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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Evaluation of Simulated Cloud Water in Low Clouds over the Beaufort Sea in Arctic System Reanalysis using ARISE Airborne In Situ Observations" *by* J. Brant Dodson et al.

Anonymous Referee #1

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This paper presents a comparison of cloud water derived from the Arctic System Reanalysis version 2 (ASR) to measurements made in situ over the Beaufort Sea during the ARISE campaign in September, 2014. The manuscript has three main components: (1) a comparison between the cloud water properties of ARISE and ASR which accounts for variations in environmental state, (2) an explanation of the observed differences between the data sets, and similarly (3) an evaluation of the impact limited flight sampling has on the analysis of the ASR cloud water product.

This topic of this paper is highly relevant and fits within the scope of ACP. The scientific reasoning is sound. I appreciate the discussion of how to improve sampling methods

of future airborne field campaigns that aim to study cloud processes. This paper is very well written, and I recommend publication with consideration to a few minor comments.

L39-40 "Through these processes, clouds shape the temperature and sea ice variability and trends in the central Arctic representing a potentially significant climate feedback." This sentence is worded in a confusing manner. Should the second "and" be deleted?

L103 The description of the cloud sampling method would be easier to follow if it is mention that the 2mm wire is used for the calculation of cloud water. This explanation is given in the following paragraph but I don't see the harm in telling the reader this fact on the spot.

L121/L130 Specifically, will ASRv3 have more sophisticated cloud microphysics scheme?

L130 "...with issues such as explored here." Could add the word "those" in front of explored.

L185/L405 Do you know why mixed-phase cloud processes are not occurring in ASR? In explaining the lack of ice, could ice be forming but quickly falling out? That is, I'm unclear about the evidence supporting the notion that mixed-phase cloud processes are not occurring in ASR versus mixed-phase processes just being poorly implemented. Though I admit that this distinction is not terribly important. Also, it's not clear if the use of the term precipitation in the manuscript includes ice and liquid, or only liquid?

L238 Should it be "sizes", and not "sized"? This sentence could be worded in a less confusing manner.

L322 The sentence starting "Implying..." is awkwardly associated with the previous sentence.

L436-437 The first sentence of this paragraph is incomplete.

L555, Fig 1: The left panel needs units or label.

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