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Interactive comment on "^{10}Be in last deglacial climate simulated by ECHAM5-HAM – Part 1: Climatological influences on ^{10}Be deposition" *by* U. Heikkilä et al.

Anonymous Referee #1

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The paper describes simulation experiments with the atmosphere-aerosol model ECHAM-HAM. It focusses on ^{10}Be deposition during climate stages at the end of the last deglaciation. In details, it analyses the impact of climate on ^{10}Be deposition around 12, 11, 10 kyr BP.

The paper is interesting, worth publishing and fits in the scope of the journal. However, while I believe the content of the research is suitable for CP, I think the form of the presentation needs some effort to come to a publishable manuscript. My critisim here focusses on some key issues:

1. Text: There are various repetitions throughout the draft, mainly concerning the

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principle modelling setup. For example, on page 3683, last paragraph is a brief description on the methods (although this is written in the Introduction, where I believe other things should be written down), the description of the simulations, section 2 on page 3685 find more or less similar informations on the methods (similar to the Intro), but they are also partly repeated in the first and second paragraph on that page. Brief versions of the methods are also found in the abstract and in the final summary. While abstract and summary surely need to contain some information on the methods, the Intro and methods needs major streamlining in that respect.

2. Results and Figures: All results are shown in anomaly to the pre-industrial control run. I understand, that this is a typcial way to communicate such simulation experiments (and I have nothing against it), but I am missing the results of the control run here. To get an idea about the importance of these anomalies, it is very useful to have the control results also available, maybe even briefly mentioned in the text. Because most figures (Figs. 2–4, 6–10) consist of 3 subfigure with the anomalies, I strongly suggest to use the available white space for a 4th subfigure each to show control run results (then of course with other units and color bar).

3. Wet versus dry depostion: Since Fig 8 shows only the changes in the wet ^{10}Be deposition it is hard to tell, what this means for the absolute numbers in dry deposition. Do they increase? I therefore suggest to split the analysis of the ^{10}Be deposition (also the suggested correlation with precipitation, see next point) into two analysis, one only calculating wet, the other only dry deposition. The total changes in deposition (and the relative share of the wet fraction), now Figs 7 and 8 are only the subsequent results of that split analysis.

4. Results: My reading of the figures tells me that the ^{10}Be deposition is to a large extent depending on precipitation (e.g. compare Figs 7 and 8 with Fig 4). I

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would expect some more in-depth analysis of this dependency, e.g. correlation coefficient of precipitation with total ^{10}Be deposition and with wet ^{10}Be deposition for every grid cell. However, since the plots showe only the anomalies, and not the absolute numbers, it is hard to judge if this correlation coefficient or relationship is similar stong for absolute values, please check and discuss.

5. Results: The description of results in the text is often very vague, one would expect more hard numbers, e.g. p 3687 "... stratospheric and tropospheric resitence times are both increased ..." By how much? Whenever numbers can be given, they should be mentioned in the text, not only that there was an increase or decrease in a certain variable, but also by how much.

6. Title: Calling the study in the title and throughout the text a study of "deglacial" climate influence on ^{10}Be deposition is slightly misleading, when only climate at 12, 11, 10 kyr BP are investigated. If its called "deglacial" I would expect also scenarios earlier in the last termination. I therefore strongly suggest to refine the wording here, maybe to something like "Influence of Younger Dryas to Eary Holocene climate on ^{10}Be deposition..." or "Late deglaciation climate anomalies...".

7. Results: Maybe I missed it: Which data were analysed for the plotted results? The final year of the simulation, or the full 30 yr? Please state.

Minors:

1. Intro: Changes in production rate during the Holocene were recently published in *Roth and Joos* (2013), please discuss, might have an impact on the 10k scenario.

2. Table 1: If I got it right: greenhouse gases are the FORCING used, temperature and precipitation are model results, right? If so, please say so.

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3. Table 2: Please use full words for stratosphere and troposphere in the table. How can production be in %, should not it be number of atoms or grams per time unit?

4. Fig 1: Units of Deposition is “atoms per m^2 per s”. Please delete “o” and “x” in y axes labels.

5. Figs: X and y axes need labels and units, x is most of the time latitude, y pressure?

6. Fig 6: All other anomalies have blue for positive and red for negative changes, herein Fig 6 it is the opposite, I suggest to used the same throughout the draft.

References

Roth, R., and F. Joos (2013), A reconstruction of radiocarbon production and total solar irradiance from the Holocene ^{14}C and CO_2 records: implications of data and model uncertainties, *Climate of the Past*, *9*(4), 1879–1909, doi:10.5194/cp-9-1879-2013.

Interactive comment on Clim. Past Discuss., 9, 3681, 2013.