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Pacing glacial cycles

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It has been proposed that Milankovitch forcing affects the phase of the 100 kyr glacial cycles via a mechanism known as "nonlinear phase locking". Some of the consequences of this hypothesis are examined. Phase locking provides a mechanism by which Milankovitch forcing can act as the "pacemaker" of the glacial cycles. It is suggested that phase locking may determine the timing of the major deglaciations, nearly independently of the specific mechanism or model that is responsible for these cycles as long as this mechanism is suitably nonlinear.

Phase locking to obliquity and possibly precession variations is distinct from mechanisms relying on a linear or nonlinear amplification of the eccentricity forcing. Phase locking may determine the phase of the glacial cycles even in the presence of noise in the climate system, and can be effective at setting glacial termination times even when the precession and obliquity bands account only for a small portion of the total power of an ice volume record. Phase locking may also result in a "quantization" of the glacial period into multiples of the obliquity or precession periods.