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Modelling Palaeomonsoon

M. Claussen (1,2)

(1) Meteorological Institute, University Hamburg, Germany, (2) Max Planck Institute for Meteorology, Hamburg, Germany (claussen@dkrz.de)

Some 80 years ago, Rudolf Spitaler suggested that changes in the Earth's orbit could affect the temperature gradient between land and ocean and thereby, the strength of the subtropical summer monsoon. Unfortunately, his calculations were flawed such that his theory was forgotten until the 1980ies when John Kutzbach convincingly demonstrated the strong relation between the precession of equinoxes and the strength of summer monsoon. However, it was soon realized that orbital forcing alone was not sufficient to explain the amplitude in long-term changes of monsoon precipitation. It became apparent that the interaction with other components in the climate system, mainly vegetation dynamics and, as a secondary effect, changes in sea-surface temperature, has to be taken into account. Furthermore, it appears that the biogeophysical feedback in the subtropics is strongly non-linear which could explain the abrupt changes in summer monsoon such as the abrupt increase in North African summer monsoon some 16,000 years ago and the abrupt decrease, some 5,500 years ago. Besides orbital forcing, internal climate system processes such as Dansgaard-Oeschger and Heinrich events affect the pacing and magnitude of the African summer monsoon as well as the Asian winter monsoon.