

Relevant changes made to the manuscript after minor revisions

1. The title has been changed to better reflect the paper's content
2. The "Summary and conclusion" section has been shortened and streamlined to focus on the actual results of the research
3. Figures 3 and 4 have been color-corrected

## Answer to the Editor, February 1, 2023

Structure of the document:

1. The remarks by the editor are black.
2. Our answer is red

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Dear Dr. Lelli,

Considerable effort was made on your part to address the excellent, detailed reviews of the manuscript. Nonetheless, I continue to have deep misgivings about what I see as a lack of concision in this article that will make results that appear to be highly valuable lacking in accessibility. Rather than send it out for further review, I am willing to accept the article subject to minor revisions for its considerable merits as an analysis of the radiation budget of the Arctic region, with the highly interesting result about thermodynamic phase transitions you emphasize. However, I think two things should be adjusted. First, the title does not make sense as written. I suggest instead "Satellite remote sensing of regional and seasonal Arctic cooling showing a multi-decadal trend towards brighter and more liquid clouds". Second I recommend a shortened conclusions section that better emphasizes the key methods and results rather than discussion. You might also wish to shorten Section 4 by reducing speculation as the paper is already very long. A model for how the paper can be written well is the opening of Section 4 which is emphatic and to-the-point in a manner that accurately reflects the prior analyses.

For future reference, the response to reviewers document should explicitly specify verbatim the changes made in manuscript.

Thank you for taking these suggestions into account.

Regards,

Tim Garrett.

We are pleased with the positive evaluation of our revised work by the editor. We acknowledge the effort and time spent by the two referees in scrutinizing our work, which is not taken for granted.

Personally, as lead author, I deeply enjoyed the scientific debate that ensued. I firmly believe that the quality of the work done by all parties involved in this review was key to the delivery of a scientifically interesting and sound article.

Specifically to the corrections suggested by the editor, we changed the title and rewrote the conclusions in the spirit of highlighting only our findings and removed the more speculative sections of the section.

As for the length of Section 4, we are not comfortable changing it at this point. First, it is our intention, with our results, to address several communities (i.e., the modeling and the observational one) active in Arctic science at once. For this reason, we have grouped the knowledge gathered during the making of the manuscript into thematic subsections so that different scientists can directly access the information relevant to their work.

Second, considering that the presentation and suitability analysis of the used data sets occupies nearly 7 pages by itself, the results presentation and discussion part seem to us to be reduced to the necessary

minimum. Changing its structure now would endanger the logical train of reasoning.

Please note that we have inserted a paragraph on the surface-cloud radiative interaction with the citation of Stapf et al. (2020) at the end of Section 4.4 (lines 629–633) as it was commented on by both referees in the last review round.

Best regards,  
Luca Lelli