The Cryosphere Discussions

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Comment on tc-2021-225

Anonymous Referee #3

Referee comment on "Propagating information from snow observations with CrocO ensemble data assimilation system: a 10-years case study over a snow depth observation network" by Bertrand Cluzet et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2021-225-RC3, 2021

Propagating information from snow observations with CrocO ensemble data assimilation system: a 10-years case study over a snow depth observation network

by: Bertrand Cluzet1, Matthieu Lafaysse1, César Deschamps-Berger1, 2, Matthieu Vernay1, and Marie Dumont1

The paper demonstrates that assimilation of in-situ sown depth observations does not provide significant RMSE improvements over the open-loop and operational simulations. It reduces bias in snow depth estimates and outperforms the open-loop simulations in specific elevation bands in locations with a lower observation density.

The methodology and the presentation of results are clear, and I agree that this approach seems to be relevant for the estimations of snow depth and SWE. For all these reasons, I think the paper should be published with a minor revision.

The paper is interesting and provides insight into analyzing ensemble data assimilation approaches. However, there is too much emphasis on the Continuous Ranked Probability Score (CRPS). It would be more insightful to show snow depth maps or scatter plots of model simulations (open loop, oper, DA vs. observations).

L137-140: Please provide perturbation statistics (additive/multiplicative, mean, standard deviations/correlation coefficients, spatial, and temporal correlations) for each forcing).

L165: a summary about the updating step and how the PF updates the snow profile would improve the clarity of the setup section.

L229: Please provide some information about the resolution of simulations.

How are the bias and RMSE computed (i.e., point vs. gridded simulations)? What is the uncertainty of this comparison?

The authors can elaborate more on the representative error. Gridded simulations are compared with ground-based point measurements. There is a scale gap in this comparison. It will benefit the paper if the authors discuss this source of uncertainty.

L300: What is the reason for presenting figure 10b?

If possible, please improve the quality of the figures.