Hydrology and
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Discussions

Interactive comment on "Spatio-temporal variability of snow water equivalent in the extra-tropical Andes cordillera from a distributed energy balance modeling and remotely sensed snow cover" *by* E. Cornwell et al.

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General comments

The manuscript explores spatio-temporal patterns of snow water equivalent (SWE) in the extra-tropical Andes in the period 2001-2014. The patterns are estimated by a distributed energy-balance model, which is driven by distributed forcing from satellite (MODIS) and station data. The approach is based on retrospective reconstruction of SWE. The modeled peak SWEs are validated by snow pillow observations at 12 sites

and additional snow surveys. The results show that the model explains 32-88% of the variability in observations over the model domain. The modeled patterns of peak SWE are related to the topography, latitude and position to the continental divide. The authors conclude that the results have the potential for improving seasonal forecasts, regional climate model validation as well as for water resource infrastructure development.

As the authors report, this is the first assessment of peak SWE patterns over a large region of central Chile and Argentina. So I found results interesting and original. However, the methodology is not new and novel scientific contribution is not clearly formulated. In many parts, the manuscripts reads like a technical report and not a scientific paper. I would suggest to consider discussing the results in more detail and present some more generalization of the findings. In the current form, it is not clear what can be learned from such assessment? What does it mean and what are the implications if e.g. is R2=0.61? What are the factors that control the over/under- estimation of the model? How does the assessment compare with similar analyses in other parts of the world (this part is briefly mentioned in the conclusions, but some more detailed discussion would be helpful). Summing up, I would suggest a moderate revision of the paper with a focus on better formulation and discussion of scientific novelty.

Specific comments

1) How are the results sensitive to the selection of sub-regions?

2) Approach to test and justify the regional consistency of river flow data is not clear.

3) Results: I would strongly suggest to show some time series (i.e. snow pillow/survey data vs. model simulations).

4) Please consider to elaborate more on why? is the model over/underestimating snow pillow and snow survey data?

5) p.8947, l.1-23: Does this part refer to model validation (as the title indicates)?

6) p.8947, l.24: September 15? not 1?

7) regional SWE estimates - how do the values above 1500mm represent reality? the comparison on Figure 5 indicates that some model estimates strongly overestimate observations for larger peak SWE.

8) Please consider to move the comparison of results with the literature (SWE reconstruction in other parts of the world) from the conclusions to discussion and to elaborate more about the similarities and differences of the findings. What can be learned from the current results?

9) Fig.2: caption - hidro-climatology

10) Fig.5: Plots are very small. Please consider to use 3x4 panels arrangement. Why are the units in m? Please consider to make them consistent with other figures.

11) Fig. 6.: Again, plots are too small, please consider some other arrangement to make the message out of this figure more clear and attractive.

12) Fig.9, 10: Please add x labels. What is the meaning of (a), (b),...(h)?