Geophysical Research Abstracts,
Vol. 11, EGU2009-2514, 2009
EGU General Assembly 2009

Evidence for warmer interglacials in East Antarctic ice cores

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Stable isotope ratios of oxygen and hydrogen in the Antarctic ice record provide invaluable proxy temperature information. Conversions from these isotope ratios to temperature are generally based on geographical observations of the spatial relationship. The relationship is said to be uniform $\pm$ 10% over the East Antarctic and constant with time $\pm$ 20%. There is no reliable additional temperature proxy information available in individual ice cores, but general circulation model (GCM) studies have supported the constant uniform conversion for climates cooler than present day. By jointly analysing the three available 340 ky ice core records alongside input from state of the art GCM modelling, we show that for warmer interglacial periods, the conversions vary between different East Antarctic ice core sites. Because the differences are a function of temperature, the conversions must be non-linear for at least some sites. Model results indicate that the East Antarctic isotopes are less sensitive to temperature changes during warmer climates. We conclude that previous temperature estimates from interglacial climates are likely to be too low. The available evidence is consistent with Antarctic interglacial temperatures that were more than 6^{o}C higher than present day; approximately double the widely quoted 3$\pm$ 1.5^{o}C.