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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Stem-root flow effect on soil–atmosphere interactions and uncertainty assessments" *by* T.-H. Kuo et al.

Anonymous Referee #2

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In this paper, a new process about vertical water movement along with plant root was incorporated in a land surface model. Sensitivity tests were conducted at two experimental observation sites, and the impacts were investigated. The results showed better agreement with both sites, and the impacts on the atmosphere-soil interaction were different between the two sites depending on the climatological characteristic.

I liked this paper because the message is straightforward and the method is well targeted. The parameterization of indicated process seems applicable to macro scale models, such as climate models. So there is potential benefit to introduce this scheme to the community by publishing this paper. Here are some major and minor comments for the authors to further improve the manuscript.

Major comments:

1. There have been quite a few studies about partitioning of water transport recently (Jasechko et. al. 2013; Good et al 2015; Wei et al., 2015; etc.) The parameterization proposed in this manuscript should the partition of latent heat (E or T) and runoff (surface or subsurface). In considering those studies, what is additional information / constraint that this paper proposes?

Jasechko, S., Z. D. Sharp, J. J. Gibson, S. J. Birks, Y. Yi, and P. J. Fawcett (2013), Terrestrial water fluxes dominated by transpiration, Nature, 496(7445), 347–350, doi: 10.1038/nature11983.

Good, S. P., D. Noone, and G. Bowen (2015), Hydrologic connectivity constrains partitioning of global terrestrial water fluxes, Science, 349(6244), 175–177, doi:10.1126/science.aaa5931.

Wei, Z., K. Yoshimura, A. Okazaki, W. Kim, Z. Liu, and M. Yokoi (2015), Partitioning of evapotranspiration using high-frequency water vapor isotopic measurement over a rice paddy field, Water Resources Research, doi:10.1002/2014WR016737.

2. Similar to the first comment, but there are lots of model-intercomparison studies (PILPS1,2, GSWP1,2,3, etc.) in land surface schemes. What is significance of this paper among these intercomparison studies? In particular, in PILPS, experiment at HAPEX was conducted (Boone and Wetzel, 1996).

Boone, A. and P. J. Wetzel (1996), Issues related to low resolution modeling of soil moisture: experience with the PLACE model, Global and Planetary Change, 13, 161-181

3. Detailed experiment specification is missing. What kind of atmospheric data in which time interval is used to run the model? How long is spin-up period? Is the experiment setup typical offline simulation setup for land surface model?

Minor comments:

1. Equation (3): what is relationship between q0, qz and qx?

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2. P11790L25: I don't understand "SLR; i.e., q0 LD". It's better to use SLR in Equation (2).

3. P11792L24: Isn't it so obvious that larger the P, stronger the step-root effect? Through fall would be stronger too.

4. P11793L27: Is the vapor density changeable in this experiment setup? Humidity is forced to run the model, right? Some sort of nudging (relaxation) method was applied? Please specify the detail of the method in the method section (see Major 3 comment).

5. Figure 4: Too small characters to read. (same as Figure 5-9).

6. Figure 6: Is air temperature changeable? (Similar to above comment about humidity)

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 11783, 2015.