

Late Pleistocene - Holocene paleo-hydrological changes in the saline playas of the Thar Desert: A synthesis

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The Thar Desert in India is a region of high rainfall gradient (~1mm/km). The annual rainfall ranges from ~500 mm in the east (semi humid) to ~100 mm in the west (arid). Across this gradient, numerous saline playas with centripetal drainage exist and draw their water from summer rainfall events. In view of their location in different rainfall regimes, they enable reconstruction of spatial gradients of paleo-precipitation. This contribution synthesizes the published literature on lithostratigraphy, mineralogy, palynology, (isotope) geochemistry, radiocarbon and optical dating of the lacustrine sequences for synoptic overview of spatial variation in rainfall through time.

The antiquity of the semi-humid eastern playa sediments goes beyond 20 ka but most of the western and northwestern playas post-date the 20 ka glacial epoch. During the Holocene, the eastern playas show abundance of carbonates (calcite, CaCO₃ and proto-dolomite ($Ca_{>1}Mg_{<1}(CO_3)_2$) and the playas in the west show presence of gypsum (CaSO₄ 2H₂O). This suggests a spatially variable development of evaporation cycles. The geochemical proxies for chemical weathering and C3/C4 vegetation changes suggest that though the overall nature of the rainfall gradient remained unchanged, the exact magnitude was different. Thus for example, in the eastern playas gypsum precipitation ceased after ~10 ka, whereas the process continued intermittently during the Holocene in the western playas. Further, the paleo-hydrological fluctuations suggest that in the eastern playa it was limited for 2 ka (7 - 5 ka). Compared to this, the playas in the extreme western Thar Desert remained perennially saline. The western playas became ephemeral and saline 1 ka earlier at ~6 ka compared to eastern playas that were fresh till ~ 5 ka.

Presently the chronometric data using optical dating of playa sediments is underway to refine the timing of key hydrological changes. The presentation will comprise a regional survey of securely dated playa successions in the Thar Desert and discuss their import on regional reconstruction of changes in the monsoon through the Holocene.

Keywords: Rainfall Gradient; Evaporites; Optical Dating; Saline Playas; Thar Desert.