

Interactive comment on “Detecting vegetation-precipitation feedbacks in mid-Holocene North Africa from two climate models” by Y. Wang et al.

Anonymous Referee #1

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The manuscript by Wang et al. is a short, well-focused, and interesting contribution to analysis of feedbacks between climate and vegetation in North Africa during the mid-Holocene. They compared results from simulations with two models, FOAM and CCSM-2. The authors found, contrary to many previous modeling studies, a negative feedback between vegetation and precipitation at the annual time scale. The reason for the negative feedback is a parameterization of the land surface processes that leads to a higher evaporation from bare soils than from vegetated surface. This is understandable at the monthly time scale because vegetation removal delays water release from the deep layer, but it is rather puzzling at the annual time scale. Besides, albedo of soil without vegetation canopy is assumed to be lower than albedo of bare

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ground, which results in switching off Charney's radiative feedback. A plausibility of these assumptions should be discussed in details before the manuscript can be accepted for publication.

Major comments

1. Many studies suggest that runoff in semidesert is enhanced with vegetation removal. This should lead to a water loss from the soil-atmosphere system. Is this accounted in the models?
2. Soil is a product of vegetation development. One can assume that vegetation removal will lead to removal of soil layer as well and this should affect the surface albedo. As far as I understand, this effect was neglected in the simulations, and this might have led to overestimation of the negative feedback.
3. I have recently reviewed a paper by Notaro et al. 'Statistical and Dynamical Assessment of a Simulated Negative Vegetation Feedback on North African Precipitation During the Mid-Holocene' which methodology and conclusions are similar to this paper. A novelty of Wang et al. paper in comparison with the paper by Notaro et al. should be stressed here.

Minor comments

- p. 962, l. 26: I think that LPJ is used in a very different way in two models. What are possible implications of different coupling approaches for the feedback analysis?
- p. 964, l. 4-5: it would be better to provide spatial resolution in degrees, not number of grid cells.
- p.964, l. 6: 'the simulated pattern agrees with ...'. This is too general statement. Is

there any disagreement, especially in North Africa? If so, provide more details here.

p. 967, l. 13-14: FPAR in this context is a fraction of photosynthetically active radiation ABSORBED by a plant canopy. Please specify this.

p. 968, l. 1-3. Explain more in details what are relevant difference in soil components between two models.

Fig. 2. A term 'Total Vege vs' on the figure labels looks clumsy. You can remove it without any consequence for understanding. Also, figure caption repeats the same peace of text three times. This can be easily avoided.

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