AOGS 2006

Synchronous Variations in Polar Temperature and South Asian Monsoon Precipitation

MANISH TIWARI

Planetary & Geosciences Division, Physical Research Laboratory, Ahmedabad, 380009, India

The abrupt climate changes recorded in polar ice sheets have elicited various explanations relating to either thermohaline circulation changes by ice-rafting or natural greenhouse gas concentrations modulated by tropics. If these abrupt changes are recorded in equatorial/tropical records as well, it indicates that there is a rapid correspondence between the tropical and high-latitude climate that is possibly achieved via natural greenhouse gas concentrations in atmosphere. The earlier work done in this direction used sediment cores from highly productive ocean regions (e.g., western Arabian Sea) so as to obtain high sedimentation rate, which is comparable with polar ice-core records having high time resolution. Necessarily such regions give the wind records, as in the tropics high productivity is associated with upwelling driven by winds. To compare tropical precipitation records with high-latitude records is, however, a more difficult task because sediments recording paleo-precipitation usually have low sedimentation rates and offer coarser resolution relative to polar ice cores and our study is the first attempt in correlating equatorial precipitation record with the polar record. Here we present d18O data (a proxy for precipitation) of three planktonic species of Foraminifera viz. Globigerinoides ruber, Globigerinoides sacculifer and Globorotalia menardii from a sediment core namely SS3827G (spanning the past 35 kyr) from the equatorial Indian Ocean ($3^{c}irc42$'N, $75^{c}irc54.5$'E; water depth: 3118 m), which falls under the southwest monsoon (SWM) realm. Results show that minimum SWM precipitation occurred at Last Glacial Maximum with a subsequent increase at Termination IA. During the Holocene, SWM precipitation intensified uniformly upto the core top ($\sim$2.2 ka BP) as revealed by the decreasing trend exhibited by the d18O values. Variations in precipitation are consistent with climate changes recorded in polar ice sheets: abrupt cooling/warming events appear to be accompanied by sudden reduction/enhancement in (SWM) rainfall. Thus, mechanisms with time scales much less than a millennium, such as natural greenhouse warming (e.g., CH4 concentration), controlled by emissions from the tropics, could have played a major role in high-latitude climate change.