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The subsurface structure of the Congo basin: Gravity signatures, isostatic anomaly and seismic constraints.

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The Congo Basin (CB) is a distinctive large sub-circular long-term sedimentation area defined in Central Africa. It contains more than 9 km of mostly detrital and very few organic-rich types of sediment. Surrounded by known and explored cratonic blocks, its thick sedimentary column overlies a less constrained shield structure. The loaded sediments hide the connection between known and unknown Precambrian blocks forming the largest as “Congo Shield” [3]. This complex structure is been supported by global-scale seismic tomography and gravity constraint models.

Thick (~200 km) and rigid lithosphere with faster velocities has been defined beneath much of the basin, contrasted with a thinner lithosphere with slower velocities observed on other area [6]. Otherwise, pronounced and low free-air gravity anomaly dominated the CB area has been associated even to the effect of a thick but low-density sediments overlying a thick lithosphere rifted during Neoproterozoic age, or to that of a high-density body within a deeper lithosphere [2,4]. Though global-scale tomography models and gravity constraints show the existence of a complex lithosphere structure beneath the basin, today more scientific evidences are needed to better define the cratonic block limits.

Choosing an Airy scheme land area, we obtain an isostatic anomaly map of the CB area. The map shows that the CB is dominated by large undercompensated zones separated by thin zones isostatically overcompensated. This indicates that the isostatic correction (IC) agrees with deep crustal gravity effects beneath large area of the basin and shallow crustal gravity effects on other area. On the residual gravity map obtained after removing sediment attraction effect |1,5], overcompensated areas can be correlated with high residual gravity anomaly zones and undercompensated areas with other zones of low residual gravity (under 30 mgal).

In the southwestern area of the basin, we perform a combined geophysical interpretation including gravity and seismic (reflection and refraction) modeling. The models highlighted a plausible suture zone between the known Archean Cuango-Kasai Craton to the south and a hided unknown craton to the north. The latter is bounded by a thin and NW-SE elongated overcompensated area suture zone early defined [3]. This result supports the complex nature of the Congo Basin’s subsurface structure and provides some clarification on where are the cratonic block limits.

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