

***Interactive comment on* “Coupling a land surface model with a crop growth model to improve ET flux estimations in the Upper Ganges basin, India” by G. M. Tsarouchi et al.**

Anonymous Referee #2

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General comments

This paper proposes land surface model JULES coupled with crop growth model In-Crop and examines the performance of ET estimation for a rice-wheat rotation area in the Upper Ganges basin. The background of the study is very important and the proposed modelling scheme could be useful. However, most results are limited to a spatial mean ET comparison between the original JULES and the coupled model. I think that a restructuring of the paper is necessary to provide more useful results and suggestions to readers from this valuable study. Comments and questions for the authors are as follows.

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1. Page 6847 Lines 1–5: I agree that comparing pre-coupling and post-coupling is useful to allow understanding of the LSM sensitivity to crop dynamics. However, the results show that most ET differences are caused by LAI and I think that this finding is less novel. A more novel aspect is the application of a coupled model at large spatial scale to an agricultural area, so this should receive greater emphasis. Spatial variation in the performance of ET estimation, through for example a comparison between rain-fed and irrigated areas (as mentioned by the author near the end), could be useful to many readers, so it should be addressed with quantitative results.

2. Page 6854 Lines 21–28: In the coupled model, ET is computed by the LSM and photosynthesis is then calculated by a crop growth model. The latter calculation (dry matter production) appeared to be based on radiation use efficiency in InfoCrop, in contrast to the biochemical model in JULES. I think that this coupling scheme is incomplete because the calculation of ET (more properly g_s) in JULES is linked to photosynthesis (A) via a CO₂ diffusion equation and stomatal conductance model. It is better to use the LSM photosynthesis to maintain reasonableness in a coupled model, or it is necessary to discuss and justify the use of photosynthesis from the crop growth model.

Minor remarks

1. Page 6851 Line 20, “there is no subsurface grid heterogeneity”: Does this mean soil moisture values are the same at all grids? Is this not a problem to calculate soil heat flux (G) or water stress impacts on ET at individual grids?

2. Page 6851 Line 25, “Ground surface heat components”: Does this mean soil heat flux (G), or G plus heat flux into the plant body?

3. 6852 Line 5: Why is soil evaporation restricted by stomatal resistance (though it is possible via the energy budget)? Is this soil resistance?

4. Page 6852 Line 22, “canopy capacity C_m ”: Specify the subject matter for capacity. Is this “canopy capacity to hold water”? The unit of C_m is necessary.

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5. Page 6853 Line 7: This ET from InfoCrop seems to be unused in a coupled scheme. It is helpful for readers to distinguish the explanation for coupled and uncoupled parts throughout model description.

6. Page 6855 Line 8, “JULES-Info model was parameterized for those crops”: Which parameters did you use for parameterization? Describe the details of parameterization and discuss the result, such as values obtained. This information could be useful for readers.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 6843, 2014.

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