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Provenance, transport, and post-depositional alteration of sandy sediment across the Thar Desert

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Geochemical and radiogenic isotope tracers are widely used for provenance studies. However, limited knowledge of eolian processes and aridity conditions in altering detrital sediment composition generally hampers reliable provenance tracing in arid/semi-arid environments. This study presents a novel geochemical and Sr-Nd isotope dataset for sandy surface sediments (52 samples) collected across the Thar Desert, Rajasthan. The probability distribution patterns indicate a consistent upwind provenance of sandy sediments across the desert. The upwind Thar sediment signatures[1] from Jaisalmer and Barmer districts could be reliably traced to ~400–500 km downwind locations falling in the northeastern semi-arid fringes of Rajasthan. The northeastern dune profile sediments are relatively more chemically weathered and show relatively higher Zr abundances and lower e_{Nd}. Whereas, higher $^{87}Sr/^{86}Sr$ relates to K-feldspar/mica preferentially retained in fine quartz-enriched sediment delivered to the Aravalli highlands, probably under stormy conditions. This study highlights the widespread eolian transport of sandy desert sediments, accompanied by spatially varying sedimentary processes, which modify geochemical/isotope compositions under favorable conditions.

[1] Bhattacharyya et al., (2024), Journal of Geophysical Research: Earth Surface 129 (8), 1-22.