

Interactive comment on “Future projections of the climate and surface mass balance of Svalbard with the regional climate model MAR” by C. Lang et al.

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Lang et al. present a well designed and highly valuable study on the impacts of climate change on the mass balance of the glaciers and ice caps of Svalbard. However, their calculations are based on only one climate model (MIROC5) forced by only one future climate scenario (RCP 8.5). This makes their results rather speculative when it comes to what might really happen to the glacierized areas of Svalbard in the future.

With respect to this, the following issues should be accounted for in the revised version of the discussion paper in order to give the reader the necessary information to better set the results of this really important study into perspective.

1) The choice of the MIROC5 climate model and the RCP 8.5 scenario needs to be

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better motivated. The reader needs to know more about both the MIROC5 model and the different RCP scenarios (e.g. Moss et al., 2010). So far, not even the meaning of "RCP" is explained.

2) It needs to be worked out explicitly whether the future SMB modelled by Lang et al. represent a "conservative" or an "aggressive" estimate for the future evolution. A recently published study on the future mass balance evolution of a large ice cap in northern Svalbard (Möller and Schneider, 2015) could be considered as a useful reference to set the Svalbard-wide SMB modelling of Lang et al. into perspective. In this study the future evolution of the mass balance of Vestfonna was modelled according to all four RCP scenarios represented by ten different climate models each. By this means, a reliable hold on potential scenario uncertainty and model uncertainties (Hawkins and Sutton, 2009) and the spread of potential future mass balance evolutions is given. Hence, it would be most useful to directly compare a spatial subset of the calculations of Lang et al. for the Vestfonna ice cap to the results of the study by Möller and Schneider and to discuss aspects of scenario uncertainty and model uncertainty with respect to the chosen combination of RCP 8.5 and MIROC5.

3) It should be explained why only one combination of model and scenario is presented and not an ensemble approach (which would yield much more reliable results). The limitations that are going along with this fact needs to be discussed and expressed clearly. With the choice of only one model and one scenario the outcome of the study by Lang et al. does only represent one single possibility in the universe of possible future mass balance evolutions on Svalbard. This needs to be stated much more prominently in both the abstract and the conclusion.

References:

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