The purpose of this study is to show inter-comparison of reflectivities from the W-, Ka-, and X-band precipitation radar (X-SAPR, Ka-SACR, W-SACR) in the Arctic. The Ka-band Scanning Cloud Radar (Ka-SACR) was installed in Barrow, Alaska. Several studies focused on the dual frequency ratio (DFR) for pure ice clouds. The large DFR of KAZR/W-SACR are shown in large ZDR regions and some significant decreases of the power are shown below a height of 1.5 km, where liquid clouds were present. The backscatter correlation and depolarization suggest the presence of liquid droplets in the clouds. The large DFR of Ka/W-SACR results from resonance effects. The low liquid direct signal is significantly not only resonance and Mie scattering effects with ice particles.

**INTRODUCTION**

- **W-band Scanning ARM Cloud Radar (W-SACR, •)** 
- **Ka-band Scanning ARM Cloud Radar (Ka-SACR, •)** 
- **X-band Scanning ARM Precipitation Radar (X-SAPR, •)** 
- **Ka ARM Znith Radar (KAZR, •)**

**DATA**

- **Backscattering cross section, Linear depolarization ratio**

**COMPARISON WITH KAZR**

- The Ka-SACR Zh: Calculated from the observation. Zh = 20 dBZ. The radar cross section is about 1 dB higher than that of the W-SACR. The regions of large Zrhc in liquid clouds are shown in the large Zh regions.

**HIGH-LIQUID (MIXED-PHASE) CLOUDS**

- The normalized DFRs indicate large values below the height of 1 m. The normalized DFRs calculated from DFR of Ka-SACR/W-SACR, divided by the mean power ratio (ZKa/ZW) in the same range. The regions of large DFR correspond to the heights of liquid clouds.

**LOW-LIQUID CLOUDS**

- The low liquid direct signal is significantly not only resonance and Mie scattering effects with ice particles. The DFR of KAZR/W-SACR would result from resonance effects. The ZDR values indicate approximately 1 dB at lower elevation angles and decrease with increasing elevation angle.

**SUMMARY**

- The large DFR of Ka/W-SACR would be derived from attenuation by liquid water significantly not only resonance and Mie scattering effects with ice particles.
- The DFR of KAZR/W-SACR would result from resonance and Mie scattering effects with large ice particles.
- The DFR of X-SAPR would show weak values due to resonance effects.