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Trends, rhythms and events in Plio-Pleistocene African climate and human evolution

M.H. Trauth (1), J.C. Larrasoaña (2)

(1) Universitaet Potsdam, Institut fuer Geowissenschaften, Golm, Germany, (2) Institute of Earth Sciences Jaume Almera, Barcelona, Spain. (trauth@geo.uni-potsdam.de)

We analyzed published records of terrigenous dust flux from marine sediments off subtropical West Africa, the eastern Mediterranean Sea, and the Arabian Sea using statistical methods (robust regression, running Mann-Whitney and Ansari-Bradley tests, evolutionary Lomb-Scargle powerspectral analysis) to detect trends, rhythms and events in Plio-Pleistocene African climate. We strictly followed the suggestion by Muller and MacDonald (2000) and developed three different age models for each dust and isotope record: (1) an untuned age model only based on radiometrically dated tie points, (2) an age model based on the minimal-tuning approach, i.e., using the age model published by the corresponding authors and eliminating all tuning points except for one point every 100 kyr; (3) the fully-tuned records as published by the authors of the dust records. Based on the results of this statistical experiment, these records document significant differences in the timing and magnitude of African aridity changes reflecting regional differences in the dust availability and the strength of the wind systems on the African continent. Significant differences also exist between these records and published lake chronologies, carbon isotope records from soil carbonates and other records of Plio-Pleistocene East African climate fluctuations. These results suggest that these terrigenous dust records therefore cannot be used to test proposed models of climate-human evolution linkages unless their paleoclimatic significance are fully established.