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Millennial-Scale Climate Variability in the Indo-Pacific Warm Pool During Marine Isotope Stage 3

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New high deposition rate marine cores recovered from the Indonesian region as part of the IMAGES IV project provide planktonic foraminiferal stable oxygen isotope records of sea surface temperature variability in the western tropical Pacific for the past 80,000 years. The isotope records reveal millennial scale cooling events in the western Pacific warm pool that correlate with Dansgaard/Oeschger events during marine isotope stage 3 (MIS 3) (Figure1). Sea surface temperatures varied by as much as 4-5°C in this part of the warm pool while temperatures within the upper thermocline, as measured by deeper-dwelling planktonic foraminiferal species, did not undergo such pronounced temperature variability. In this way the large millennial scale changes differ from those associated with larger El Nino events where sea surface temperatures undergo relatively small (~2ºC) cooling and the upper thermocline experiences the most pronounced temperature changes. Both the timing of the sea surface temperature change in the tropics and the fact that similar temperature changes, matching those of ice core records, have been documented in widely separated parts of the world ocean indicate that Dansgaard/Oeschger events were global in extent. Perhaps more importantly, the magnitude of sea surface temperature change documented in the warm pool region raises the question of whether millennial-scale climate variability as recorded in ice cores from high latitudes was a response to climate forcing originating in the low latitudes. As the tropics are the major source of heat and vapor flux to the atmosphere, significant cooling at low latitudes would have a major impact on the global climate system.

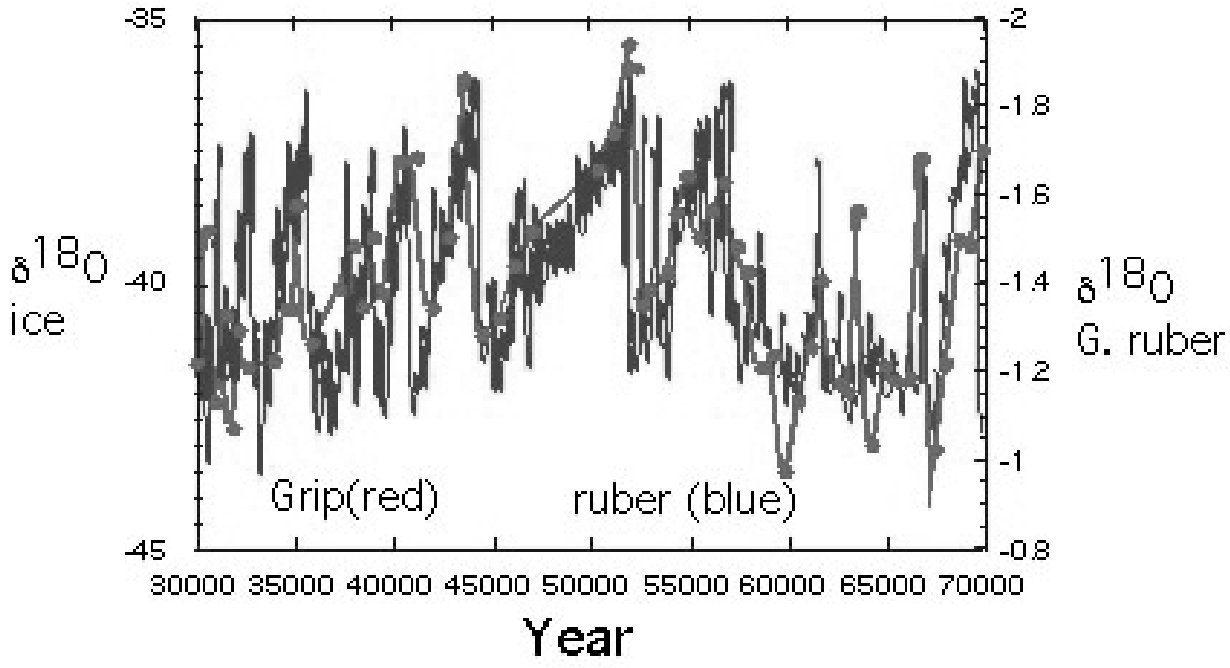

Figure 1: The figure is the GRIP ICE core record plotted against the planktonic foraminiferal record from the western tropical pacific (*G. ruber*). The SST reconstruction based on G. ruber clearly illustrates that the same abrupt climate changes recorded in Greenland were experienced in the tropics as well. The magnitude of the $\delta^{18}O$ variability in the tropical record is equivalent to about 4°C, a remarkably large amount of SST change for the western tropical Pacific.