

# **A Model of Flexural Stresses to Explain the Goiás-Tocantins Seismic Belt in Central Brazil**

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**ABSTRACT:** Explaining intraplate seismic activity is always a challenging task. Several different models have been proposed combining weak crustal zones and mechanisms of stress concentration. Here we propose that stress concentration due to flexural deformation is an important factor to explain the SW-NE oriented belt of intraplate seismic activity in Central Brazil, called “Goiás-Tocantins Seismic Belt”. This activity has been usually associated with the TransBrazilian Lineament (TBL). However, two observations cast doubt on a direct relationship with the Lineament. First, the seismic activity is concentrated in the Tocantins province while the continental scale TransBrazilian Lineament show no seismic activity further to the NE (beneath the Parnaíba basin); to the SW, the seismic activity follows a E-W and then N-S direction and does not coincide with the TBL. Secondly, a close examination of the orientation of the seismic belt shows deviations from the orientation of the Lineament. On the other hand, the seismic belt coincides exactly with the trend of high isostatic gravity anomalies (about 30 mGal), probably due to intracrustal loads, which cause flexural deformation of the lithosphere. Compressional stresses due to this flexural deformation were calculated with finite-element methods assuming a purely elastic lithosphere overlying a very soft asthenosphere. An intracrustal load (perhaps associated with high density rocks of the Goiás magmatic arc) was modeled which could explain the gravity anomalies and produce compressional stresses beneath the load with a width of about 200-300 km. Far from the central zone of horizontal compression, extensional stresses (related to the peripheral bulge) coincide with aseismic zones. We also propose that similar flexural stresses could contribute to the seismicity in a N-S belt along the Eastern border of the Amazon craton, and along the Paraguay-Araguaia foldbelt beneath the Pantanal basins, which also coincide with positive isostatic anomalies.

**Keywords:** Intraplate seismicity, gravity anomalies.