Geophysical Research Abstracts
Vol. 12, EGU2010-11438-1, 2010
EGU General Assembly 2010

Analysis of Proterozoic rifting and subsequent subsidence of the Central Congo Basin

Etienne Kadima Kabongo (1), Stanislas Sebagenzi Mwene Ntabwoba (1), and Francis Lucazeau (2)

(1) Faculté des Sciences, UNILU , Lubumbashi, Congo Democratic Republic (Kadima.Kabongo@unilu.ac.cd), (2) CNRS/IPGP, 75252 Paris cedex 05, France (lucazeau@ipgp.fr, +33144279969)

The Central Basin (or Cuvette Centrale) of Congo is a late-Proterozoic to Recent basin covering near one million km2 with up to 9 km of sediment. Its subsidence has been related to a preexisting failed rift (Daly et al, 1992), whose origin, geometry and structure remain largely unknown. Here we present a combined analysis of subsidence and gravity that provides new lines of evidence for a rift origin.

Although the dataset for the Central Basin is poor and has not been improved for a long time (only four deep wells with depths between 1856 and 4666 meters and 33 seismic lines covering 2900 km), it is sufficient for the first order characteristics. The analysis of wells data reveals that the long term subsidence (∼450 m.y.) and present-day surface heat flow (∼40 mWm-2) are both characteristic of a 250 km thick thermal lithosphere. This is consistent with the Archean age of the craton but not with thermal reworking during Paleozoic as hypothesized by Artemieva (2006). From the seismic lines, we can derive a 3D geometrical basin model divided into three different units defined by two major uncomformities. Each layer is assigned an average density value inferred from geophysical logs and then gravity effect is determined and subtracted from the observed gravity anomalies. The residual map shows a positive SE-NW elongated structure that can be related to a possible rift prior to basin subsidence. In order to determine the associated crustal structure, we simply assumed that the post-rift subsidence is flexural and that the rift isostasy is governed by a depth of necking. The procedure involves first flexural backstripping of sediments assuming a given Equivalent Elastic Thickness EET and then determination of the crustal thickness assuming a given depth of necking DON. EET and DON are varied in order to obtain the minimum misfit between predicted and observed gravity. The best results are obtained for EET = 100 km, DON = 10 km and an initial crust thickness of 35 km. The thinning factor within the rift is 1.75-2.00, which is comparable with modern rift such as Baikal (Poort et al, 1998) or East African Rift (Mechie, 1994). The modeled EET is high (100 km) but comparable with estimated values from Bouguer gravity / topography coherence analysis (Pérez-Gussinyé et al, 2009) for that area. Such a large strength value is consistent with a 250 km thick and cold thermal lithosphere. Finally, the depth of necking DON=10 km is shallow but mostly representative of the strength conditions during rifting as for modern rifts. The hidden rift below Central Basin is in the continuity of neo Proterozoic geological structures, the Bushimay supergroup to the South-East and the the Liki-Bembien group to the North-West, while a satellite structure is connecting to the Sangha aulacogen.