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Discussions
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Interactive comment on "Oscillations in a simple climate–vegetation model" *by* J. Rombouts and M. Ghil

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The paper presents a simple conceptual climate vegetation model exhibiting oscillatory behavior for a certain parameter setting. In particular including an ocean with ice cover saw tooth-like oscillation are observed similar to the glaciation-deglaciation cycles in the quaternary. The model consists of two coupled ODEs and can be handled analytically. Therefore stationary states and their stability are determined being the main advantage of simple conceptual models. Overall the paper is organized and written very well and fits into the scope of the journal. On the other hand, such models have their limitations. On a global scale vegetation albedo is not the main driver of the climate, clouds play also an important role. In reality other effects might result in climate oscillations observed in the last 800kyr with a different periodicity.

More specific comments:

In the introduction two types of models area presented. On the one hand simple models like the presented one, on the other hand complex general circulation models. Models of intermediate complexity define a third type of models considerably faster than the GCMs. This has to be mentioned.

Page 159: The sawtooth like behaviour is driven by internal oscillations of the system with a 1000yr periodicity, while the glaciation/deglaciation cycles of the Earth are driven by external perturbations due to the Milankovitch cycle. In models of intermediate complexity the sawtooth-like behaviour can be explained by a positive feedback (see, e.g.," The role of orbital forcing, carbon dioxide and regolith in 100 kyr glacial cycles", Ganopolski and Calov, Clim. Past, 7, 1415–1425, 2011). Results of their experiments support the notion that 100 kyr cycles represent a direct, strongly nonlinear response of the climate-cryosphere system to orbital forcing and they are directly related to the corresponding eccentricity period. In terms of nonlinear dynamics, this link can be interpreted as the phase-locking of the long glacial cycles to the shortest (100 kyr) eccentricity cycles. Please comment on that.

Interactive comment on Nonlin. Processes Geophys. Discuss., 2, 145, 2015.