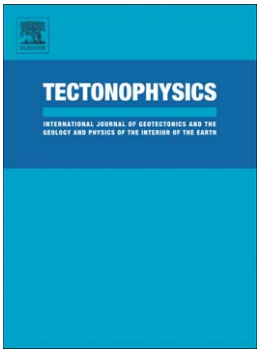

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Is the Okavango Delta the terminus of the East African Rift System ? Towards a new geodynamic model : geodetic study and geophysical review

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Abstract

The Okavango Graben (OG) has been considered as the terminus of the southwestern branch of the East African Rift System (EARS) since the 1970's based on fault morphology and early seismic and geophysical data. Thus it is assumed to be an incipient rifting zone, analogous to the early stage of mature rifts in the EARS. Recent geodetic data and geophysical studies in the area bring new insights on the local crust and lithosphere, mantle activity and fault activity. In this study, we computed the velocities for three permanent GPS stations surrounding the graben and undertook a review of the new geophysical data available for the area. The northern and southern blocks of the graben show exclusively a low strike-slip displacement rate of about 1 mm/yr, revealing the transtensional nature of this basin. The seismic record of central and southern Africa is revealed to be instrumentally biased for the events recorded before 2004 and the OG may not represent the most seismically active area in Botswana anymore. Moreover, no significant lithosphere and crustal thinning is found in the tectonic structure as well as no strong negative Bouguer anomaly and surface heat flux. Thus the OG does not match the classical model for a rifting zone. We propose a new geodynamic model for the deformation observed west of the EARS based on accommodation of far-field deformation due to the differential extension rates of the EARS and the displacement of the Kalahari craton relative to the Nubian plate.

Keywords: Intraplate tectonics, Okavango, Geodesy, East African Rift System.

Highlights :

- Time series for three GPS stations astride the Okavango graben have been processed.
- The Okavango graben showed main strike-slip displacement over the five past years.
- There is no significant evidence for rifting in the area.
- Deformation in the region can be explained by far-field deformation accommodation.

1. Introduction

The East African Rift System (EARS) is a major geodynamic feature which has been splitting the African continent since the late Eocene-Oligocene (e.g., Macgregor, 2015). It propagates from the northern Afar Depression and Main Ethiopian Rift to the southern diverging branches (Fig. 1) : the eastern branch from the Kenyan rifts to

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