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Life in Wet Peperites from the Paraná-Etendeka Large Igneous Province, Brazil

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Abstract: Evidence of ancient life has traditionally been associated with sedimentary rocks; however, recent studies have unveiled the presence of life in unconventional deposits, such as igneous and metamorphic rocks. This research investigates the biodiversity of the Paraná Basin by exploring the occurrence of organic walled microfossils (OWM) in wet peperites, unique rocks formed from the interaction of lava and subaqueous sediments. The study focuses on wet peperite deposits within the Paraná-Etendeka Large Igneous Province, specifically the Torres, Esmeralda, Pitanga, and Paranapanema formations in the Paraná, Santa Catarina, and Rio Grande do Sul states of Brazil. A total of 42 microfossils were recovered from wet peperites, with notable features including well-preserved morphological ornamentation, such as sacci delimitation, predominantly observed in bissacates. Interestingly, the abundance and preservation quality of these microfossils show an increasing trend in the upper formations, documenting the later stages of the volcanic event (Torres Formation, N=8; Pitanga Formation, N=12; Paranapanema Formation, N=51). Additionally, dubiofossils were identified in wet peperites from the Paranapanema Formation, displaying intriguing characteristics like irregular stem branching, hinting at possible botanical affiliations that require further investigation. The discovery of life evidence in the Paraná-Etendeka deposits provides valuable insights into the region's biodiversity and suggests a regional paleoclimatic transition from arid to more humid conditions, likely influenced by volcanic activity. Remarkably, wet peperites demonstrate superior fossil preservation and higher abundance compared to their laterally correlated deposits, the volcanoclastic heterolytic sandstones. Despite both settings sharing a similar sedimentary framework (fine sand with silt-mud laminae), wet peperites exhibit a clear trend of enhanced preservation of organic walled microfossils. This observation implies that differences during early diagenesis may have favored preservation in peperites. The interaction of lava and wet sediments might have accelerated sediment cementation, potentially promoting enhanced fossil preservation through vapor film generation (non-explosive molten fuel-coolant interactions) and facilitating the mixing process.

KEY-WORDS: MICROFOSSILS, SERRA GERAL GROUP, VOLCANICLASTIC ROCKS