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EVALUATION OF NASA OPERATION ICEBRIDGE SNOW RADAR MEASUREMENTS OVER SEA ICE IN THE CANADIAN ARCTIC

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ABSTRACT:

Efforts to retrieve snow depth on sea ice using the Operation IceBridge (OIB) snow radar have described uncertainties related vertical heterogeneity of snow, ice deformation, and radar side lobes (e.g. Farrell et al., 2012, Kurtz et al., 2013, Kwok and Maksym, 2014). To evaluate the perceived uncertainties in the Canadian Arctic archipelago an OIB mission was flown near Eureka, Nunavut (79°59'20"N, 85°56'27"W) as part of the 2014 Arctic campaign. A series of 12 parallel flight lines covered a narrow swath of first year sea ice, approximately 50 km in length. Immediately following the OIB mission, an intensive 10-day field campaign was completed to characterize snow and ice properties within the footprint of the OIB snow radar at multiple scales. Measurements were divided between two observation areas: (1) a primary sampling transect along the length of the flights to characterize horizontal variability in bulk snow properties and (2) a set of intensive grids (250 m x 250 m) to evaluate variations in horizontal and vertical snow properties sub-grid to OIB products. As part of each experiment, standard sampling methods were used to collect geo-located snow depth and snow pit measurements (stratigraphy, density, grain size, and salinity). More than 30,000 geo-located snow depth measurements were collected along the primary transect with 94% located within the snow radar footprint. The substantial volume of field measurements coincident with the OIB flights provides an excellent opportunity to evaluate and advance the retrieval of snow depth over sea ice. In this study we present correlative analysis with empathises on previously identified uncertainties to relate the available radar products to geophysical processes at multiple scales within Eureka Sound.

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