

Review of

Chadburn et al: "An improved representation of physical permafrost dynamics in the JULES land surface model"

This manuscript is an important contribution towards a more realistic depiction of frozen ground properties in the JULES model, with important implications for land surface models in general. As such it is of considerable interest to the scientific community and deserves publication in Geoscientific Model Development, provided that the authors have addressed the following minor points.

General remarks:

The authors report results and describe model tuning for one particular station, Samoylov Island. It would be interesting to know how the model behaves under different soil conditions.

I have problems understanding the formulation "extended to 10 m" in subchapter 2.2.5. Do you mean that bedrock is not included in this extension, but is to be added separately?

The authors could make their main point more clearly, namely that all the three introduced improvements (organic matter, saturation, moss cover) are relevant for Samoylov and probably for the high Arctic in general.

Specific remarks:

Page 727, line 5: The formulation "based in ERA40" is at least misleading. ERA40 data is only available from 1958, so no data for the period 1901-1957 can be based on ERA40. Please reformulate.

Page 728, line 12: remove brackets.

Page 729, line 2: Replace "futher" with "further".

Page 729, line 23: Labelling the standard mineral soil case with "std" is not a good idea, as most readers will connect this abbreviation with some kind of standard deviation.

Page 732, line 17: What is the rationale for using a depth of 32 cm? This number is presented somewhat unexpectedly to the reader.

Page 732, line 22: Replace "shows" with "show".

Page 733, line 10: "as large as".

Page 734, line 1: "which is about...".

Page 742, line 25: Is this the correct reference? Shouldn't ECMWF (2009) in the main text refer to ERA-Interim?