

Interactive comment on “The Land Surface, Snow and Soil moisture Model Intercomparison Program (LS3MIP): aims, set-up and expected outcome” by Bart van den Hurk et al.

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General comments:

Realizing this is primarily a "documentation" paper and not a "results" paper, my comments are mainly regarding clarity and completeness of description, although there are a couple of (belated) comments about the experiment set-up.

Objectives section: An obvious "omission" is anything to do directly with vegetation or the carbon cycle, which will probably stir up questions in the minds of readers. The authors should declare the territory of this MIP up front, presaging Fig 3, that the focus is on the "GEWEXy" bits, especially the water cycle. State explicitly that there are other

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MIPs (e.g., LUMIP) that are concerned with the vegetation aspect of the land surface (can say "...as described later..." as this does get addressed eventually with Figs 2 and 3 on p.6).

Specific comments:

Paragraph lines 84-98: Highly relevant work on snow-climate coupling should be cited (Xu and Dirmeyer 2011) especially regarding the albedo versus delayed hydrologic effects (Xu and Dirmeyer 2013), the latter also at line 191.

L169: Change "experimend" to "experiment".

L171: Fig 3 should not be cited before Figs 1 & 2. Remove the overt reference here or reorder the figures.

Para lines 176-192: This is rather redundant with the first paragraph of the introduction. Probably needs to be in only one place.

Same para: Is WCRP the only "customer" for this project? Seems that the potential audience is much broader - should be stated here. Along with the next paragraph, gives short shrift to the broader impacts of L3MIP.

ca. L184: What about feedbacks literature? Chapter 15 of "Seamless Prediction of the Earth System: from Minutes to Months" might be a good summary citation (Dirmeyer et al. 2015).

L297: Which NCEP reanalysis? There are 3 separate unique NCEP reanalyses.

Para lines 427-439: Really need to avoid prescribing surface soil layer moisture as well, because it can cause highly unrealistic Bowen ratios where net radiation is high, (cf. GLACE2 experiment "S"; Koster et al. 2006)

L444: Change "participants to LS3MIP" to "LS3MIP participants".

L510-12: What is the protocol for ensemble construction? Are there suggestions of a

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prioritized list of preferred approaches like there were for GLACE-1 and -2?

Tier 2 experiments in LFMIP: The mean AOGCM climatology of SST will certainly differ from that of an AMIP run based on observed SST, introducing two differences between the experiments, not one. What are the implications?

Bullet at line 625: This section has multiple language problems:

- » L626: Change "allows the" to "allows".
- » L627-28: Change "as, for instance," to "such as"
- » L629: Change "several time scale" to "several time scales".
- » L631: "focus with be set" makes no sense - not sure what is meant.
- » L637: Change "droughts signal" to "drought signals".
- » L638: Change "of the river" to "of river".
- » L639: Change "discharge in the" to "discharge to the".

L647: Change "the model" to "model"

L699-702: It seems agricultural areas in general should be a focus.

Table 2 caption: Change "to" to "in".

Table A1-A4: For clarity and completeness, need to define what "Direction" means (presumably the direction that is positive in sign).

References:

Dirmeyer, P. A., C. Peters-Lidard, and G. Balsamo, 2015: Land-Atmosphere Interactions and the Water Cycle. [Chapter 15 in: Seamless Prediction of the Earth System: from Minutes to Months (G Brunet, S Jones, PM Ruti Eds.)], World Meteorological Organization (WMO-No. 1156), Geneva.

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Koster, R. D., and co-authors, 2006: GLACE: The Global Land-Atmosphere Coupling Experiment. 1. Overview and results. *J. Hydrometeor.*, 7, 590-610, doi: 10.1175/JHM510.1.

Xu, L., and P. Dirmeyer, 2011: Snow-atmosphere coupling strength in a global atmospheric model. *Geophys. Res. Lett.*, 38, L13401, doi: 10.1029/2011GL048049.

Xu, L., and P. Dirmeyer, 2013: Snow-atmosphere coupling strength. Part II: Albedo effect versus hydrological effect. *J. Hydrometeor.*, 14, 404-418, doi: 10.1175/JHM-D-11-0103.1.

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