

Interactive comment on “Dynamic soil feedbacks on the climate of the mid-Holocene and the Last Glacial Maximum” by M. Stärz et al.

Anonymous Referee #1

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The authors present a new soil scheme, which they asynchronously couple to an AOGCM. The scheme is tested for pre-industrial conditions and then used for two palaeo climate time-slices: the mid-Holocene and the last glacial maximum (LGM). The topic is relevant for publication in Climate of the past, however the current version of the paper lacks a clear message.

My main concern is the lack of clear conclusions and also to some extent the motivation for using the soil scheme itself. This lack of clear message is in part caused by unclear language and imprecise descriptions, and in part due to a lack of focus and precise argumentation. Most of the problems highlighted here can be solved by rewriting/streamlining (possibly shortening) the text, in order to obtain a better overall picture. However since this lack of precision and focus is a problem throughout the article and

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not just in certain sections, I recommend a major revision.

I would also recommend the authors to check the sentence structure and the general quality of the language used, before submitting the next version of the paper, as this version contains a large number of typos, missing words and non-defined abbreviations and variables. Additionally, some of the values you mention in the text, do not correspond to those in table 2, so please re-check these values.

Below are some of the main points that I think could be improved:

The authors start and end their article with the “equable climate enigma“, however there is no clear connection between this theme and the current study. An improved soil scheme might change the simulations for the time-periods during which an equable climate prevailed, but the authors do not provide a motivation or theory for why this particular model improvement might solve the current model-data mismatch. It is also unclear why the authors did not test their soil model under such a scenario, but rather decided to test it first for the mid-Holocene and the LGM. The introduction thus needs to be improved so that it provides the reader with a good motivation for the study and also provides a clear statement of the aim and the novelty of it.

In the model description the authors write that the phenology was not calculated, because dynamic vegetation was switched on. This is surprising to me, since if you do not calculate the phenology then the annual cycle in LAI would not be calculated, which would make a large difference to the study and this point thus needs to be clarified.

In the current version of the paper it is not possible to fully retrace the steps taken in deriving the Table 1 parameters. I assume that you associate the PFT covering more than 50% (not < 50% page 2724, line 17) of one gridcell and then calculate the mean of values of all gridcells where this PFT is dominant, to derive the value for that PFT. However whether you use the mean or some other statistic is not quite clear from the text.

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The results section is extremely difficult to read, because the authors do not follow a clear line of argumentation and at times it is not possible to know which simulation or simulation difference is currently being discussed. If you use the Stein-Alpert factor separation technique, then it needs to be defined carefully and then you can use these definitions to make it easier for the reader to follow your arguments.

A critical assessment of the performance of the soil scheme is missing. It would be nice if you could discuss the assumptions inherent to your soil scheme, e.g. what is the influence of only considering dominant PFTs, what difference could you expect would you use time-dependent soil variables and how these assumptions might affect your results.

To me, many of the things in the discussion section seem to belong to the introduction, as it often only states previous results without a pertinent comparison to this study. Equally some parts of the conclusions belong to the discussion section. A clear conclusion for the whole study is missing.

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