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Interactive comment on “Contrasting roles of interception and transpiration in the hydrological cycle – Part 2: Moisture recycling” by R. J. van der Ent et al.

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We thank referee 1 for his positive remarks and the several constructive suggestions. Remarks by the referee are in *italic* and answers are in normal text.

General comments

The referee suggested the use of evapotranspiration (ET) instead of evaporation *E*. Although we appreciate the call for consistent terminology, we will stick to our terminol-

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ogy for reasons given in a previous response in the open discussion (Van der Ent et al., 2014).

Figure 1 is a key figure but really needs additional clarification. I don't believe F_{in} or F_{out} are defined in the sects. 2.2.1 or 3.1. More importantly, it takes a lot of work to determine what exactly is going on at each intersection. Some additional labels on the lines/intersections would be helpful. Also, should describe in caption that this is modeled using the land model and WAM-2 layer.

F_{in} and F_{out} refer to the incoming and outgoing atmospheric moisture over the ocean-continent boundary. In the revised manuscript we will provide additional descriptions in the caption to clarify these things.

While I found the West Africa section interesting it doesn't seem to add much to the overall results, and is somewhat distracting from the primary aim of the paper. I would suggest removing this section.

On the one hand, we agree with the referee that it is a big switch from the global results to a specific case study. On the other hand, we consider the West Africa section an informative case study that illustrates how interception and transpiration have different roles in moisture recycling throughout the year. As such, it highlights the importance of seasonality and for that reason we would really prefer to keep this section in the revised manuscript and we will try to highlight better the importance of this section.

Specific comments

Page 286 line 25 – Should comment explicitly that globally E_i term is mostly interception, but regionally other components can dominate.

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Page 287 Line 15 – In appendix would be useful to add figure showing percentage of transpiration relative to total evapotranspiration, and comment briefly whether or not it is similar to 2013(?) Jasechko Nature paper that where they generated observational estimates of transpiration vs total evapotranspiration.

This issue is already being discussed in the companion paper, Wang-Erlandsson et al. (2014), hereafter Part 1. The ratio of different evaporation fluxes relative to total evaporation is shown in Fig 3 (Part 1), and comparison of global evaporation partitioning with other studies are shown in Table 4 (Part 1) and discussed in Sect 5.1 (Part 1). Our transpiration ratio is estimated at 59 %, which is smaller than the 80 – 90 % estimated by Jasechko et al., (2013), however our estimate is in line with the criticism to that paper of Coenders-Gerrits et al. (2014) (35 – 80 %) and the later paper by Schlesinger and Jasechko (2014) (46 – 76 %).

Page 294 line 17 – Recommend additional estimates of global continental recycling here from other authors.

Actually not many of these estimates are given in the literature. For example Goessling and Reick (2011) only report the July value of 50 %. Dirmeyer et al. (2014) report: “The global mean percentages of terrestrial sources of moisture supplying terrestrial precipitation are 46 %, 50 %, 40 % and 38 % during boreal spring, summer, fall and winter respectively.” We might have overlooked other estimates, but as no other annual average values are reported, this value is impossible to compare with other authors, thus we cannot add that in the revised version of the manuscript.

Page 296 line 8 – Please specify what you mean by “whatever evaporates”.

We will rephrase to: “independent of the type of evaporation process, each evaporated water particle”

Figure 2 – I like having the equation explicitly in (a) of the figure. Recommend adding it to (b) and (c).

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This is a good suggestion. We will do this in Fig. 3 as well.

Page 297 Line 10 – Should remove this line. There are parts of the tropics where recycling is longer than 3-6 days and parts of the temperate zones that look very short. More analysis and explanation are needed to support why the tropics should be faster. Also, doesn't fit with rest of paragraph.

We will remove this statement

Appendix 1 – Would be useful to summarize briefly at beginning what key differences between WAM – 1 layer and 2 layer are.

We will add 1-2 sentences to summarize.

Page 307 line 14 – Same water balance as what?

There should have been a reference to Eq. (B1), which we will add this in the revised version.

Technical Comments

We thank the referee for these useful comments, which help to improve the readability of our paper.

ABSTRACT: Line 11 – Remove “As the main result” Line 16 – Without reading rest of paper unclear what “local length scale” is. May want to rephrase in abstract.

OK

PAGE 284: Line 3 – What is “these” referring to? Moisture recycling ratios? Line 3-10

Indeed, so we think this was already clear.

Would be useful to briefly describe here what the length scale represents. Line 7 –

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Should Dirmeyer paper be 2014?

Yes, we will change this.

Page 290: Is there a reason that term in parentheses is opposite in eqn. 12 relative to eqn's 13 and 14?

Yes, because in Eq. (12) we are looking at the point of precipitation and in Eqs. (13) and (14) we are looking at the point of evaporation.

Page 299 Line 22 – Location of La Plata Basin may not be obvious to some readers. We will add that the La Plata Basin discharges to the bay bordering Argentina and Uruguay.

References

Coenders-Gerrits, A. M. J., Van der Ent, R. J., Bogaard, T. A., Wang-Erlandsson, L., Hrachowitz, M., and Savenije, H. H. G.: Uncertainties in transpiration estimates, *Nature*, 506, E1-E2, doi:10.1038/nature12925. 2014.

Dirmeyer, P. A., Wei, J., Bosilovich, M. G., and Mocko, D. M.: Comparing Evaporative Sources of Terrestrial Precipitation and Their Extremes in MERRA Using Relative Entropy, *J. Hydrometeorol.*, 15, 102-116, doi:10.1175/jhm-d-13-053.1. 2014.

Goessling, H. F., and Reick, C. H.: What do moisture recycling estimates tell us? Exploring the extreme case of non-evaporating continents, *Hydrol. Earth Syst. Sci.*, 15, 3217-3235, doi:10.5194/hess-15-3217-2011. 2011.

Jasechko, S., Sharp, Z. D., Gibson, J. J., Birks, S. J., Yi, Y., and Fawcett, P. J.: Terrestrial water fluxes dominated by transpiration, *Nature*, 496, 347-350, doi:10.1038/nature11983. 2013.

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5, C153–C158, 2014

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Schlesinger, W. H., and Jasechko, S.: Transpiration in the global water cycle, *Agricultural and Forest Meteorology*, 189–190, 115–117, doi:10.1016/j.agrformet.2014.01.011. 2014.

Van der Ent, R. J., Wang-Erlandsson, L., Keys, P. W., and Savenije, H. H. G.: On the use of evaporation or evapotranspiration. Interactive comment on “Contrasting roles of interception and transpiration in the hydrological cycle – Part 2: Moisture recycling” by R. J. van der Ent et al., *Earth System Dynamics Discussions*, 5, C133–C137. 2014.

Wang-Erlandsson, L., Van der Ent, R. J., Gordon, L., and Savenije, H. H. G.: Contrasting roles of interception and transpiration in the hydrological cycle - Part 1: Simple Terrestrial Evaporation to Atmosphere Model, *Earth System Dynamics Discussions*, 5, 203–279, doi:10.5194/esdd-5-203-2014. 2014.

Interactive comment on *Earth Syst. Dynam. Discuss.*, 5, 281, 2014.

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