IDENTIFYING CYCLICITIES IN DIFFERENT TYPES OF DATA SERIES: A STUDY OF THE CARBONIFEROUS RHYTHMITES OF THE ITARARÉ GROUP, PARANÁ BASIN

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ABSTRACT: The Itararé Group records the end of the "Late Paleozoic Ice Age" (LPIA) in the Paraná Basin, southern Brazil. In the southernmost part of the Paraná Basin, glacial conditions are evidenced mainly by the presence of mudstones and varve-like rhythmites with dropstones, and diamictites with striated, faceted and bullet-shaped pebbles, cobbles and boulders, besides striated pavements. It is known that glacial and interglacial periods are controlled by insolation changes caused by orbital cycles related to variations of Earth's orbit through time. As a consequence, orbitally paced climate changes may influence the sedimentation patterns, which can record the cycles and enable their recognition in the geological record. Assuming the hypothesis that orbital cycles conditioned the deposition of the sedimentary succession of the Itararé Group, this research aims to (i) recognize the cyclicities preserved in rhythmites of Itararé Group in southernmost part of the Paraná Basin and (ii) compare cyclicities identified in two different data series and thus estimate sedimentation rates for the studied succession. The analyses were made in a core drilled by the Brazilian Geological Survey (CPRM), which is located in the Mariana Pimentel paleovalley, southeastern border of the Paraná Basin. One dataset was obtained by measuring the lithological couplet thickness of rhythmites, and the other, by measuring the spectral reflectance of visible wavelength. Both datasets were processed with the software R, using the Astrochron package. We used Astrochron to perform time series analyses such as Robust Locally-Weighted Regression Spectral Background Estimation, Evolutive Harmonic Analysis, and Multitaper Method Spectral Analysis. Using these algorithms, the datasets were interpolated creating a more detailed scale and reducing noise in order to identify cyclicities and to estimate sedimentation rates. Preliminary results enabled the recognition of frequencies ranging between 1 and 10 cycles per meter in both couplet thickness and reflectance measurements. Overall, our analysis suggests an increasing-upward trend in sedimentation rates, based on the length of the cycles identified within the sedimentary succession. Furthermore, the results obtained so far are in agreement with previous studies carried out in other Carboniferous successions of the Paraná Basin (Santa Catarina and São Paulo states), which identified Milankovitch and millennial-scale cycles controlling sedimentation patterns. Future developments on the analysis presented herein will contribute to improve the chronology of deposition of the rhythmites within the Itararé Group.

KEYWORDS: CARBONIFEROUS; GONDWANA GLACIATION; CYCLOSTRATIGRAPHY