



INTRODUCTION

MOTIVATIONS • Short-wavelength radars (W-, Ka, and X-bands) are valuable instruments for investigations of ice hydrometeors.

In Recent years, several studies pointed out differences in reflectivities among multiple frequency radars (e.g., Kneifel et al., 2011; Leininen et al., 2012; Botta et al., 2013). These studies focused on the dual frequency ratio (DFR) for pure ice clouds.

• Mixed-phase clouds are commonly observed in the Arctic.

Mixed-phase clouds, which are composed of supercooled liquid drops and ice crystals, persist in the boundary layer from a few days to a couple of weeks. For understanding microphysics in the Arctic, clarification of characteristics of short-wavelength radar parameters in the mixed-phase clouds and pure ice clouds is an important subject.

 Ka-, W-, and X-band polarimetric radars have been installed in Barrow, Alaska. These radars were installed by the Department of Energy (DOE) Atmospheric Radiation Measurements (ARM) program in recent years. However, characteristics of radar reflectivity

PURPOSE

ZDR) in the Arctic are unclear.

The purpose of this study is to show inter comparison of reflectivities from the W-, Ka, and X-band polarimetric radars in the Arctic clouds, which are mixed-phase clouds (highliquid clouds) and ice clouds with low liquid water (low-liquid clouds).

DATA				
• W-band Scanning ARM Cloud Radar (W-SACR,•)				<u>3ARROW</u> 157.0° -156.5° X-SAPR(X)
• Ka-band Scanning ARM Cloud Radar (Ka-SACR,•)				1.5° KAZ
• X-band Scanning ARM Precipitation Radar (X-SAPR,×) b 10 …Zh, ZDR				
• Ka ARM Zenith Radar (KAZR,•) …Zh				
Note: The Zhs from scanning radars have unknown offsets. This study presents inter comparisons by use of the KAZR Zh as a reference				
 High Spectral Resolution Lidar (HSRL,•) Backscattering cross section, Linear depolarization ratio 				
	W-SACR	Ka-SACR	X-SAPR	KAZR
Frequency	93.93 GHz	35.29 GHz	9.67 GHz	34.89 GHz
Polarization	H transmit a simultaneou	and Is H&V receive	Simultaneous H&V transmit and receive	H transmit and simultaneous H8
Beam width	0.33°	0.33°	1.0°	0.3°
Pulse repetition frequency	4950 Hz	4960 Hz	1950 Hz	2771.31 Hz
Pulse width	333 µs	1333 µs	0.5 µs	4.0 µs (long pul
Range spacing	25 m	25 m	75 m	30 m
Number of integration pulses	3	3	32 (~2012/12/05) 80 (2012/12/06 ~2013/05/01)	20
Observation range	25 km	25 km	50 km	17.5 km





X-, KA-, AND W-BAND RADAR OBSERVATIONS OF PRECIPITATING CLOUDS IN THE ARCTIC

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