$\delta^{13}C$ of coals from the Moatize Basin, Mozambique: a terminal record of the Late Palaeozoic Ice Age (LPIA)

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The Moatize Basin is a Palaeozoic sedimentary basin located in Mozambique; despite being one of the largest Karoo sub-basins of Mozambique, it remains underepresented in the literature. Recently, the coal-bearing stratigraphy of the Moatize Formation has been biostratigraphically aged as Artinskian[1], a time period coinciding with the end of the Late Palaeozoic Ice Age (LPIA). Isotopic records of climate change from this period in geological history are limited to mostly marine sediments, with little isotopic evidence obtained from terrestrial sediments such as coal. In order to contribute a robust geochemical record to this time period, $\delta^{13}C$ analysis was performed on coal samples retrieved from the Chipanga Seam, Moatize Formation (n = 101). Two drill core locations with equivalent stratigraphy were selected to decouple local environmental, and regional climatic variations expressed by $\delta^{13}C$. The total range of $\delta^{13}C$ (VPDB) was between -20.5 ‰ and -26.9 ‰, with no significant statistical variation in the average values between the stratigraphy at either location ($\Delta\bar{x}$ = 0.4 ‰). In the upper and middle Chipanga Seam, $\delta^{13}C$ varies cyclically ($\bar{x}$ = -22.7 ‰, s = -0.2 ‰), expressing palaeoenvironmental changes. A significant negative isotopic excursion is observed within the lower Chipanga Seam, concurrent between the two sample locations ($\bar{x}$ = -26.6 ‰). From this data, it can be inferred that this isotopic excursion represents a global geochemical boundary, coincident with isotopic excursions observed in age-equivalent sediments of Australia. This negative $\delta^{13}C$ excursion marks the transition between ice-house conditions, dominant in the Early to Middle Permian, and green-house conditions that progressed into the Late Permian. This research represents the first stable isotopic record from terrestrial sediments of the Karoo sub-basins, and opens the door for further research investigating the global climatic shift at the terminus of the LPIA.

[1] Götz, A. Hancox, J.P, Lloyd, A. (2017), *Acta Palaeobotanica* 57(1), 3–11.

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