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Interactive comment on "Drifting snow measurements on the Greenland Ice Sheet and their application for model evaluation" *by* J. T. M. Lenaerts et al.

Anonymous Referee #2

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This paper deals with a field campain of blowing snow measurements over the Greenland Ice Sheet, in order to validate the parameterization of that process in the RCM RACMO. The paper provides to the community some highlights about the behaviour of blowing snow over huge ice sheets, as well illustrates the difficulty for RCMs to accurately simulate that process. Some points of the paper should be considered more deeply and apparent contradictions must be explained before the paper is published.

The authors suggest that the representation of blowing snow particles distributions they use is calibrated for antarctic snow and is not adapted to Greenland, because observed snow particles are larger for the last (p.31, line 2). Using that argument they claim that the model overestimates the simulated TRds by several orders of magnitude

(p.31, line 8). Why in this case does the model overestimate much more the snow transport during dry events, when actual snow particles size is better described by the gama distribution parameters they use, than during snowfall, when the snow particles are larger and their description by the gama distribution worserÂă? This behaviour of the model seems to apparently contradict the explanation the authors give. Could the author clarify that pointÂă?

Other points.

p.27, line 13. What is the RACMO2 domain and what is the model sensitivity to the domain sizeÂă?

p.28 line 13. Why did the authors not measure the snow density, or at least the water equivalent of fallen snow during the field campainÂă? Have they at least an estimation of snow density variationsÂă?

p. 31 lines 3 – 4. What is the sensitivity of the model (i.e., its local snow horizontal transport accumulated over the day) to the improved parameters of the gamma distributionÂă?

p.31 lines 5. What is the relative importance of the particle snow weight in influencing the behaviour of the horizontal snow transport simulated by the modelÂă? If the model is not sensitive to the parameters of the gamma distribution, the representation of the particle snow weight is not a critical parameterization of the model (see also comment about p.33, line 27 until p.34, line 1).

p. 33, line 9. Walden et al., (2003) did observations at South Pole, which is not fully representative of East Antarctica. Moreover they found that snow grains (and not diamond dust) are the main contributor to the volume of ice crystals precipitation they observe (see their table 3). Are the authors aware of other studies that confirm the importance of diamond dust over AntarcticaÂă?

p.33, line 27 until p.34, line 1. The authors find that the simulated horizontal transport

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of snow TRds is not significantly altered by an improvment of the gamma distribution parameter, suggesting that this process seems not to be critical in driving the horizontal transport of snow simulated by the model, in apparent contradiction with their explanation of p.31.

Interactive comment on The Cryosphere Discuss., 8, 21, 2014.