The Cryosphere Discuss.,
doi:10.5194/tc-2016-281-RC1, 2017

The Cryosphere Discussions
Open Access
EGU

Interactive comment on "Influence of albedo parameterization on surface mass balance in the perspective of Greenland ice sheet modelling in EC-Earth" *by* Michiel Helsen et al.

X. Fettweis (Referee)

xavier.fettweis@ulg.ac.be

Received and published: 19 January 2017

This paper presents over the Greenland ice sheet sensitivity experiments performed with EC-Earth discussing parameters of simple albedo parametrizations. This paper is rather a "model development" paper (fitting well in GMD) and does not really bring new stuff. However, showing EC-Earth performance over GrIS could deserve to be published in TC. However, before final acceptance, some revisions are needed:

- No validation of albedo with observations is presented. A comparison with the mean RACMO albedo (which is enough robust to be considered as observation) is here at least needed as the melt biases (Fig4) are discussed in fct of albedo biases.

Printer-friendly version

Discussion paper

- pg8, lines 9-18: We observe exactly the same differences/biases in the precipitation patterns when MAR is run at lower resolutions as shown in Franco et al. (TC, 2012) who should be cited here.

- No evaluation of the SEB is shown. Again, a comparison of the incoming shortwave and longwave fluxes with RACMO outputs should be added. I know that RACMO (and MAR) have significant biases in simulated SWD/LWD but it is better than nothing. Due to error compensations (as it is the case with MAR), overestimation of SWD can be compensated by too high albedo for example. A comparison of EC-Earth simulated SWD/LWD will able to better interpret comparisons shown in Fig4.

- pg 10, lines 1-2: the apparent decrease of the RACMO SMB is strange and is an artifact of the interpolation. The comparison and statistics listed in Table 1 should be made on the common ice sheet mask and not on the ISM ice sheet mask.

- pg 11, lines 28-31: I fully agree with the authors that a large part of their biases are due to the no-distinction between melting bare ice and melting snow. The melting snow albedo (alpha min) used here is artificially too low in the aim of approximating the bare ice albedo over the ablation zone. The best should be to have two albedo. As the snow model computes SMB, it looks like easy for me to implement a simple correction of the albedo parmetrisation following SMB values. If SMB <0 (or if ablation > winter accumulated snowpack), then alpha min = 0.40 else alphamin=0.6 for example. The accumulated snow height from previous 1st Sep could be used to distinguish accumulation to ablation zone. I think that this simple correction of albedo will improve a lot the comparison with RACMO.

- pg 13, line 4: due to some error compensations, best parameters for albedo are not necessary the best to simulated the present ice sheet topography. This should be clearly mentioned in the text.

- It should be interesting to test the albedo parametrization of SEMIC which seems to be easily to implement. There is here a clear distinction between snow and ice albedo.

Krapp, M., Robinson, A., and Ganopolski, A.: SEMIC: an efficient surface energy and mass balance model applied to the Greenland ice sheet, The Cryosphere Discuss., doi:10.5194/tc-2016-252, in review, 2016.

Interactive comment on The Cryosphere Discuss., doi:10.5194/tc-2016-281, 2016.

Printer-friendly version

Discussion paper