

AFRICAN CLIMATE & HUMAN EVOLUTION: THE LAND-SEA CONNECTION

Peter B. deMenocal, Lamont-Doherty Earth Observatory, Columbia University

A comparison of ODP results with anthropological studies suggests that human evolution in Africa may have been influenced by climate change. Detailed records of African climate change during the Pliocene-Pleistocene are rare from geological sequences on land. However, in 1986, ocean drilling on the western marine margin of Africa during ODP Leg 108 recovered a continuous and well-dated record of wind-borne dust, an indicator of atmospheric conditions. Because the export of dust to the ocean is linked to regional precipitation patterns, this record constrains subtropical African climate variability over the past 5 million years. The East African fossil chronology is primarily based on geochemically dated volcanic ash layers. Ash shards from these same eruptions are also found within the marine paleoclimate records providing a correlation between marine and land records.

The monsoonal climate regime of Africa before 2.8 Ma was paced by 21,000-year cycles in low-latitude incoming solar radiation (Earth's orbital precession). Marine records document a shift toward prolonged and seasonally more arid conditions, favorable to grasslands, after 2.8 Ma. (See figure and *deMenocal*, [1995]. All subsequent citations are referenced therein). Other paleoclimate data (e.g., $\delta^{18}\text{O}$) and climate modeling results suggest that this shift was the result of cooler North Atlantic sea-surface temperatures associated with the onset of significant Northern Hemisphere glaciation [*Rind et al.*, 1986; *deMenocal et al.*, 1993]. Major steps in the evolution of African hominids [*Wood*, 1995] and other vertebrates [*Vrba*, 1995] coincide with shifts to more arid and open conditions near 2.8, 1.7, and 1.0 Ma, suggesting that the extinction of some species and the evolution of new ones during the Plio-Pleistocene may have been climatically mediated.

Reference:
deMenocal, P.B., Plio-Pleistocene African Climate, *Science*, 270, 53-59, 1995.

