The De-Icing Comparison Experiment (D-ICE): A Study of Broadband Radiometric Measurements Under Icing Conditions in the Arctic

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The De-Icing Comparison Experiment (D-ICE) was a campaign carried out at the NOAA Barrow Atmospheric Baseline Observatory in Utqiagvik, Alaska, from August 2017 to July 2018. The purpose of D-ICE was to evaluate ventilation and heating technologies developed to mitigate radiometer icing. D-ICE consisted of 20 pyranometers and 5 pyrgeometers operating in various ventilator housings alongside operational stations run by NOAA and the Department of Energy - Atmospheric Raditation Measurement (DOE-ARM) North Slope of Alaska (NSA) and Oliktok Point (AMF3) observatories. All radiometers were monitored continuously using cameras, and a total of more than one million images of sensor domes were archived. The data are used to calculate both the effectiveness of the ventilators in mitigating ice formation and biases associated with icing that does occur. Results are used to formulate recommendations for the operational and end-user communities.



Figure 1. Effectiveness of tested systems in mitigating ice formation derived from qualitative analysis of images collected during the campaign. Effectiveness is relative to the icing conditions that occurred in the vicinity of the systems such that a value of 0 indicates that the radiometer was iced equally as often as the surrounding environment and negative values are the percent reduction in icing observed on the radiometer dome; -100% indicates mitigation of all icing. Values > 0 indicate that a radiometer was observed to be iced more frequently than the surrounding environment.