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Solar timing of Dansgaard-Oeschger events in a coupled climate system model

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Various climate archives show a quasi-periodicity of about 1470 years during the last ice-age, which manifests itself in the prominent Dansgaard-Oeschger (DO) warming events. Due to the high regularity of this climate cycle, external forcing has been suggested as a trigger of the DO events.

We show that the coupled climate system model CLIMBER-2 is able to reproduce many features of the observed DO events when forced by two sinusoidal freshwater cycles with frequencies chosen according to two well-known solar cycles, the 87-year Gleissberg cycle and the 210-year DeVries cycle. Due to the model dynamics (i.e. the threshold character and the inertia of the thermohaline circulation) the combined effect of these two cycles results in a robust 1470-year timescale of the model response for glacial conditions.

Our model simulation shows that the lack of a 1470-year cycle in records of solar activity does not argue against a solar origin of the glacial 1470-year climate cycle. Rather, our study suggests that the DO events could have been synchronized by very pronounced, century-scale components in solar activity.