

PaCMEDy - Palaeoclimate Constraints on Monsoon Evolution and Dynamics

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PaCMEDy aims to identify emerging constraints on monsoon evolution and dynamics, linking modelling of past climates to future projections. The evaluation of the variability and the strength of monsoons in palaeoclimate simulations through past records provides the opportunity to assess the credibility of future climate projections. The project uses annually-resolved palaeoenvironmental records of past 6000 years from corals, molluscs, speleothems and tree rings, together with global climate-model and high resolution simulations of Indian, African and South-American monsoons to provide a better understanding of the monsoon dynamics. It is organised around four themes: (1) the impact of external forcing and extratropical climates on intertropical convergence and the hydrological cycle in the tropics; (2) characterization of IM variability to determine the extent to which the stochastic component is modulated by external forcing or changes in mean climate; (3) the influence of local (vegetation, dust) and remote factors on the duration, intensity and pattern of the Indian, African and South American monsoons; and (4) the identification of paleo-constraints that can be used to assess the reliability of future monsoon evolution.

At present, several groups within PaCMEDy started analyses of the different monsoon systems using previous simulations as part of CMIP5/PMIP3 or their own experiments. Updates have been made for the BIOME6000 reconstruction of vegetation, including a new data set covering the eastern Mediterranean-Black-Sea region-Caspian region, and the Global Lake status database. The equatorial ocean SST database with a discussion on the uncertainties has been completed and ice-core data have been provided, as well as a synthesis of speleothems datasets from South America, and India, tree rings from India, and the complement of coral and shell database with records for the west Pacific Ocean and the Atlantic. On the modelling side, PaCMEDy has contributed to the definition of the boundary conditions to be used for the PMIP4/CMIP6 set of simulations. Transient simulations, partly with new estimates of external forcing or new sub-components (carbon cycle, interactive water isotopes) have been carried out. Also sensitivity studies on dust, vegetation and runoff are investigated with EC-Earth, MPI-ESM and IPSL models on mid-Holocene time slice or transient experiments.

This contribution will present the objectives of the project and a synthesis of the results obtained during last 18 months.

Key words: Monsoon, Holocene, palaeodata, modelling.