transitional domain located on both side of the shoreline with successive phases of uplift and subsidence. This latter domain is affected by a flexure that is recorded onshore by the tilt of the Etendeka flows and Cenozoic deposits. This flexure migrated seaward. The offshore subsidence varies along the ocean domain with a maximum above a deep sedimentary trough. The reconstruction of the onshore evolution was done with AFT, intrusion depth of magmatic massifs and thickness estimates of Etendeka basalts. It results a first stage a subsidence induced by the fast basalt accumulation, then a regular cover denudation of 5-6 km, since 130 Ma. By integrated isostatic adjustment due to denudation, cover thickness and the present-day elevation of the singular point, the palaeotopography is approximated from present-day to the rifting time. The topography remained elevated since the continental breakup at least 1000 m, and probably around 1500 m, then the elevation decreased progressively until present-day elevation. No event like an uplift was detected during the late Cretaceous or during the Cenozoic. Therefore, the southern African plateau in the north Namibia was present since 140 Ma, at least.

Therefore one question rises: which process allows the persistence of a high plateau during 140 Ma? We propose a special mantle dynamics which sustains the crust through such a long period. It can be due to a permanent mantel plume whose periodic activity should explain the different magmatic events that affect the southern part of Africa since 200 Ma.