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Mantle convection under the South American plate and possible implications on the evolution of the Pantanal Basin

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The Pantanal wetland is a Quaternary basin in Southwestern Brazil, reaching up to ∼500 m of sedimentary package. Although the relatively recent formation of the basin, the mechanisms involved in the origin of the regional subsidence are not fully understood. Previous works proposed a flexural origin for the basin, invoking the last pulse of Andean tectonism and consequent topographic load as the source for the creation of the Pantanal Basin. However, taking into account the flexural rigidity of the South American lithosphere and the Andean geometry, it is difficult to explain the subsidence amplitude as well as the position of the basin due to flexural effects. Therefore, probably another mechanism must be involved in the formation and evolution of this active sedimentary basin. In the present work we assess if the influence of mantle convection generated by the subduction of the Nazca Plate can induce dynamic topography and can contribute to create the depression associated with the Pantanal Basin. We used a finite element code to simulate the thermochemical convection in the mantle, calculating the associated dynamic topography along a profile from 80ºW to 40ºW, crossing the Pantanal wetland at a latitude of 18ºS. To simulate the mantle flow, the thickness of both lithosphere and crust were resampled from the global LITHO1.0 model and the initial thermal structure for subducting slab was constructed based on a simplified thermokinematic model. The subducting slab geometry adopted was derived from the Slab2 model. We propose that, although the wavelength of the negative dynamic topography produced in the interior of the continent is larger than the width of the Pantanal basin, the amplitude of the subsidence and the geographic position of the depression are compatible to the observed values. Additional three dimensional models will be considered in the future to better represent latitudinal variations of the subducting slab and consequently improving the representation of the dynamic topography in the interior of the South American Plate.