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Multidisciplinary palaeoenvironmental characterisation of the late Permian Matinde Formation, Mozambique

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The Muarádzi Sub-basin is part of the Moatize-Minjova Basin (MMB), an important Karoo aged coalfield in Tete Province, Mozambique. It is a WNW-ESE trending, elongated sedimentary basin located in the eastern part of the MMB, whilst during the late Permian was situated in the southern-central part of Gondwana. In this study, we undertook a multidisciplinary approach involving the lithological, palynofacies, and palynological analysis of samples collected from 3 coal exploration boreholes (DW11, DW21, and DW141) collected from this sub-basin. A total of 99 core samples were collected and studied, allowing for the characterisation of depositional environments and existing palaeofloras for this sub-basin.

The palynological data indicates that all the successions have a Lopingian age, and a vast lowland fluvial setting existed in an area controlled by tectonic movements associated with a continental rifting phase. Correlation between the three sections enabled the recognition of an initial meandering fluvial system affected by repeated flooding events that changed to a braided river. The palynofacies corroborate the interpreted fluvial model and the palynological record obtained.

The existence of a humid and warm climate during the Lopingian led to the development of vast floodplains and diversified wetland types, typical of lowland settings recorded in the analysed samples. The palynofacies analysis also indicate that the thick coal beds' development is associated with deposition in anoxic to dysoxic environments. Furthermore, the *Glossopteris* Province vegetation, responsible for the coal development in the Muarádzi Sub-basin, is documented in the palynological assemblages, allowing for the characterization of a flora dominated by glossopterids (*Protohaploxypinus* and *Striatopodocarpites*) and gymnosperm pollen (*Alisporites*). The palaeofloral analysis based on palynological data also shows that associated ferns (e.g., *Osmundidacites senectus*, *Thymospora pseudothiessenii*), sphenophytes (e.g., *Calamospora*) and lycophytes (e.g., *Lundbladispora*, *Kraeuselisporites*) were common in this area. Additionally, upland vegetation indicators in the palynological

assemblages, as monosaccate pollen grains, are rare, indicating that upland regions were distant from the studied sections.

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