Interactive comment on "Validating a 1-D SVAT model in a range of USA and Australian ecosystems: evidence towards its use as a tool to study Earth's system interactions" *by* G. P. Petropoulos et al.

Anonymous Referee #2

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Review of Petropoulos et al.(2015), 'Validating a 1-D SVAT model in a range of USA and Australian ecosystems: evidence towards its use as a tool to study Earth's system interactions

This paper describes the validation of the one dimensional SimSphere model against eight Fluxnet sites in the US and Australia. The validation period covers 72 selected cloud free days during 2011. This paper is fairly well written and likely to be of interest to the land surface modelling community.

Major Comments

1) The authors should avoid the use of subjective assessments such as 2438L15 "good to excellent agreement". Readers may not consider a RMSD of 3 to 4 Kelvin for atmospheric temperature to be good, excellent or even satisfactory.

2) The authors should also provide validation statistics (e.g. RMSD) for a "zero skill" model that only uses persistence or a monthly climatology based on observations. This would aid the reader to determine the actual skill of the SimSphere model.

A recent paper compares 13 Land Surface Models (LSMs) at 20 Fluxnet sites and finds that the LSMs are less skilful at predicting sensible heat flux than simple linear regression against incoming surface shortwave radiation. Best, et al. "The plumbing of land surface models: benchmarking model performance." Journal of Hydrometeorology 2015, http://journals.ametsoc.org/doi/abs/10.1175/JHM-D-14-0158.1.

3) The authors should discuss more deeply why they have chosen to validate SimSphere against only 8 Fluxnet sites during 2011. How many Fluxnet sites are available for validation? They should also discuss whether it would be possible to validate SimSphere over a longer time period using Fluxnet data from other years.

4) The Introduction can be improved by having a greater focus on the utility and usefulness of the SimSphere model. 2443L10 states that SimSphere is used to downscale SMOS soil moisture to 1km resolution. What features of SimSphere make it attractive for such applications? How does SimSphere differ from single column versions of weather and climate models?

Minor Comments

2449L1: Explain the symbols G and S used in equation 1.

Table 1: RKS parameter: Please check whether Cosby et al 1984 provide estimates of saturated hydraulic conductivity or saturated thermal conductivity. What are the units of the RKS, THM and PSI parameters?

Sections 5.1 and 5.2: Please make it clear that Rg and Rnet are at the surface.