

## ***Interactive comment on “The improvement of soil thermodynamics and its effects on land surface meteorology in the IPSL climate model” by F. Wang et al.***

### **Anonymous Referee #2**

Received and published: 16 November 2015

#### General Comments

The authors present a clear, concise description of the soil moisture and temperature treatment in the IPSL ORCHIDEE model. The study modifies the existing model and demonstrates some sensitivity model results. Overall, the manuscript is written well and focused. I find two deficiencies with the manuscript: 1) there is no comparison to observations, and thus no evidence that the new model is actually better than the original; and 2) the results are merely presented and there is very little explanation of why the results are different.

Since the study is presented as a sensitivity study, there is no need to address 1),

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though it would be nice to see some verification.

#### Specific Comments

1. Most of the analysis does not have a sufficient amount of explanation of results. For example, p10 L17 states the model modification effect on Brazil. Why do these changes occur there and nowhere else? What contributes to the changes there? I had these questions throughout sections 3 and 4.
2. The bulk water budget terms should be more of a focus. For example, Figure 5 shows several regions that have  $>5W/m^2$  differences. If I'm reading this figure correctly, that equates to 50 – 100 mm of water that is being shifted from one part of the water budget to another. That is a significant amount. Where is that water coming from or going to? Similarly, I think latent heat flux is more important to include in Fig. 7 and 8 than say  $T_s$  or  $R_{lw,up}$  (which is basically the same as  $T_s$  in Fig 8).
3. p13L7: Explain what  $ITV$  and  $ITnV$  are and what the magnitude of the changes in these values mean before you state the values to give the reader some context in these somewhat abstract terms.
4. The figures/captions need some clarity. The lines are labeled in the figures but the labels are not explained in the caption. This happens many times. For example, what are all the lines in Figure 4? I can guess what 90D, 270D, etc. are but they should be explicitly described in the caption.

#### Technical Corrections

1. Most of the manuscript reads very well. I suggest a re-read of the Introduction section. I suggest changing LSM to mean “Land Surface Model” and refer to the plural as LSMs. This will read better and not conflict with the later use of LSM, i.e., ORCHIDEE LSM.
2. In Table 1, the Noah LSM should not have Niu et al. (2011) as a reference. A more appropriate reference is Ek et al. (2003).

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