Clim. Past Discuss., 9, C2260–C2262, 2013
www.clim-past-discuss.net/9/C2260/2013/

Climate of the Past Discussions
Open Access

Interactive comment on "Investigating vegetation-climate feedbacks during the early Eocene" *by* C. A. Loptson et al.

Anonymous Referee #4

Received and published: 7 October 2013

Investigating vegetation-climate feedbacks during the early Eocene C. A. Loptson, D. J. Lunt, and J. E. Francis

Reviewer's comments:

The study by Loptson et al. (2013) has tried to understand the role of vegetation-climate feedbacks in reconstructing the climate of early Eocene. They have applied a global climate model (HadCM3L) to study the dynamic vegetation-climate feedbacks (fixed vs dynamic vegetation). The DGVM used is TRIFFID. TRIFFID simulates five PFTs. The MOSES used is version 2.1, which was different from what was used in the standard HadCM3L (version 2.2).

I fully agreed with other reviewers' comments. This article has to be substantially

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

improved in order to be considered for publishing. In particular, a clear focus on vegetation-climate feedbacks is needed. As pointed out by one of the other reviewers, the cloud (CCN, aerosols) and its feedbacks should be reduced or even taken out, and replaced with more overviews on previous studies about vegetation-climate feedbacks (see my detailed comments below). Also, there are many arguments that stand out without scientific evidences except for broad, sometimes wild, speculations (e.g., page 4716 about sea ice extent; page 4718 about albedo due to changes in cloud). Here you really need a plot of sea ice or cloud fraction to support your arguments.

In addition to those comments from other reviewers, I want to raise a few major/minor issues as listed below:

First, there are quite a few major previous studies, which are missing. They include, but not limited to, 1) Sloan and Rea (1995, 119, 275-292, Palaeogeography, Palaeoclimatology, Palaeoecology, hereafter, P3), 2) Shellito et al. (2003, 193, 113-123, P3), 3) Shellito and Sloan (2006, 50, 1-17, Global and Planetary Change, hereafter GPC), 4) Shellito and Sloan (2006, 50, 18-32, GPC), and 5) Utescher and Mosbrugger (2007, 247, 243-271, P3).

Second, this study has claimed that previous studies in palaeoclimate have hardly included vegetation-climate feedbacks, which I could not fully agree. For example, 1) there are many EMIC model studies (e.g., Claussen et al., GRL, 1999; Wang et al., GRL on dynamic vegetation and last glacial inception, 2005; Wang et al., Climate Dynamics on the Holocene vegetation-climate feedbacks, 2005); 2) there are fully-coupled climate-vegetation model studies (e.g., Notaro et al., Global Change Biology, 2008, Wang et al., Climate of the Past, 2008, Liu et al., Quaternary Science Reviews, 2007).

Third, this study has claimed that vegetation-climate feedbacks (albedo and hydrology) are mostly positive (see page, 4715, lines 20-21). This is not valid at all the time and for all the models. Notaro et al. (2008, Global Change Biology) and Wang et al. (2008, Cli-

CPD
9, C2260–C2262, 2013

mate of the Past) have carried out some detailed analyses of vegetation-climate feedbacks, and found out there may be possible negative vegetation-precipitation feedback (hydrology) in FOAM and CCSM for the Holocene.

Fourth, could you elaborate what you mean by "The global annual mean SAT difference between the simulations with MOSES 2.1 and MOSES 2.2 is larger at higher CO2 concentrations, resulting in a higher climate sensitivity in the SHRUB simulations than the EoMIP HadCM3L simulations."? I was a bit concerned by swapping 2.2 with 2.1 version. It is well known that climate models are scientifically tuned to reproduce an accurate climate for, at least, present-day. The replacement of a newer version with an older one may cause some subtle issues if other model components and parameters are not changed accordingly. The author should address those subtle issues somewhere in the article.

Fifth, could you explain what you mean by "This is due to a combination of differences in surface albedo, where broadleaf trees replace needleleaf trees, and albedo due to changes in clouds."? I cannot follow your arguments here.

Sixth, it will help to see how ground evaporation and transpiration have changed between fixed and dynamic vegetation simulations.

Finally, the 2-D figures are very hard to read the color scales, and the panel plots are too small to make sense.

Interactive comment on Clim. Past Discuss., 9, 4705, 2013.