

***Interactive comment on* “Quantifying the impact of groundwater depth on evapotranspiration in a semi-arid grassland region” by M. E. Soylyu et al.**

Anonymous Referee #3

Received and published: 20 October 2010

Review of the paper by Soylyu et al.

General

This is a well written paper targeting an issue of great importance: the effect of groundwater depth on evapotranspiration. Although this issue has been addressed before by e.g. Fan et al (2007), Maxwell et al (2007) and most recently by Ferguson and Maxwell (2010) (which could be added to the references), this paper adds to this previous work by looking at the way the capillary rise process is incorporated in the model and the effects of numerical resolution and the effect of soil physical repro data.

Two results stand out in this paper:

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1) The terrifying effect on land surface energy partitioning as a result of using different relations between texture and soil physical properties as shown in Figure 4.

2) The surprisingly good results when using a simple bucket approach in combination with the simple Gardner-Eagleson approach to capillary rise.

These results provide very important guidance for future research.

There are only a few remarks I can make:

- Page 2, Line 11: change “profiles” to “content”
- Page 3, Line 4: change “the Richard equation” to “Richards’ equation”.
- Page 3, Line 14: van Genuchten (add c)
- Page 6, Line 14: change “phenomena” to “processes”
- Page 6, Line 24: It is called “moisture diffusivity” rather than “diffusion coefficient”.
- Page 12, Line 29: were hourly soil moisture data used in the compariso with the Hydrus and IBIS models? This would possibly make the fit of these models better as hourly soil moisture data are more variable, as are the hourly model outputs of Hydrus and IBIS.
- Page 15, lines 8/9: rephrase. Using a uniform root distribution does not reduce uncertainty but rather eliminates an additional source of variation when changing grid spacing.
- Page 19, Line 29: I am not sure if increasing the number of soil layers is such a good idea if the soil physical properties of such layers cannot be determined and if this also implies using smaller time steps to resolve the soil moisture profile in time.
- Page 20, Line 14: what is meant by “more field validation”? Explain this. In fact, here it becomes evident that one type of information is lacking from the experimental setup of this research: independent observations of actual evaporation under conditions of

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different water table depth using e.g. eddy covariance measurements or lysimeters.

Ferguson, I. M. and R. M. Maxwell (2010), Role of groundwater in watershed response and land surface feedbacks under climate change, *Water Resour. Res.*, 46, W00F02, doi:10.1029/2009WR008616.

Interactive comment on *Hydrol. Earth Syst. Sci. Discuss.*, 7, 6887, 2010.

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7, C3070–C3072, 2010

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