

UC SANTA BARBARA

THE *Current*

December 1, 2005

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Tropical Atlantic Cooling and African Deforestation Correlate to Drought, Report Scientists

Against the backdrop of the Montreal Summit on global climate being held this week, an article on African droughts and monsoons, by a University of California, Santa Barbara scientist and others, which appears in the December issue of the journal *Geology*, underlines concern about the effects of global climate change.

Tropical ocean temperatures and land vegetation have an important effect on African monsoon systems, explains first author Syee Weldeab, a post-doctoral fellow in the Department of Earth Science at the University of California, Santa Barbara. The monsoons are critical to sustaining agriculture in equatorial Africa.

Weldeab says that man's reduction of inland vegetation cover through deforestation and overgrazing in equatorial Africa and increases in global temperatures through the emission of greenhouse gases will likely strongly affect the African monsoon system in the future.

"The weakening of the monsoon has a huge effect," says Weldeab, "resulting in shortages of harvests and hunger."

As vegetation is cleared, the land loses its capacity to retain heat and becomes cooler. As the land cools relative to the ocean, there is a larger gradient between the

ocean temperature and the land causing less moisture to be pulled from the ocean air toward the land.

Weldeab and his colleagues studied cores from beneath the ocean floor of the Gulf of Guinea, in the tropical Atlantic just off the coast of Cameroon, to understand the history of climate in the area for the past 10,000 years. The cores contain foraminifera, tiny plankton shells that are composed of calcium and trace elements. By studying the ratios of magnesium and calcium in the shells, the scientists are able to correlate that information to past temperature changes in the ocean. In analyzing these records for the past 10,000 years, the scientists found three pronounced cooling periods which indicate drought.

Besides the ocean records, the scientists analyzed data from four lakes that are distributed across central Africa on the monsoon belt. The three sea surface cooling periods found by the scientists correlate to records of low lake levels. These clearly were times of drought; the land became more arid.

The authors state, "periods of drought likely brought about environmental hardship, triggering population migration, giving rise to changes in the modes of agricultural production, and influencing the fall or rise of civilizations."

Weldeab points out that the past 50 years are marked by deforestation and overgrazing much greater than that of the past, thus disturbing the climate system that results from the coupling of sea surface temperature and vegetation cover on land. "We can't predict how, but it is clear that this human-induced change will change the terrestrial and ocean system," he says. He notes that droughts in this region are currently occurring more frequently than in the past few thousand years, although the frequency of the droughts is unpredictable.

"People in less developed countries live from rain, harvests and animal husbandry," says Weldeab. "Drought directly affects them; they run out of food for people and animals."

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