Geophysical Research Abstracts, Vol. 8, 10050, 2006
SRef-ID: 1607-7962/gra/EGU06-A-10050

Scenarios regarding the lead of equatorial sea surface temperature over global ice volume

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Recent proxy evidences indicate that the equatorial sea surface temperature (SST) may have led global ice volume by $\sim$3kyr during the Late Pleistocene glacial cycles. Given the short time scales of equatorial dynamics, equatorial climate variability is characterized by a time scale of no more than a few years. It would seem somewhat surprising therefore that the equatorial ocean and atmosphere can determine and lead the long time scale 100 kyr glacial cycles. Two scenarios are presented according to which such a lead may be observed even when the equatorial ocean and atmosphere are not necessarily responsible for leading the glacial cycles (they may still act as a strong amplifier). First, it is shown that if the plankton-based proxy reflects the warm season temperature rather than an annual temperature, it may lead the global temperature, although the dynamics of the glacial cycles may still be dominated by the northern hemisphere ice sheets. It is noted that a present-day seasonal bias of the equatorial proxy record is still inconclusive, and the possibility of a proxy bias only during glacial times is considered as well. A second scenario is suggested in which global sea level rises before equatorial SST, yet the later evolution of factors such as the atmospheric CO_2 and equatorial SST is faster and takes the lead over global ice volume. If the initial rise of sea level is masked by a sufficiently large proxy noise (due to instrumental and natural noise), it may not be seen and the lead may be attributed to the equatorial SST and CO_2.