We would like to thank the reviewer for your thorough reviews and valuable comments on the manuscript. The responses to reviewer comments are shown in blue font, proposed additions and revisions of the manuscript are shown in red font, and any original manuscript text is shown in gray font. Figure R1 – R4 are used only in the response document.

Review #2

General comments:

1. It is difficult to appreciate the water storage units of cubic kilometers and to put the climatological peak and uncertainty metrics in the context of water resources. It seems that all reservoirs in the contiguous US hold 600 km3 of water (Steyaert et al., 2022). This suggests that the climatological average snow water storage in the western US is 269/600 or 45% of all reservoir storage in the contiguous US (much of which is in the western US). While this is a compelling number, the more compelling result, in my opinion, would be expressing the uncertainty of global models relative to this US reservoir storage estimate. My quick assessment (check this) is that the low-resolution products underestimate snow volume by nearly 24% of all the water held in these US reservoirs. That astounding fact is likely not appreciated by most users of those (commonly used) data.

Thank you for the great suggestions and providing the sources. We verified the number and percentage you computed are correct. We will include this information in the conclusion section:

"In the WUS, HR and MR snow products are in better agreement with WUS-SR peak snow storage (269 km^3) than the LR snow products, among which snow storage is biased low with large uncertainty. The climatological snow storage was found to be 284 km^3 ± 14 km^3 among HR and MR products and 127 km^3 ± 54 km^3 among LR products. For context, the reservoir capacity in the contiguous U.S. is around 600 km^3 (Steyaert et al., 2022). Thus, based on the WUS-SR, the snow water stored in the WUS is 45 % (269 km^3 of WUS-SR SWE_{peak} / 600 km^3 of contiguous US reservoir capacity) of the total reservoir capacity. Compared to the snow storage from WUS-SR, the averaged snow water storage from LR products misses 142 km^3 of snow water storage, equivalent to 24% of total reservoir capacity over the contiguous U.S."

Steyaert, J.C., Condon, L.E., WD Turner, S. and Voisin, N., 2022. ResOpsUS, a dataset of historical reservoir operations in the contiguous United States. Scientific Data, 9(1), p.34.

2. Please discuss the implications of snow model uncertainty in coarse scale model (> 10 km) applications on the topic of snow volume sensitivity to warming. For example, Siirla-Woodburn et al. (2021) sited in this paper uses coarse-scale model output and concludes a dire water resource scenario for mid-century. Might results of such studies be different and arguably more accurate if models were run at finer spatial resolution?

Thank you for suggesting the analysis of snow volume sensitivity to warming in coarse scale models. We agree that, given the underestimated SWE, it would disappear more quickly from coarse resolution models if melt rates were the same. We propose to add the following comments in the conclusion:

"The averaged SWE volumes from LR products in the WUS and Andes are underestimated by over 30% compared to the reanalysis datasets. For similar melt rates, SWE computed from LR models would therefore disappear more quickly than HR/MR products. Hence calculation of snow volume sensitivity based on LR products could exaggerate the impact of warming on snow loss.”

Additionally, we computed the snow volume loss trends. However, we found that WUS-aggregated snow trends are not significant (p-value > 0.05) over all the products and that the snow loss rates vary significantly (Figure R3), likely in part due to the relatively short analysis periods.

Moreover, the slope and p values of the fitted trendlines are sensitive to the study period chosen. For example, if the starting year is a wet year (Figure R4), the p-value and slope (△) would be much lower than starting with a normal or dry year (Figure R3). Therefore, we believe this topic deserves further investigation, but that it is beyond the scope of this paper.

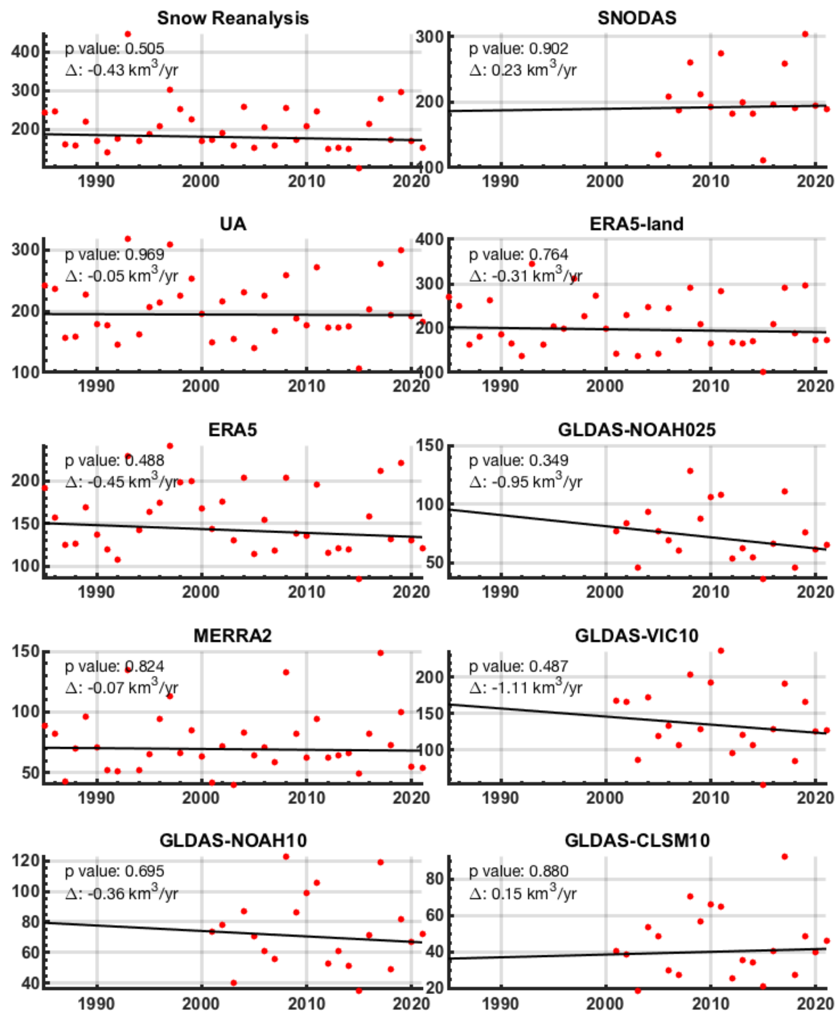

Figure R3. WUS-aggregated peak SWE trend. △ represents the snow loss rate computed using Theil–Sen slope. P-value is computed based on Mann Kendall test. The study periods for GLDAS, SNODAS and the rest of products and dataset are WY 2001 to 2021, 2005 to 2021, and 1985 to 2021 respectively.

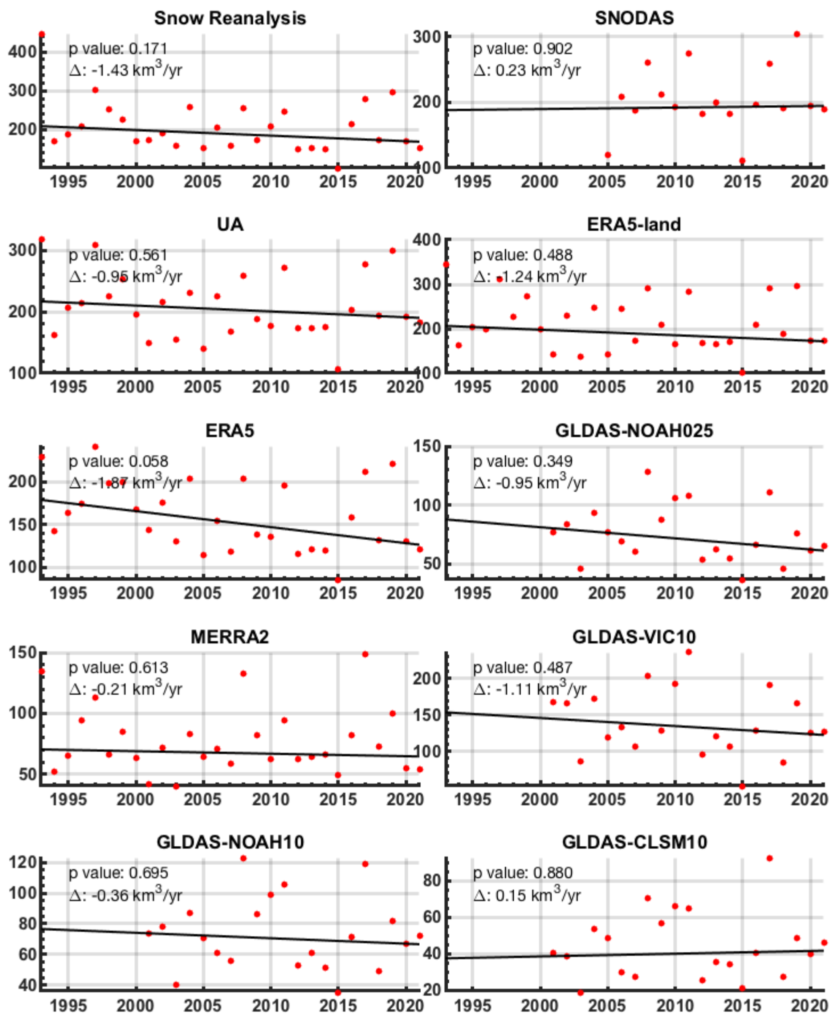

Figure R4. WUS-aggregated peak SWE trend. △ represents the snow loss rate computed using Theil–Sen slope. P-value is computed based on Mann Kendall test. The study periods for GLDAS, SNODAS and the rest of products and dataset are WY 2001 to 2021, 2005 to 2021, and 1994 to 2021 respectively.

Siirila-Woodburn, E. R., Rhoades, A. M., Hatchett, B. J., Huning, L. S., Szinai, J., Tague, C., Nico, P. S., Feldman, D. R., Jones, A. D., Collins, W. D., and Kaatz, L.: A low-to-no snow future and its impacts on water resources in the western United States, Nat Rev Earth Environ, 2, 800– 819, https://doi.org/10.1038/s43017-021-00219-y, 2021.

Detailed Edits:

Line 200: To make the comparison clear, perhaps add “in the Andes than they do in the WUS”.

“in the Andes” will be added before “than they do in the WUS”.