

Interactive comment on “Integrative and comprehensive Understanding on Polar Environments (iCUPE): the concept and initial results” by Tuukka Petäjä et al.

Anonymous Referee #2

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The paper of Petäjä et al. summarizes the aims and preliminary results of a project called “iCUPE - integrative and Comprehensive Understanding on Polar Environments”. The main objective of the project is to provide assessment of observational data (ground based, remote, and satellite) with focus on Arctic. There is no doubt that the targeted issue is very relevant and the applied methodologies are adequate. Because of the different aspects of the significance in the research field, the subject of the paper is of great interest not only to the atmospheric and aerosol physics community, but also for a broader audience. Nevertheless, after reading the manuscript I am not convinced that the correct manuscript type of the present paper is Research article. Although there are a lot of novel results and scientific conclusions listed, the detailed

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scientific deduction of single methods, results, discussions, and conclusions are missing. Therefore, in my opinion the manuscript is rather an Overview or a Review article. However, for an Overview article the substantial results are not listed and discussed in the adequate way, and only a few new papers and submissions from the project are cited (the most in Sections 3.7.3; 3.7.2). It is also not clear for the reader what iCUPE exactly is. When has it started? When will it end? For me the manuscript sounds rather as a progress report than a scientific research paper. This is also reflected in the non-uniform presentation of figures and structure of sections. I suggest that the Authors define at the end of the Introduction what they will present in the paper and why those issues are important. In the current stage, topics are just following each other. The only keyword connecting the topics is “Arctic”, I could not recognize any other links among the sub-areas. As I mentioned, the paper is nonuniformly structured and written, there are some sections which are very well written (Section 3.3.) or presented in a very detailed manner (e.g., Section 3.7.2.). The Authors should pay heed that all figures are understood without reading the text, and that they are described adequately in the text. . This is definitely not the case for Figs. 1, 2, and 3. Furthermore, most of the figures are discussed poorly in the text. The most detailed discussion is provided for Fig. 30; including costs – is that really an issue for a scientific paper?

In the following I list some minor comments to be considered when revising the manuscript:

Reference to Figs. 21, and 25 are missing in the paper

Page 7, line 248: What are the ACTRIS and IASOA networks? And how are they connected to Figure 3?

Page 7, discussion about Fig. 5: the gradual reduction mentioned is not obvious. Probably a trend line would help.

Page 8, line 270: Where is the simulation presented? And how? This is not clear here.

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Page 8, line 280: Complex sentence, hard to understand, and to follow. The statements here are not supported by concrete data or figure. Please refer them here.

Line 355/368: Aladina was flying up to which level? 800 or 850 m?

What is the red area in Fig 9.?

Figure 11b: In the figure different metrics are used for fluxes and reservoirs, so I suggest different style/color for the numbers.

Page 13, line 470: the linear approximation was carried out on Fig. 14a, and not on Fig. 14b, when I understand correctly.

Lines 479-484: I just highlight this part as a prominent example making the reader confused. Have you done that already, or do you plan to do that in the future, or you did it but published elsewhere, or is this just for posing the problem?

Page 19, line 731: Fig. 24: Dash-dotted line indicates the CloudSat overpass, not a dashed line which is used for the grid lines. Further, the difference in the observed values is not obvious for a non-expert reader.

Page 19, line: 737: Again, just as a prominent example. Does iCUPE only models/analyses/uses the data collected from 2014 till 2017, or was that the part of the project?

Fig. 27: the details given for the model in the text should also been provided to figure caption.

Page 20, line 805: I think the lowest size limit for the aerosol measurement is 0.01 micron. At least this is what I suppose from Fig. 28.

Page 23: Some part of the data flow should be written somewhere else in a statement at the end of the paper, not in the main part. For example, which platforms are planned to be tested.

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In summary, I recommend the publication of the manuscript in ACP after major revision. I suggest the authors to read the complete manuscript carefully and try to understand the scientific statements of the co-authors. Please feel free to criticize and ask questions. I understand that this is a huge amount of work, but that would definitely improve the quality of the paper and help non-expert readers to understand the presented results of this very important topic.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, <https://doi.org/10.5194/acp-2019-1217>, 2020.

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