



Paleoclimatic insights into forcing and response of monsoon rainfall

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Paleoclimatic evidence of monsoon rainfall dynamics across different regions and timescales could help us to understand and predict the sensitivity and response of monsoons to varying environmental conditions. Monsoon rainfall records show that large-scale meridional temperature gradients and the related position of the intertropical convergence zone strongly shape the monsoon dynamics. However, study of past monsoons also reveals that these temperature gradients are sensitive to many types of forcing, the influence of which seems to vary in time and space. For instance, orbital forcing affects all the monsoon domains by changing the meridional gradient in insolation and, hence, heating. However, there is no consistent response of the specific monsoon systems to orbitally forced insolation changes. This is partly due to the internal feedback mechanisms such as ocean–atmosphere interaction. We discuss some of the main forcings of monsoon variability and their uncertainties, and argue that a coordinated effort to quantify past variations in meridional temperature gradients and the connection between oceanic heat transport and monsoon systems will provide a crucial test bed for model improvement.