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 each the Reviewer's comments, reproduced in black.

Review 2 Comments (RC2)

General comments:

The manuscript presents results from "The De-Icing Comparison Experiment" (D-ICE) which was conducted from August 2017 to July 2018 at the NOAA Atmospheric Baseline Observatory in Utqiaġvik, Alaska (71.3°N). In addition, data from the DoE ARM NSA (also Utqiaġvik) and Oliktok Point (250 km east of Utqiaġvik) sites were used. Main objective was to study existing ventilation and heating technologies developed to mitigate radiometer icing. D-ICE comprised 20 pyranometers and 5 pyrgeometers operating in ventilator housings from various vendors alongside operational systems such as BSRN and ARM. Ventilator/heater performance was high with an average ice mitigation at 77% and many being 90 % effective or even better. In addition, a record of ice- free radiative fluxes was compiled. This data set was used to quantify short- and long-term biases in iced sensors. While biases in instantaneous 1-minute records can be up to +60 and -211 to +188 Wm-2 for long-wave and shortwave fluxes, respectively, the corresponding biases in the monthly means were substantially smaller at less than approximately 2 Wm-2 except for some few systems with insufficient ice mitigation. Finally, observed ice mitigation processes were verified in the laboratory: ventilators without heaters were postulated to be effective by providing heat through waste energy from the fan and adiabatic heating.

The Earth's radiation fluxes play a fundamental role in the climate system, thus accurate ground based observations of shortwave and longwave radiative fluxes are essential for long term monitoring and validation of corresponding satellite products and climate model outputs. Therefore, such experiments are of great importance. D-ICE is an impressive and comprehensive experiment, conducted and documented very carefully. It is unique with respect to its extent providing very useful and novel results.

The manuscript is very well structured and clearly written. The literature has been selected and cited carefully. Graphics and tables are clear and the captions self-explanatory. This work is a very interesting and a valuable contribution to the atmospheric science community and is in my opinion absolutely suited for publication in AMT. I recommend publishing with minor revisions and/or technical corrections.

Specific comments:

The heater in the 480 unit from Eigenbrodt is operated at 25 W. I expect a substantial warming of the radiometer's body as shown in Fig.1a (on the next page). While the long-wave irradiance is interestingly not necessarily affected (Fig. 1b), the overheating reduces the stability of the pyranometer measurements considerably (see Fig.2). Thus, a high power heating system may boosts ice mitigation but it can affect the observations negatively. Did you also observe higher case temperatures of systems operated at 15 W or higher with respect to heaters running at 10 W?

Your question is important and we recognize this issue. It was in fact one of our motivations, though we approached the problem differently beginning with the hypothesis put forward by the BSRN working group that "aspiration of ambient air without additional heat is sufficient to mitigate ice". Because the experimental design was built around explaining how this could be achieved, the D-ICE data have limited potential for studying the negative effects of heating. The campaign did not feature enough configurations of heaters using the same models of ventilator and radiometer, and most systems housed pyranometers, many of which do not have case thermistors. As it were, the nighttime offsets (and so the signal we would be looking for) observed during D-ICE were small, in part due to the models of pyranometers, as well as environmental conditions (like frequent cloud cover) and happenstance. We concluded that "…while heating elements were found to be effective, they are not required for successful ice mitigation" alongside details explaining this observation.

Some technical corrections:

- Line 310: add 'with respect to windowless long-wave radiometers'

  We have added this phrase to the text.

- Line 320: SWD on 13-14 April (but the x-axis of the figure is labelled as 14-15 April)

  Thank you for pointing this out. The figure is correct. We have changed the text.

- Line 383: aggregate means◊mean of all sensors? BE product?

  Yes, it is the composite mean of the mean errors from the individual sensors. The calculation is relative to the BE product. We have added clarity to the text.

- Line 459: Another reasonable explanation would be a different fan speed. However, fan speed was apparently monitored at D-ICE as pointed out later in line 542. You may place this statement already here.

  The statements at line 542 are specific to the Eppley VEN experiments, but we agree that they apply also here. Based on your suggestion, we reviewed the fan speed data from the ventilators discussed at line 459 and we found that the fan speeds agreed with one another within about 1% for the duration of the experiment, though interestingly they were about 7% lower than the same fans in KZ ventilators housing pyrgeometers for most of the winter into the spring. Your suggestion was a good one but does not appear to be the explanation so we have not made changes to the text. Notably, the conclusions from section 4.2 (Fig 9c) indicate that small differences in fan speed – assuming these differences are expressions of variability in fan efficiency – actually do not necessarily cause much net difference in dome heating, but rather exchange the source of the heating between adiabatic heating and waste heat.

- Line 898 (Caption of Fig. 6): Panel a, c represent LWD (not SWD) and panel b, d SWD (not LWD). Even though the dots in panels c, d may be inferred intuitively from the respective panels a, b, a legend in panels c, d might be helpful to identify the sensors with higher biases highlighted in panels a, b.

  Thank you for identifying this error, which we have corrected. After consideration of your suggestion for additional labeling, we have decided that we prefer it as is because we cannot think of a way to do this without making the graphic very busy and, as you say, it would not add any new information to the figure.