# Desert systems, climate change, and trace fossils

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We present a model for trace-fossil distribution on desert eolian dunes and coastal eolian dunes developed in arid climates that reflects the partitioning of desert settings in a mosaic of landscape units; they are characterized by water content and its temporal fluctuations, nutrient availability, nature of the substrate, and the dominant organisms present. Landscape units, such as eolian sand seas, salt flat and playa lake systems, ephemeral rivers and alluvial fans, interact in response to regional-scale climate variations in hyper-arid, arid, and semiarid climatic settings. The model proposed results from the elaboration of a comprehensive database that summarizes all life known in eolian deposits from the Cambrian to the Recent, reported in the literature. Ancient deserts completely developed under hyper-arid climatic conditions rarely preserve ichnofossils due to the absence of moisture near the surface in addition to a lower biomass of bioturbating organisms. The alternation of wet periods may represent windows for life and thus, preservation of biogenic structures. Arid deserts display complex patterns of dunes combined with dry, wet, and flooded interdunes. Dry desert elements (dunes, interdunes, sand sheets) typically record the *Entradichnus-Octopodichnus* and *Chelichnus* ichnofacies. Slight rises in regional precipitation produce elevation of the water table and increase of fluvial discharges that provide water and sediment to the system. These processes may result in the intense bioturbation of wet interdunes and ephemeral fluvial systems, illustrating the *Scoyenia* and *Chelichnus* ichnofacies. In semiarid systems playa lakes expand by the addition of freshwater, evolving into freshwater lakes, and fluvial systems may become more common; lake margins and fluvial overbanks typically contain trace-fossil assemblages that may be ascribed to the *Scoyenia* ichnofacies.