Reviewer 2

We would like to thank this reviewer for a positive review of our paper and for showing a great deal of understanding not only on the scientific issues but also on the challenge of writing an overview paper like this.

The problem is not to write a technical overview of instruments and the deployment, which can be used as a reference when later using the data; the problem is to write a paper that tells a history which will be enjoyable to read and to publish this in a science journal, where some degree of scientific novelty and discussion is required. This type of paper is also an opportunity to take a step back and take a look at the "why" and the "how" in a perspective that also transcends this one field experiment.

Below we will respond in detail to the reviewers comments; this will be done so that what we perceive as key comments from the review will be set in *gray italic*, followed by our comments and suggestions for changes in revision; the latter will be written **in bold text**. We hope in this way it will be clear what are responses to review comments and what are suggestions for the revisions.

Main comments

The scientific rationale sections are interesting and a useful summary of many of the key issues for Arctic clouds, aerosols, boundary layers and climate. The (retrospective) motivation for ASCOS is clear and compelling.

Thank you for the positive comments

The experimental design sections are exhaustive (and somewhat exhausting to read). To be honest these sections were very much a technical report, with around a dozen tables of instruments, etc., and associated sections describing the measurements made, protocols in place and so on. It is probably useful to have this information in the open literature and to be fair it is mainly in an Appendix here.

Well, it has to be documented somewhere, and like this reviewer remarks, most of the technical information, and most of the tables, are contained in an Appendix. The intention is to have this in the open press, as a one-stop reference for anyone using our data in the future, while keeping it out of the way for those not interested in these details.

The most interesting sections scientifically were section 7, on some highlights of the project and section 8 a discussion and conclusions section. This was a useful summary of the key findings – pointing in the direction of the key primary references, which have been published in the last few years. The Conclusions too are useful, pointing out where key questions have not been answered. In short, this is not a standard paper.

We appreciate the nice words; at the request of another reviewer some of this will be complemented using the same principle; only use published ASCOS results. We hope that this will broaden the results and create a better balance.

It is a mixture of a dry technical document and some authoritative review and synthesis material. I suspect both components will be of great use to the community and I can see the merits of publishing them as one paper.

We agree.

Minor comments

Overall, I have only a few minor spelling and grammatical comments, as detailed below. Hence I recommend publication once these are addressed.

Page 13554, line 14, suggest delete ". We also need" replace with "and" P13556, line

7, rephrase, "particle source of particles" ??? P13572, line 23, "was through that a"

doesn't make sense

P13574, line 17, "the clouds, : : :, vanish" (not vanishes) Line 28, "compare" not compares

Fig 1 I guess the solid blue line is sea ice at exit time, dashed at entry, need to state this. Only dashed is in caption at present.

All these corrections will be included in the revision

Fig 2 reproduced very small in my pdf print out – text unreadable. I assume this will be ok in final formatting. Figs 15-18 were also too small.

We suspect that this is a consequence of the "landscape" format used by ACPD, and that they will be better visible in the final version. These figures in themselves are not small as originals.