Thank you to the Reviewer for providing constructive and thoughtful feedback, which have helped us to improve the manuscript. Our point-by-point responses are provided below in blue text following the Reviewer's comments, reproduced in black.

Review 1 Comments (RC1)

This manuscript describes and analyzes results from the De-Icing Comparison Experiment (D-ICE), which aims to provide information to mitigate the long-lasting issue of radiation measurements in polar regions, ice on sensor domes. By comparing 20 pyranometers and 5 pyrgeometers side-by-side during one cold season of the Arctic, the authors present biases in shortwave and longwave radiation measurements caused by icing under different environmental conditions and find that ventilation alone is an effective way to mitigate the issue. They further explain the physical processes of how ventilation reduces icing and provide "the best estimates" (icing free) of radiation measurements for developing quality control procedures to improve retrospective data. The experiment design is appropriate; the findings are novel and practical; the flow and languages are clear. I recommend publishing on AMT with minor revisions.

Line 102: semi-colon → colon?
We replaced the semi-colon with a comma and split the statement into two sentences.

Line 104: it is not clear if "The operational stations" refer to D-ICE stations or ARM stations or all stations used in this study.
We refer to the radiometric stations at NOAA-GML (BSRN), ARM-NSA, and ARM-OLI, which are similarly configured. We have clarified this in the text.

Line 193: Did you guys try any machine learning methods to help detect icing situations?
We considered machine learning and prior to carrying out the manual classifications we discussed the possibility with a machine learning expert at a DoE Atmospheric Systems Research (ASR) conference. In the end we decided not to attempt to implement it out of concern for a large number of potential false positives and negatives due to irregularity in the shape and texture of ice in the images. Additionally, the size of the training set would have likely been similar in size to the base data set of images.

Line 226: repeating section numbering
Thank you for identifying this error. We have corrected it.

Line 291: why the latter data set is "verifiably ice-free"?
These were the data that were monitored directly using the cameras and were visually verified as ice-free as described in Section 2.3.1. We have clarified the text.

Line 297: it is not clear whether this "1σ" is over time or over different instruments
It is the latter. We have clarified this in the text.

Line 309: "When this occurs" meaning > 1 cm or <= 1 cm?
It is the latter. We have clarified this in the text.

Line 319 and 320: panel a → Panel a; panel b → Panel b
Based on AMT's author guide, we think the change actually needs to be panel a -> panel (a); panel b -> panel (b). We have made this change, as well as similar changes elsewhere in the text.

Line 320: it shows 14-15 April in Fig. 4. Which is it?
Thank you for catching this error. It is 14-15. We have corrected the text.

Line 378: it would be nice to have a mini-summary of shortwave biases here, something similar to Line 344-345 in the longwave section
We have added the following sentence at the end of the section: "These cases demonstrate that errors from ice in SWD can be large and that the sign of the bias is dependent on the amount of coverage of ice on the pyranometer dome, as well as the presence, and likely also the angle, of irradiance from the direct beam."

S1: Since some of the sensors are heated, will this extra heat affect the longwave measurements of surrounding sensors?
We concede that we cannot rule out this possibility. However, as described in section 2.1, the orientation and layout of the instruments was designed so that each instrument was exposed to the predominant winds. We expanded this discussion including specific reference to the wind direction, citing an earlier study we conducted that reported on those winds.

S1: Does icing ever occur on the camera lenses? How often? How much could it affect your results?
It can, but rarely. We designed the camera installation to minimize this problem and were successful. In section 2.1 we state that "All systems on the D-ICE table were monitored using three 720p low-light (0.1 lux) cameras in heated enclosures. … They were installed facing west (away from the predominant wind direction). … The cameras were functional and unobscured by ice for 97.6% of the campaign." Indeed, only a portion of the small amount of downtime is attributable to ice, while the rest was due to a power outage.

S1: the color of model details (shortwave as blue and longwave as red). The number 17 is red but the 17th model name is blue.
Thank you for point this out. There were actually two other similar color-coding errors. We made the corrections.

S2: To confirm, is there any human interference other than in Jan 2018?
We reviewed our notes and found several additional instances of minor modifications, which we have added to S2:
October 13: added putty to radiometer 6 and 8
October 26: removed intake screens from 2-5, 15-17, 12-14
February 8: repaired fan at #14 20:54Z
March 20: instrument levels checked and corrected
We have also explicitly noted (in text) the relevant dates when ice was cleaned from radiometers that was discussed generally in Section 2.1.