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The Cryosphere Discussions

Interactive comment on "Future Snow? A Spatial-Probabilistic Assessment of the Extraordinarily Low Snowpacks of 2014 and 2015 in the Oregon Cascades" *by* E. A. Sproles et al.

Anonymous Referee #2

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This paper described spatial probabilistic assessment of snowpack of WY 2014 and 2015 in Mackenzie River Basin. Here are my comments on this paper.

1. The results and analysis mainly came from the SnowModel estimates. However, the authors did not provide any detail information of model (inputs, calibration & evaluation statistics). Only authors mentioned, page 5, lines 11-12, "Model forcing data include temperature and precipitation from the SNOTEL network and additional meteorological data as described in Sproles et al. (2013)." I am not sure whether authors used an exactly same framework of Sproles et al. (2013) or not. Even though authors did, authors need to provide a concise summary of the model and model performance information. Without the information, the analysis may be lost the confidence of readers.

2. Authors used 20-year periods (WY 1989-2009) to calculate EP with +2C condition. But the authors also presented that, page 5, line 11, "The calibration period for our model was WY2006 through WY2012." Why did authors include the period WY 2010-2012 that did not contain the experimental periods? Also, lines page 5, lines 16-18: is not clear for the reason for selecting the calibration period.

3. The authors mentioned several times in the manuscript, "extreme low snowpacks of 2013-2014 and 2014-2015." But I am confused - Page 6, lines 25-26: "For N–M in WY 2014, precipitation was at 112% of the 30-year normal and temperatures at SNOTEL stations in the MRB were 0.9 C warmer than normal." - Page 7, lines 1-2: "we see that the April 1 basin-wide snow water storage for WY 2014 corresponds to 40% EP, meaning that WY 2014 snowpack storage is slightly above average for a +2 C model perturbation." Is WY 2014 dry year in MRB?

4. As the authors mentioned that EP is generally used to show a probability of a natural hazard event occurring annually. Thus, page 6, lines 1-2, "90% EP describes the statistical likelihood of a measurement that would be met or exceeded in 90% of the time, or a 9 in 10 chance of occurring in any year, and represents a relatively low SWE value." may lead to confusion (e.g., dry season, like WY2015, may happen 90% probability in any years.) I suggest that author may use a new term or a different way of expression to clear over the entire manuscript.

5. Only 2/10 pages used to explain methods and results. Authors may more focus on their methods and results. Also, this paper pretended to perform over Pacific Northwest area. Please clearly mention that this is a case study for MBR (3,041km2) in abstract and introduction. Also, I recommended that "2 Research Methods" need to divide into two sections, study area and methods to clear.

6. Fig 2 & page 6, line 28: "30-year" – where is coming from? Authors used 20-year model estimate. But without any description, authors used 30-year average air temperature and precipitation dataset for comparison, not 20-year model inputs or estimates.

7. The authors mentioned that page 6, lines 25-26, “For the DJF period, WY 2014 monthly precipitation was 103% of normal and SNOTEL temperatures were 0.7C warmer than normal.” In Fig 2., Why WY2014 for DJF is less than 30-year normal? Please check your dataset.

8. page 7, lines 7-9 – author may need to provide a figure for SWE and precipitation of WY 2014 and 2015 to clear the description.

9. page 7, lines 13-14 – “393 km2 is essentially snow-free (Fig. 4).” Where is “393 km2” coming from?

10. page 7, lines 17-19 – Authors should provide references to support their insistence.

11. page 7, line 22-23 “This ratio does not exceed 0.20 below until an elevation of 1500 m in WY 2014, which is still markedly lower than the mean SWE:P at the McKenzie SNOTEL site (0.58, 1454 m).” - Why is so much different between your estimates and SNOTEL?

12. page 8, line 1 – “slightly warmer conditions (+1–2C)” – Author already mentioned in the manuscript that 0.9C was increased in N-M for WY2014. Why +1-2C? Please mentioned specifically not an ambiguous word.

13. I have more comments, but I stop to review the manuscript. Please keep focusing on your method and results, not the general idea.

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