Geophysical Research Abstracts,
Vol. 11, EGU2009-7576-2, 2009
EGU General Assembly 2009

Basic mechanism for abrupt monsoon transitions

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Monsoon systems in India and China are recorded to have shown strong variations in rainfall in Holocene and glacial climate as well as significant intraseasonal variations. Though details of regional monsoon circulations are complicated, their dynamics contains a defining moisture-advection feedback which could be at the heart of this variability as an internal amplifier of relatively weak changes in external forcing. Observations show that it plays a strong role in current monsoon systems. Here we present a minimal conceptualmodel not meant to realistically represent the complexity of the monsoon circulation but merely to comprises this positive feedback as a conceptual building block to understand abrupt monsoon transitions. The fundamental physical relations used in the model are motivated by observations. The model exhibits a threshold behavior for strongly reduced solar insulation into the monsoon region. Beyond this threshold, no conventional monsoon circulation exists. Within the restrictions of the simple model we compute the critical thresholds for current monsoon systems.