

Interactive comment on “Sensitivity of snow models to the accuracy of meteorological forcings in mountain environment” by Silvia Terzago et al.

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Dear Referee,

thank you for your comments. A comprehensive reply to all the points you raised will be prepared after the closure of the public discussion. Here we reply specifically to the main limitation highlighted in your report, i.e.:

" The research idea is based on straightforward model testing, i.e. running an ensemble of models with different forcing data and calculating statistics on how the models' performance (evaluated against point snow observations) vary. However, the two main weaknesses of the ms. are in my opinion that 1) the model evaluation is made at only one single site (Torgnon) [...]"

We see your point and we are aware that the choice of a single study-site can be highlighted as a limitation, however we have some motivations to support this choice. The strengths of our work are, in our opinion, the analysis of a multi-model ensemble, representative of different degrees of complexity of snow models, and the analysis of a wide range of possible meteorological forcing datasets, to explore in detail the response of the models to forcings with different characteristics and resolutions in time and space. When planning this large, collaborative experiment we carefully considered the choice of the site where to perform our analysis. The site we finally selected is quite unique as it provides high quality data in particular for precipitation (in most cases poorly measured in high elevation sites) and it is affected by low wind speeds, so that the snow-drift effect is limited. The combination of these two conditions is rare in high-elevation mountain measurement sites, nevertheless it is essential if we want to reduce the uncertainties on the input data. Repeating this effort in multiple test sites, for example in other Alpine sites at different elevations, or at non-alpine sites, i.e. in the Arctic) would certainly expand the vision provided by the paper but at the cost of larger uncertainties in the forcings which propagate across the modeling exercise and complicate the interpretation of the model outputs. Reducing the uncertainty on the “control” forcings is a prerequisite, in our case, to better separate the error due to model structure from the error due to the forcing. In this context, the selected site represents an appropriate benchmark for the aim of the paper. Extending the investigation to other test sites with less “optimal” forcing is of great interest but in our opinion it deserves attention in a separate paper, as a more complex framework is needed compared to the one adopted in this study.

We hope to have clarified the motivations underlying our choice. We believe that this study, shedding light on the impacts of the model complexity and of the accuracy of the forcing on snow simulations, could be of interest for the readers of Hydrology and Earth System Sciences involved in catchment hydrology, snow modelling and snow and water resources management.

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Many thanks for your feedback and kind regards.

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