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Geoscientific Model Development Discussions
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Interactive comment on "TOPMELT 1.0: A topography-based distribution function approach to snowmelt simulation for hydrological modelling at basin scale" *by* Mattia Zaramella et al.

Anonymous Referee #2

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General comment

In this manuscript, the authors presented a new model simulating snowpack and snowmelt (TOPMELT), integrated in a lumped basin scale hydrological model. TOPMELT is based on an enhanced temperature index accounting for elevation bands and radiation classes (obtained by clear sky radiation values derived by the analysis of Digital Terrain Models). After the presentation of the model structure, the authors presented an application of the model to a catchment in the Eastern Italian Alps for which there are long-term discharge data and snow-covered-area data derived by MODIS maps. Specifically, the authors compared snow-covered areas obtained by TOPMELT

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Discussion paper

and MODIS and analyzed the sensitivity of the model results to the spatial and temporal aggregation of the radiation data.

I think the topic of the manuscript is interesting for the readers of Geoscientific Model Development. The structure of the model is well described and clear, and the manuscript is well organized. However, I have few specific comments that should be considered by the authors and various minor corrections to the text (small errors and typos).

All the specific and minor comments are reported in the supplementary pdf file.

Specific comments

Page 4, line 14: The Precipitation Correction Factor is mentioned only here without further explanation or details. Is it an important parameter in the model? How is it determined? What are the typical values? In the revised manuscript, I suggest the authors to integrate the description of the Precipitation Correction Factor.

Page 8, line 17: How does the conversion snow-water equivalent maps to snow cover maps work? What are the 'suitable threshold values'? I suggest the authors to integrate the description in the text.

Page 9, line 9: The authors should report the estimated fractions of catchment area for the different land uses. Does the model consider interception by various vegetation covers? If so, how? How does the snowmelt module work in forested areas and are there any differences compared to other land uses?

Page 13, lines 5-8: I think coniferous forests and discontinuous vegetation might be the dominant land covers in such a catchment. Therefore, given the limits of MODIS in vegetated areas, I suggest to show the comparison between TOPMELT and MODIS for all the land covers, except for the forested areas. As an alternative, the results of the comparison could be shown in a table or in the figures, but distinguishing the various land uses.

Please also note the supplement to this comment:
https://www.geosci-model-dev-discuss.net/gmd-2018-202/gmd-2018-202-RC2-supplement.pdf

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