Geophysical Research Abstracts, Vol. 7, 08903, 2005
SRef-ID: 1607-7962/gra/EGU05-A-08903

Past climate variations derived from spectral analysis of isotopic records from marine sediments and ice cores

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Stable isotopes in marine sediments and in ice cores are the most important proxies of past climate change, sea level variations and the global redistribution of water. Marine sediment proxies span much longer time coverage than ice cores. Interpretation of isotopic records in terms of temperature and sea-level variations requires accurate dating and consideration of non-climatic biases influencing the separation of isotopes. To better understand the physical mechanisms of climatic variations it is expedient to consider records in the spectral domain. The Maximum Entropy Method (MEM) is implemented for spectral analysis of oxygen isotope records from select marine sediment cores and deuterium records provided by deep drilling of the Antarctic ice sheet at Vostok and Dome C stations. Additionally, a Lomb-Scargle Fourier transform is applied to the ice-core records to account for the inherent irregular timing of sampling. Comparison of spectral structures of the ice core records with the marine sediment records shows similar general variability. Analysis of bi-variate records insight into the links between air temperature variations over Antarctica and variations of the global sea level in terms of coherence, phase shifts and time lags.