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The Cryosphere Discussions



# *Interactive comment on* "A regional climate model hindcast for Siberia – assessing the added value of snow water equivalent using ESA GlobSnow and reanalyses" *by* K. Klehmet et al.

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This paper is one more contribution which demonstrates the capacity of snow/atmosphere models to simulate in a realistic manner the physical processes which control the snow cover dynamics over Siberia. However, the evaluation of the climate model hindcast is limited to a comparison of the simulated SWE with satellite products. Even if this comparison makes sense, a deeper evaluation would strengthen the main results of the paper and may eventually identify the reason leading to the overestimation of the modelled SWE in April, if such an overestimation is confirmed. Therefore, we suggest to add the following points:

A comparison with the in-situ observations of SWE and snow density, performed 3 times per month in many stations of the considered domain, from 1966 to 1996. The available data sets and the way to use them for evaluating a snow model are described in "Brun, E., Vionnet, V., Boone, A., Decharme, B., Karbou, F., Morin, S., Peings, Y. and Valette, R., (2012). Simulation of northern Eurasian local snow depth, mass and density using a detailed snowpack model and meteorological reanalysis, in press doi: 10.1175/JHM-D-12-012." This comparison would make possible to confirm or not the overestimation of SWE in April, when compared with Globsnow. Indeed, we cannot exclude that Globsnow underestimates SWE during the melting period. As you mentioned in your paper page 4649 (lines 20-23), the estimation of SWE in Globsnow during the melting period is mainly based on the interpolation of in-situ snow depth observations. The density used in the Globsnow algorithm does not represent explicitely the systematic rapid increase in density due to the compaction of wet snow (see Fig 2 in the above-mentioned paper), which could lead to an underestimation of the estimated SWE. A comparison with quality-controlled in-situ snow depth observations, which are very numerous from 1948 to 1995 and easily accessible via the NSIDC portal, would allow an evaluation of the capacity of your hindcast to simulate the date of the onset of snow cover as well as the date of its melting out (see the above-mentioned paper and Peings et al, 2012 / doi:10.1029/2012GL054083). An evaluation of those hindcast meteorological fields which are the most informative with respect to the snow cover dynamics ( winter snow falls, Fall and Spring temperatures, wind velocity, . . .) would further strengthen the conclusions of your paper, as Troy et al. (2011 / doi:10.1175/2011JCLI3936.1) did for precipitation.

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