Clim. Past Discuss., 10, C72–C73, 2014
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Climate of the Past Discussions

Interactive comment on "Changing climatic response: a conceptual model for glacial cycles and the Mid-Pleistocene Transition" *by* I. Daruka and P. D. Ditlevsen

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Received and published: 15 March 2014

It is good to observe that new conceptual models of ice ages are stil being proposed. The amount of structural uncertainty arising from the complexity of the mechanical flows, the chemical and biological responses of the Earth's system at the ice age time scales indeed still leave us much freedom for some heuristics in development of dynamical system models of ice ages.

Such proposals proceed from a paradigm of modelling ice ages with low-order dynamical systems, possibly stochastic, that has been marked by a number of pioneering contributions since the 1980's, some of which are cited by the authors. They are founded

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on the assumption that despite the complexity of the Earth's system, low-order dynamical system will be good predictors of the dynamical properties of ice ages : their sensitivity to initial conditions, sensitivity to astronomical forcing, and to stochastic perturbations. This to say that I could not agree more with the authors when they write : "the suggested critical dependence on model parameters is potentially an important guideline for more realistic future model simulations and theories of the Pleistocene glacial dynamics." (see also Crucifix, Climate of the Past, 2013). It is indeed remarkable that, to our knowledge, a convincing reproduction of the Pleistocene ice ages with "fully coupled" Earth System Models of Intermediate Complexity (i.e., ice sheets + atmosphere + ocean + carbon cycle) is still awaited.

As a matter of clarification, the interpretation of ice ages as the synchronisation of a limit cycle on the astronomical forcing was indeed largely commented on in De Saedeleer et al. 2013 but to my knowledge the interpretation the proposal was introduced by Saltzman, Hansen and Maasch (Journ. of Atmos. Sci., 1984) based on a limit cycle model presented in Saltzman and Suhera, Journ. of Atmos. Sci., 1984.

Interactive comment on Clim. Past Discuss., 10, 1101, 2014.