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Quaternary palaeoenvironments in Namibia: new records from optically stimulated dating of Kalahari linear dune accumulation and northern Namib Sand Sea interdune deposits.

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In this study we consider new linear dune accumulation records from the west of the southern Kalahari linear dunefield ($\sim 24^o$ S 18^oE) and a new chronology for three sites along the former course of the Tsondab River in the northern Namib Sand Sea (23^o49'15"S, 14^o57'30"E, 23^o48'39"S, 15^o02'21"E and 23^o56'11"S, 15^o17'89"E) from Namibia, southern Africa. Optically stimulated luminescence dating (OSL) has been applied to both sites in order to: (i) provide a chronology for linear dune accumulation in a previously unstudied region of the southern Kalahari linear dunefield and (ii) to provide a chronological reassessment for water-lain units from the Namib Sand Sea, previously dated using radiocarbon applied to inorganic carbonate sediments.

The 48 OSL ages from the linear dunes include the oldest linear dune sediment ages recorded in the southern Kalahari and also reveal that the dunefield has been partially active throughout much of the past 120 ka. These ages are considered alongside the net accumulation record for the entire southern Kalahari linear dunefield (141 optical ages) and we make some important observations about the influence of sampling strategy. We attempt to isolate a rigorous signal that does not depend on sampling strategy by removing cores and comparing the net accumulation record from different parts of the dataset. We consider the young bias resulting from the predominance of shallow sampling in the total dataset.

The bracketing OSL ages (from sand units that inter-bed water-lain calcareous rich sediments) in the northern Namib Sand Sea suggest that the series of seven mud units at Narabeb (23^o49'15"S, 14^o57'30"E) are substantially older than the existing radiocarbon chronology from the mud units themselves. Twelve of the thirteen OSL ages fall within MIS 5. By contrast, at Ancient Tracks (23^o56'11"S, 15^o17'89"E) the OSL-based chronological reassessment suggests the water-lain units were 1 to 2 ka younger than the existing radiocarbon ages, with deposition between 12.8 ± 0.8 ka and 12.0 ± 0.8 ka and between 11.5 ± 0.6 ka and 10.5 ± 0.5 ka. Together the three sites provide a new estimate for the timing of the progressive desiccation of the Tsondab River.

We conclude that larger datasets of linear dune accumulation (1000s not 100s of OSL ages) are needed, and also to demonstrate that altering sampling strategy within this dataset does not bias the combined-core results, before we have a reliable dataset of dune accumulation in this region. This is before tackling the additional issue of interpreting the palaeoenvironmental significance of the dune accumulation record. For the Namib Sand Sea we conclude that the revised timing for increased moisture availability to the catchment of the Tsondab River still reinforces the idea that changes in moisture availability are driven by precipitation changes over the catchments in the Great Escarpment and further inland. Finally, we make some brief observations regarding how these two new records compare with the current regional palaeoclimatic syntheses.