

## ***Interactive comment on “Pleistocene glacial variability as a chaotic response to obliquity forcing” by P. Huybers***

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1. The idea of chaotic transitions between 40 and 100k cycles is not new. In 1992 and 1993 Saltzman and colleagues published two papers where they examine the possibility of chaotic transitions between 40k and 100k oscillatory regimes. They call this "chaotic intermittency". In the 1992 model, the astronomical forcing is necessary to trigger the transition, but in the 1993 one it is not. As far as I can understand it, the transition is the result of an unstable trade-off between calving and carbon cycle instabilities, both coded in the model.
2. Unfortunately, the dynamics of these transitions (as in the present paper) look far more abrupt than the data suggest (compare the spectrograms Figs. 1 and 2.). The data rather suggest a frequency doubling route to the transition between the

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40k and 100k oscillatory regimes.

3. This is a point I am less sure of, but inappropriate numerical schemes tend to exacerbate chaotic behaviours, and the present case seems at risk to me. See Borrelli and Coleman (1994)

[1] Barry Saltzman and Mikhail Ya Verbitsky. Asthenospheric ice-load effects in a global dynamical-system model of the Pleistocene climate. *Clim. Dyn.*, 8:1-11, 1992.

[2] Barry Saltzman and Mikhail Ya Verbitsky. Multiple instabilities and modes of glacial rhythmicity in the Plio-Pleistocene: a general theory of late Cenozoic climatic change. *Clim. Dyn.*, 9:1-15, 1993.

[3] Robert L. Borrelli and Courtney S. Coleman. Computers, lies, and the fishing season. *The College Mathematics Journal*, 25(5):401–412, 1994.

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