# Ka-band Radar Polarimetric and Doppler Spectrum Measurements for Snowbands Along the U.S. Northeast Coast

*Mariko Oue[1], Pavlos Kollias[1,2], Brian A. Colle[1], Alexander Ryzhkov[3], James Mead[4]

1. Stony Brook University, Stony Brook, NY, USA, 2. Brookhaven National Laboratory, Upton, NY, USA, 3. Cooperative Institute for Mesoscale Meteorological Studies, University of Oklahoma and National Severe Storms Laboratory, Norman, OK, USA, 4. ProSensing, Amherst, MA, USA

Snowbands are a major cause of heavy snowfall in the Northeast Coast in winter seasons. However, microphysical processes producing snowbands are not well understood, resulting in large uncertainty in forecasting winter snow storms. Microphysical and mesoscale characteristics associated with snowbands passing through the U.S. Northeast Coast observed in cold seasons in 2017-2019 were analyzed using Ka-band scanning polarimetric radar, multi-wavelength profiling radar, lidar, microwave radiometer, disdrometer, and snow camera measurements at Stony Brook University (~100 km east of New York City on north shore of Long Island) together with a NEXRAD S-band polarimetric radar at Upton, NY. Four cases out of 12 snow storm events observed during the period were associated with single or multiple snowbands. The goal of this analysis is to better understand spatial variability and evolution of the microphysical characteristics of snowbands comprising these winter storms.

Snowstorm bands often included large amount of supercooled liquid water with liquid water path exceeding 200 g $m^{-2}$, while unrimed/rimed aggregate and/or graupel particles were observed at the ground. The radar Doppler spectrum measurements identified turbulent layers with strong updrafts, suggesting that riming process dominated. Riming signatures were observed in the turbulent layers which produced generating cells, where Ka-band specific differential phase ($K_{DP}$) increased (> 3 $^{\circ}km^{-1}$) and differential reflectivity ($Z_{DR}$) had moderate values (~1.5 dB). A signature of secondary ice production was also found in the linear depolarization ratio Doppler spectra collocated with the riming signatures. Those riming signatures tended to be found in association with northerly to northeaster wind at the lower level and easterly to southerly winds at the upper level. Aggregation signatures were identified as increased $K_{DP}$ and decreased $Z_{DR}$ from a height with a temperature around -15°C toward the ground, consistent with findings in the previous literature. Large values of dual-wavelength ratio of S-band radar reflectivity to the Ka-band radar reflectivity were observed in several snowbands, suggesting that the large snow aggregates dominated, consistent with less rimed, large aggregates observed by the snow camera. These aggregation signatures tended to be observed with westerly to northerly winds. We will present spatial variations and evolutions of microphysical characteristics associated with dynamical fields in the snow storms accompanying the snowbands.

Keywords: ice microphysics, polarimetric radar, Doppler spectra, snow storm