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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Advances in understanding and parameterization of small-scale physical processes in the marine Arctic climate system: a review" *by* T. Vihma et al.

Anonymous Referee #2

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This is a review paper that discusses recent advancements in the understanding of processes related to the Arctic climate system. With a focus on the ocean-ice-atmosphere interface, this paper covers a wide variety of important and timely topics, and contains a mind-boggling amount of information. Unfortunately, I believe that this is detrimental to the ultimate usefulness of this paper, as the large amount of information included results in a relatively scattered collection of summaries of various topics. Each of these various topics could (and most do) have individual review papers compiled summarizing major relevant advancements.

Unfortunately, I elected to suggest rejection of this paper. This was not a result of the

paper's aim or because the subject matter discussed was not useful and interesting, but rather it was because I believe that as the current paper is written, it is simply too long (In the end, I spent more than a day reading through and thinking about this manuscript) and needs to be divided into multiple publications to be of use to the community. In addition to its length, I do not feel as though the current version provides adequate connections between the individual topics discussed (or even within individual subtopics). This results in a long summary of papers that does not add much to our understanding beyond brief discussion of needed research efforts to address missing pieces, as covered in the discussion section. In my opinion, this has the topical coverage of a text book (though it does not contain the level of detail that would be required in a textbook), rather than a journal review paper. If there is only limited discussion on the connections between the main subsections (Atmosphere, Sea ice and snow, and Ocean), why not break it up into three papers? I don't believe that section 5.2 (cross-disciplinary aspects) provides sufficient justification for cramming it all together into one very long paper.

It is my opinion that the publication(s) stemming from this effort would be significantly more useful if the authors:

- Divide the current paper into multiple sub-discipline papers in order to reduce the overall length and more efficiently reach the intended audiences. This doesn't mean that there can not be interdisciplinary discussion or links, but they would be specific to one of the three current topic areas instead of one section that attempts to draw links between all of these disciplines.

- More explicitly draw connections between individual sub-topics within the new sub-disciplines to improve flow and readability.

- Make sure to add integrating conclusions that can only be made by synergistic evaluation of multiple individual publications and clearly bring those conclusions out in discussion on what we know and what we have yet to discover (this is done in limited

fashion, but I believe more is required to make this paper/these papers really stand out in their own right). Without this it is my opinion that a review paper does not add much to the literature beyond a listing of useful references.

- Make improvements to the figures, which, currently are relatively dry, sometimes confusing, potentially incomplete (e.g. no discussion of aerosols in the interactions between clouds and radiative transfer... Or maybe that's included in "condensation/evaporation" and "ice crystals"?). In my opinion, the fact that there are five complex flow charts/block diagrams is a clear indication that too much material is being covered for one paper (even one review paper!).

In summary, while there is a ton of useful material contained within this paper, I just don't see very many people sitting down to read the whole thing. This would be a shame because I do believe that well-written publications summarizing our advances in understanding sub-grid-scale processes in the Arctic climate system would represent useful and necessary contributions to the current literature. Because I ultimately believe that the paper needs to be divided into multiple shorter papers with the above-mentioned improvements, I can not recommend anything other than rejection of the current manuscript.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 32703, 2013.