

THE LAST GREAT GLOBAL WARMING: RECOGNIZING EXTREME INFLUENCE OF THE PALEOCENE/EOCENE THERMAL MAXIMUM (PETM) IN CONTINENTAL LITHOLOGIES OF THE SOUTHWEST RIO GRANDE DO SUL STATE, BRAZIL

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ABSTRACT: This study interprets the direct correlation between extreme effects of the Paleocene/Eocene Thermal Maximum (PETM) on the continental lithologies of the Paleocene that contain numerous resistant, fine-grained, silica-rich strata occurring in western Rio Grande do Sul State. The PETM event represents a 200,000-yr-long period of rapid carbon release and of global warming that occurred ~56 million years ago, which profoundly affected continental climate and ecosystems in the Paleogene. In a high-CO₂ world, evidence of high-CO₂ content in the paleorecords gives reliable information on the implications of possible future climate change. Understanding of the details and mechanisms of these effects is limited by the poor geographic cover of existing continental PETM records. The definition of a P-E transition surface was possible through the endcaps of the informally proposed Nova Esperança Formation, characterized by a very remarkable geomorphology of mesa-like relief in the southwest Rio Grande do Sul. This formation is a post-volcanic sedimentation that is characterized by an extensive Tertiary cover. The formation was continuous before extreme erosion; even so the horizons at which layers are found can be correlated along tens of kilometers. Silcretes are significant because they are similar in appearance wherever they are found and can be traced over large areas, making them a mappable unit. These silcretes are probably the most striking chronostratigraphic marker associated with the P-E paleoweathering, and prove to be an important tool in reconstructing the continental paleogeography. Nova Esperança Formation is fully outcropping and its fluvial facies has SW paleocurrents, locally deposited over the Sanga do Cabral Formation, Botucatu Formation and even the Serra Geral Formation. So, the disappearance of Neojurassic lithologies within the Jaguari-Mata Fault System is not a plausible explanation from physical and tectonic point of view, requiring a more realistic assessment. The presence of sinkholes, caverns and grottos is another interesting feature associated with these fluvial sandstones. Nova Esperança Formation can be considered one of the most important cases of karstic relief evolution in Brazilian siliciclastic rocks. The establishment of a new stratigraphy is significant because all studies on sandy desertification or “sandization” of this region were based on generally misinterpreted lithologic substrate.

Keywords: PALEOCENE/EOCENE THERMAL MAXIMUM, PSEUDOKARST GEOMORFOLOGY, NOVA ESPERANÇA FORMATION