EGU2020-11923
https://doi.org/10.5194/egusphere-egu2020-11923
EGU General Assembly 2020

Tidal circulation in an Early Permian epicontinental sea: insights from a mathematical modeling approach

Mariane Candido, **Joice Cagliari**, and Ernesto Luiz Lavina
Programa de Pós-Graduação em Geologia, Universidade do Vale do Rio dos Sinos, São Leopoldo, Brazil
(marianecandido@edu.unisinos.br)

The intracratonic Paraná Basin and its western extension - Chaco-Paraná Basin - are located in the south-central portion of South America and cover an area of about ~1.8 million km^2, including portions in Brazil, Argentina, Uruguay, and Paraguay. The Early Permian epicontinental sea was shallow and likely connected with the Panthalassa in the southern portion of Uruguay (Lavina, 1992). The transgressive sedimentary succession of the Guatá Group is composed of coastal plain and shallow marine deposits (Rio Bonito Formation), in complex associations due to base level fluctuations and irregular deglaciation paleotopography, and offshore-transitional deposits (Palermo Formation) (Lavina and Lopes, 1987). The Rio Bonito Formation is mostly preserved within paleovalleys carved by glaciers and tectonic. The tidal-influence in this formation occurs throughout the succession and are mainly characterized by medium- to coarse-grained arkosic and quartz sandstones with uni- and bidirectional cross-bedding, herring-bone cross-bedding, tidal bundles, reactivation surfaces, mud drapes, and double mud drapes (Fritzen et al., 2019; Lopes and Lavina, 2001). Besides the tidal sedimentological aspects, the conditions that governed tide in this epicontinental sea are poorly understood. In this work, we present a theoretical perspective on the behavior of tides in the Paraná Basin epicontinental sea during the Early Permian. Mathematical models were applied to test the existence of amphidromic points in the basin, to verify the possibility of resonance, as well as to test the tidal amplification inside two paleovalleys. The obtained results were compared to Hudson Bay, considered here a modern analog. According to the paleogeography, paleolatitude (Southern Hemisphere), depositional records and insights from the modern analog, the studied Early Permian epicontinental sea likely had bear more than one clockwise-rotation amphidromic system. Resonant effects may also have affected circulation, especially at sea depth below 100 m. In the simulated scenarios, tidal amplification in both valleys was variable but concentrated between micro to mesotidal amplitudes. This is the first contribution to the understanding of the tidal behavior of the Early Permian epicontinental sea.

References:

Fritzen, M.R., Cagliari, J., Candido, M., Lavina, E.L., 2019. Tidal bar cyclicity record in the Lower Permian (Rio Bonito Formation of the Paraná Basin). Sedimentary Geology 381, 76-83.

Lavina, E.L., 1992. Geologia sedimentar e paleogeografia do Neopermiano e Eotriassico (intervalo Kanzaniano - Scythiano) da Bacia do Parana. Ph.D. Thesis, UFRGS University.

Lavina, E.L., Lopes, R.C., 1987. A Transgressão Marinha do Permiano Inferior e a Evolução Paleogeográfica do Supergrupo Tubarão no Estado do Rio Grande do Sul. Paula-Coutiana 1, 51-103.

Lopes, R.C., Lavina, E.L., 2001. Estratigrafia de sequências nas Formações Rio Bonito e Palermo (Bacia do Paraná), na região carbonífera do Jacuí, Rio Grande do Sul, in: Severiano Ribeiro, H.J.P. (Ed.), Estratigrafia de sequências: fundamentos e aplicações. Edunisinos, São Leopoldo, pp. 391-419.

How to cite: Candido, M., Cagliari, J., and Lavina, E. L.: Tidal circulation in an Early Permian epicontinental sea: insights from a mathematical modeling approach, EGU General Assembly 2020, Online, 4–8 May 2020, EGU2020-11923, https://doi.org/10.5194/egusphere-egu2020-11923, 2020