**Climate
of the Past
Discussions**

Interactive comment on "Strength of forest-albedo feedback in mid-Holocene climate simulations" *by* J. Otto et al.

J. Otto et al.

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We thank Referee #2 for his/her comment on the method we applied. We feel that there is a misunderstanding which we would like to clarify.

With our set of simulations we aim to quantity the pure contribution of the atmosphere-vegetation interaction to the mid-Holocene climate signal. In order to estimate this contribution, Referee #2 proposed a different set of simulations.

It is true that with Referee #2's set of simulations it is as well possible to estimate the pure contribution by the vegetation. However, this implies that we use a model without internal model variability. As we use a GCM including internal model variability, we are obliged to follow our approach. In the following we explain how we derive the set of

simulations performed with a GCM.

We apply the Stein and Alpert method as described in detail in the book by Alpert and Sholokhman (2011), see chapter 4.3, by Berger et al., on page 38. There, the pure contribution of the atmosphere-vegetation feedback is given by equation 4.5 on page 38:

(4.5) $V = AV - A$

We do not use equation 4.5 itself, but we analyse the difference between signals from a control run, i.e.

(4.5a) $V = (AV - R) - (A - R)$

where R represents the pre-industrial control run. This method was already applied to the same problem by Ganopolski et al. (1998). As discussed in the chapter 4.3 on page 39, usage of the original equation 4.5 and its variant 4.5a does not affect the factor separation equations.

Ganopolski et al (1998) performed their study by using CLIMBER-2, an Earth system Model of Intermediate Complexity, which exhibits little climate variability. In our studies, we use a comprehensive model with a spectrum of climate variability on all scales. Therefore, we had to modify equation 4.5a slightly to take into account internal model variability, using:

$V = (AV - Ri) - (A - Rii)$

where Ri represents the control run R, but with prescribed pre-industrial sea-surface conditions which are also used in AV. Rii represents the control run with prescribed pre-industrial sea-surface conditions and prescribed vegetation pattern, the same as used in simulation A. In a model without internal climate variability, Ri and Rii are identical.

In the present study, we focus on the pure contribution of atmosphere-vegetation interaction which explains why we have chosen the simulations AV, A, R (resp. Ri and

Rii) as described in our manuscript. We will clarify this point in a revised version of our manuscript to avoid the apparent misunderstand which the referee clearly pointed at.

References:

Alpert, P. and Sholokhman T.: Factor Separation in the Atmosphere – Applications and Future Prospects, 2011, Cambridge University Press.

Ganopolski, A., Kubatzki, C., Claussen, M., Brovkin, V., and Petoukhov, V.: The influence of vegetation-atmosphere-ocean interaction on climate during the mid-Holocene, Science, 280, 1916–1919, 1998. 821, 822

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