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Termination timing: Testing deglacial mechanism

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The abrupt changes in climate at the end of glacial periods are prominent features of Pleistocene climate and represent the clearest indication of the 100 kyr orbital cycle. These deglaciations, particularly as recorded in marine oxygen-isotope records, have been a major target of orbitally tuned models of climate chronology. Such models rely explicitly on assumptions about the ways in which insolation and climate change are linked, but are tremendously powerful in allowing extension of climate chronologies to periods where no radiometric chronology is possible.

Recent advances in a range of chronological approaches now enable independent assessment of the linkages between orbital insolation and climate, and therefore of the assumptions on which turned age models rely. These chronologies include the timings of glacial retreat (e.g. Clark et al. 2009), regional information from stalagmite (Cheng et al. 2009) and ice-cores (Wolff et al. 2009), and new dating of sea level change. The latter is particularly powerful because sea level is a global integrator of climatic conditions, and provides direct information about the total amount of land ice on the planet.

In this presentation we will critically assess the information provided by recent chronologies of Pleistocene deglaciation in the light of possible mechanisms to link orbital insolation and climate change. A comparison of new coral records of sea level change (e.g. Thomas et al. 2009) with stalagmite (Cheng et al 2009) and ice core records indicates a midpoint timing for Termination II of 135$\pm$1.5kyr. This is significantly earlier than the timing for Termination I relative to northern hemisphere insolation and, in general, demonstrates that Terminations do not have uniform phasing relative to insolation. This challenges the use of orbitally tuned timescales to provide precise age models, and suggests that terminations are not fully deterministic. This early timing also challenges the prevailing view (e.g. Cheng et al. 2009; Denton et al. 2010) that northern hemisphere insolation is the initiator of deglaciation.

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