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Late Holocene organic matter dynamics and environmental shifts from Lakshadweep Archipelago, west coast of India, Arabian Sea

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We characterize the organic matter dynamics and environmental history from a Mangrove sediment core from Lakshadweep Archipelago, Arabian Sea. The records are constrained by stable carbon and nitrogen isotope ratios ($\delta^{13}C$ and $\delta^{15}N$), total organic carbon (TOC), total nitrogen (TN), TOC/TN, loss on ignition, and grain size changes aided by a chronology that spans the last 2200 years. Four distinct environmental phases were reconstructed based on the isotope and sedimentological records that reveal phased interactions between terrestrial and marine influences over the past 2200 years. Phase I (~2200–1700 cal yr BP) is characterized by enriched $\delta^{13}C$ values (-24‰) and high OM content, suggesting a period of strong terrestrial influence. Phase II (1700-1100 cal yr BP) reveals relatively stable conditions, with high $\delta^{13}C$ and low $\delta^{15}N$ values, and low TOC or OM content, suggesting sustained mangrove productivity and continued dominance of terrestrial inputs. Phase III (1000-400 cal yr BP) shows rapid fluctuations in $\delta^{13}C$ (-28‰), $\delta^{15}N$, and TOC/TN, indicating a more dynamic environment potentially driven by episodic environmental shifts or changes in sea level and storm surges. Phase IV (last 400 years), shows $\delta^{13}C$ and $\delta^{15}N$ enrichment and an increase in TOC/TN, indicating increased terrestrial OM inputs likely linked to the onset of anthropogenic impacts. Our records suggest that OM dynamics in the mangrove ecosystems are regulated by both marine and terrestrial processes influenced by anthropogenic activities during the last few centuries.