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Earth System Dynamics
Discussions

Interactive comment on "ESD Ideas: Why are glacial inceptions slower than terminations?" *by* Christine Ramadhin et al.

Anonymous Referee #2

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Understanding the mechanisms of Quaternary glacial cycles remains one of the main challenges in the field of theoretical climatology and not surprisingly this problem attracts significant attention. However, although a comprehensive theory of Quaternary climate dynamics is still missing, significant progress has been achieved in recent years in the understanding of glacial cycles and numerous papers on this subject have been published. This is why proposing a new idea in this field requires good knowledge of the previous works. Unfortunately, the manuscript by Ramadhin and Yi shows that this is not the case and already the title of the manuscript and the first paragraph contain a number of factual errors.

First, the question posed in the title - "Why are glacial inceptions slower than terminations" - is not correct. Glacial inceptions have the same time scale (order of 10,000

years) as glacial terminations. The asymmetry of late Quaternary glacial cycles is manifested in the fact that typically the time intervals between the end of previous interglacials and the glacial maxima (which is not the same as glacial inception) are an order of magnitude longer than the time between glacial maxima and the onset of the next interglacial state (glacial termination).

Second, 100 kyr cyclicity dominated only over the last million years and not the entire Quaternary as the authors wrote. Prior to 1 million years ago, the dominant cyclicity of glacial cycles was 40,000 years.

Third, glacial terminations do not occur "after a maximum in NH summer insolation is crossed". Glacial terminations typically begin well before the maximum of insolation is reached and, for example, in the case of the penultimate termination, the termination has been completed several thousand years before the maximum of NH summer insolation has been crossed.

However, my main problem with the manuscript is related to the fact that the authors discuss only sea ice and not continental ice sheets. The latter is only mentioned once while "sea ice" is mentioned 30 times. This makes an odd impression that under glacial cycles the authors understand growing and retreat of sea ice rather than waning and waxing of NH continental ice sheet, which of course is incorrect. There is no doubt that sea ice in both hemispheres does play an important role in climate system dynamics and there are a number of both positive and negative feedbacks related to sea ice which are important for glacial cycles. However, the asymmetry of glacial cycles is related to continental, primarily NH, ice sheets. Whatever the role of sea ice is, it simply has too short time scale to determine durations of glacial inceptions and terminations.

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