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Late Quaternary paleoenvironmental change in the year-round rainfall zone of South Africa derived from peat sediments from Vankervelsvlei

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Due to the scarcity of natural archives for paleoenvironmental studies, the climatic evolution of South Africa during the late Quaternary is highly debated. Peat deposits provide excellent archives to investigate past environmental and climate variability. Vankervelsvlei, a fen at the southern Cape coast, in the year round rainfall zone of South Africa, located 152 m above mean sea level is hence ideal to investigate past environmental change in this region. From this fen a 14.6 m long sediment sequence was retrieved from which 8.85 m sediment were analysed using a multi-proxy approach. The wetland has previously been described as a floating bog ('Schwingmoor'), based on the assumption of a water column between the sediments and a floating vegetation mat. In this study, the recovery of a continuous sediment sequence from the surface of the wetland down to dune sediments forming the bedrock has resulted in revision of the 'Schwingmoor' hypothesis.

The chronology is based on 13 radiocarbon ages and reveals a basal age of 37,430 $^{+1,570}/_{-1,710}$ cal BP. The lower part of the sediment sequence from 37,430 $^{+1,570}/_{-1,710}$ to 28,050 $^{+510}/_{-600}$ cal BP represents a rather dry phase which is derived from interpretations of leaf wax n-alkane stable isotopes and (in)organic (bio)geochemical parameters. This is followed by a hiatus of around 20,000 years (28,050 $^{+510}/_{-600}$ to 8,360 $^{+730}/_{-810}$ cal BP) likely reflecting the driest conditions of the record, hence being interpreted as a depositional gap. This is likely caused by an increase in the Antarctic sea ice extent which resulted in an equatorward shift of the Westerlies, blocking the tropical easterlies which resulted in dry conditions at the south coast. A mean annual insolation maximum at 34° S potentially increased the evaporation at Vankervelsvlei and in turn contributed to the desiccation of the fen.

During the Early Holocene the input of reworked soil into the depression and subsequently renewed peat formation from 6,820 $^{+305}/_{-365}$ cal BP to 1,180 $^{+340}/_{-170}$ cal BP in Vankervelsvlei point to moister climatic conditions. This is potentially driven by the contraction of the Antarctic sea ice and a poleward shift of the Westerlies during the Holocene. In general, Vankervelsvlei appears to be an evapotranspiration controlled ecosystem.