**Hydrology and
Earth System
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Discussions

Interactive comment on **"Should we use a simple or complex model for moisture recycling and atmospheric moisture tracking?"** *by* **R. J. van der Ent et al.**

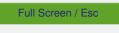**R. J. van der Ent et al.**

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Received and published: 14 August 2013

1 General comments

We would like to thank the referee for a carefully reading our manuscript. We were happy to read that the referee is generally positive and thank him/her for his/her remarks that will help us to improve the manuscript. Below we give a detailed reply.

2 Specific comments

P6728. A more detailed description of the three models used in this study would be useful.

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The first referee also asked for such a description. We therefore agree that the manuscript could benefit from this and will add such a description in the revised version.

P6733. It would be useful to make a quantitative comparison of precipitation between the different models and setups. The current figures only allow a qualitative comparison of the patterns and not a quantitative comparison of amounts.

The absolute precipitation in all tracking models is the same (see Fig. 2b). The tracked precipitation is different but we do in fact already quantify this in the left scale bar in Figs. 3-8, which read: 'tracked precipitation [mm/month]'. Table 2 gives a further quantitative assessment.

Page 6733. The movies are a useful addition to the paper. However, many readers of the manuscript may not download and watch the movies. Furthermore, comparisons between two different movies is challenging. For these reasons, I would encourage the authors to devise methods of visualising (and quantifying) the important results that do not rely on access to the movie files (e.g., as a summary table or as an additional figure).

We are glad to read that the referee find the movies a useful addition. We think that the movies tell the story sometimes better than just figures and should be seen as part of the paper. We can only hope that people will download these movies. Perhaps this is, however, a good opportunity for a call on Copernicus to start supporting interactive documents that are able to display these movies within the document itself. Comparing two movies is actually quite easy. For example, you could use the freeware VLC media player, click on the menu 'media', click on 'open (advanced)', select 'show more options', select 'play another media synchronously', and select the two files you would like to play.

Page 6374, L26. Please clarify the release height in the standard 3D-T model.

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We will add a description of the release height in the original 3D-T model in the 'Model Characteristics section': "Water parcels are released into the atmosphere at a random starting height (weighed by the moisture profile) and transported along the (3D) wind patterns of the forcing data. During the trajectory through the atmosphere, the moisture budget in Eqs. (1) and (2) is applied to track the moisture."

P6738, L15. What is meant by a "satisfying degree of similarity"?

This is subjective, but from our interpretation of the figures and movies it appeared that the patterns were very similar and thus it was for us a satisfying degree of similarity. We make clear in the revised version that this is a subjective comment.

Table 1. It is not clear what -, ++ and 0 refer to with respect to computation speed. Also the meaning of "Back-tracking possible" is also not clear. Please clarify.

The computational speed was presented with the symbols -,++ and 0 to describe their relative running speed with the algorithms used. This is somewhat qualitative, but absolute running times depend very much on the (type of) computation power you have at your disposal and your research question. For example, the methods differ in how well they can be executed in parallel. RCM-tag and WAM calculate on a Eulerian grid, which is hard to parallelize, but runs with different tagging source areas could be executed simultaneously. The 3D-T model can be parallelized easily as the trajectories are independent from each other, so this method scales very well with an increasing numbers of processors. We will change '-,++ and 0' to a description in words: 'slow, very fast, moderate'. 'Back-tracking possible' will be replaced by 'Back-tracking in time possible'

Table 2. How are categories of the pattern (exact, good, reasonable, bad) determined? This comparison is very qualitative and would be improved through a more robust, quantitative comparison of the patterns.

It is hard to quantify a pattern, but we feel that Table 2 is supported by quantitative

results in the figures.

Table 3. The meaning of ++, +, -, 0 are not clear.

We choose this system as we can only give rather rough statements. We will add that the meaning of ++, +, -, 0 in words to the caption of Table 3: '++ = very well suited, + = well suited, 0 = neutrally suited, - = not well suited'.

Figure 3-8. It might help readability of the paper if these figures were presented as different panels of the same figure and all presented on the same page. Currently, comparison between the different model runs is challenging for the reader. We thank the reviewer for pointing this out.

We will add an additional figure in the supplementary material with all figures as different panels in one big figure.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 6723, 2013.

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