Clim. Past Discuss., 2, S830–S832, 2007
www.clim-past-discuss.net/2/S830/2007/

Climate of the Past Discussions

Interactive comment on "Simulating sub-Milankovitch climate variations associated with vegetation dynamics" *by* E. Tuenter et al.

E. Tuenter et al.

Received and published: 23 January 2007

The instructive and useful comments of both referees are gratefully acknowledged. Their comments significantly improve our manuscript.

Ref. 2

General comment.

The interesting paper of Berger et al., which we had missed earlier, is referred to in the introduction.

We agree that the sentence in the abstract about the implications for the ocean salinity and circulation is misleading. This sentence is removed and we now discuss this matter in an extra subsection in section 3.1 and at the end of section 4.

We agree that the present mechanism proposed for sub-Milankovitch signals is hypothetical rather than "being the truth". Further research with more advanced models is indeed needed to test this hypothesis. This will be emphasized in the abstract and in section 4.

Specific comments.

(1) Lines 13-18 are removed and we refer to the paper of Berger et al. for a possible direct forcing of sub-Milankovitch signals.

(2) We now explain the characteristics of VECODE in more detail in section 2 including the constraining factor for the vegetation (i.e. precipitation for low latitudes and temperature for high latitudes) and an explanation of "positive day-temperature". Additionally, we include a description of the characteristics of the hydrological cycle in section 2.

(3) Of course the African monsoon is not a gridbox but an atmospheric phenomenon. The only thing we would like to explain is that if we mention, for instance, the runoff from the African monsoon then we mean the runoff from the gridbox (10-20N,atmospheric sector 2). We will rephrase the sentence dealing with the definition of the monsoons. "The runoff from the tree and the runoff from the grass" means that the runoff originates from the grid area covered with trees and grass, respectively. In CLIMBER-2 the total runoff is the sum of the runoff from the area covered with trees, grass and desert. This is explained in the revised section 2. The water holding capacity is the ability of the soil to hold the ground water in a gridbox. The water holding capacity in CLIMBER-2 depends on vegetation. For instance, the water holding capacity of a gridbox covered by desert is much smaller than covered by trees. This is also explained in the revised section 2.

(4) Our focus is on sub-Milankovitch signals in the monsoonal regions as stated at the end of the introduction. Section 3.2 was only added to illustrate that sub-Milankovitch variability is also possible in other regions and for other climatic variables. We decided not to remove section 3.2 but to enlarge this section.

CPD
2, S830–S832, 2007

EGU

(5) We improved and enlarged the figures.

(6) The obliquity signal in the runoff in the obliquity experiment of both the African and Asian monsoon is very small and does not show sub-Milankovitch signals, as clearly explained in the paper at the end of section 3.1. Furthermore, the obliquity forcing has already been shown in an earlier paper (Tuenter et al. 2005). The combined obliquity and precession forcing does show sub-Milankovitch signals in the runoff, but the figures are almost similar to the figures showing the precession forcing (i.e. Fig. 3) as also explained in the last subsection of section 3.1. To our opinion, it does not add some extra information if we show these figures.

(7) The CLEAN-method does not need an interpolation. The interpolation is done for the output of the CLIMBER-data (including the VECODE-output) as explained at the end of section 2. Of course this smoothes the data. However, the annual variability in CLIMBER-2 is very small so no information is lost by this smoothing. Furthermore, the 100-year averaging is permitted because the oscillations of the Milankovitch forcing are much larger than 100 year, as said at the end of section 2. We have not added an appendix but we have given more information about the CLEAN-method in the revised text.

In the revised version we will explain in the figure caption of figure 7 that the anomalous values are computed with respect to the averaged values over the entire time-interval (i.e. 280 kyr - 150 kyr BP).

Minor comments.

We have gone through the text to check our expressions.

Interactive comment on Clim. Past Discuss., 2, 745, 2006.