

***Interactive comment on “Snowpack dynamics in the Lebanese mountains from quasi-dynamically downscaled ERA5 reanalysis updated by assimilating remotely-sensed fractional snow-covered area” by Esteban Alonso-González et al.***

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Dear authors,

Thank you for this valuable contribution. I appreciate that you combine innovative downscaling, remote sensing and data assimilation techniques to improve our knowledge on snowpack dynamics in a high-impact area. I have a small comment on a quote of one of our papers which I found slightly misleading. Lines 100-106:

C1

“However, less often, numerical modeling and remote sensing have been combined in a data assimilation framework to study the multiyear snowpack dynamics. Assimilation of remotely sensed snow cover observations has been shown to improve numerical snowpack models outputs in both distributed (e.g. Baba et al., 2018; Margulis et al., 2016) and semi distributed simulations (Cluzet et al., 2020; Fiddes et al., 2019). These approaches are particularly promising in data-scarce regions to reduce the biases in atmospheric forcing.”

I'm afraid that the reader might understand that in Cluzet et al., 2020, we assimilated data in a semi-distributed setting, while we were indeed unable to assimilate any data due to significant biases in the satellite product retrievals. In this study, we only suggest that assimilating satellite reflectances could be beneficial in a semi-distributed area provided that this bias issue is fixed (Lamare et al., 2020), by exhibiting strong correlations between observed and modeled variables in a wide diversity of topographic conditions. I think that Fiddes et al., 2019 go much more forward in demonstrating the performance of data assimilation in such a framework, although with a different variable. More recently, we submitted a paper in GMD (Cluzet et al., 2020b) where we actually assimilate reflectances (and snow depth) in a semi-distributed area, but assimilating only synthetic data (i.e. model outputs), showing some potential, but still being unable to assimilate real data. This citation might be more appropriate depending on your purpose.

So to wrap up, I would suggest to either unquote Cluzet et al., 2020, or reformulate the sentence to make it clear that we did not assimilate real data, or cite Cluzet et al., 2020b underlining that it's only a theoretical experiment.

Thanks a lot again for this manuscript, and best regards !

References: 1. Cluzet, B., Revuelto, J., Lafaysse, M., Tuzet, F., Cosme, E., Picard, G., Arnaud, L. & Dumont, M. (2020). Towards the assimilation of satellite reflectance into semi-distributed ensemble snowpack simulations. Cold Regions Science and Technol-

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ogy, 170, 102918. 2. Cluzet, B., Lafaysse, M., Cosme, E., Albergel, C., Meunier, L. F., & Dumont, M. (2020). CrocO\_v1. 0: a Particle Filter to assimilate snowpack observations in a spatialised framework. *Geoscientific Model Development Discussions*, 1-36. 3. Lamare, M., Dumont, M., Picard, G., Larue, F., Tuzet, F., Delcourt, C., & Arnaud, L. (2020). Simulating Optical Top-Of-Atmosphere Radiance Satellite Images over Snow-Covered Rugged Terrain. *The Cryosphere Discussions*, 1-46.

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