Introduction
Mixed-phase clouds remain a difficult problem for both the observational and modeling communities. In particular, improved understanding of mixed-phase clouds in the Arctic is crucial because of radiative effects they impart on a region that is particularly sensitive to change. In order to better understand these cloud structures, the University of Wisconsin Arctic High Spectral Resolution Lidar (AHSL) has been deployed to two different Arctic locations. The first deployment lasted two months and was in Barrow, AK as part of the Mixed-Phase Arctic Clouds Experiment (MiPACE). The second deployment is ongoing, and so far over two years of data have been collected at Eureka, Canada. In both locations, the lidar was co-located with a NOAA Millimeter Cloud Radar (MMCR). Mixed-phase stratus has been readily detected at both locations, and we currently have measurements for hundreds of hours of stratus cases. Results shown here are for both locations for single-layer clouds only. Represented are 532 half-hour cases for Barrow, and 1569 for Eureka.

Observation Sites
The shiphousing at Eureka (left) and Eureka (right). The map of the western Arctic (top) shows the differences in location between Barrow and Eureka. (Bathymetric chart produced by and courtesy of the NOAA/NGDC program: http://www.ngdc.noaa.gov/mgg/bathmetry/arctic/arctic.html) Also visible in the Eureka picture is the antenna for the NOAA millimeter cloud radar (MMCR).

Long-Term Lidar and Radar Observations of Arctic Stratus at Two Locations
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Mixed-Phase Arctic Stratus
09 October, 2004: Barrow
15 February, 2006: Eureka

Lidar/Radar Microphysical Retrievals
Based on method by Donovan and Van Lennepen (2001)
15 February, 2006: Eureka

Long-Term Stratus Properties

Cloud Mask
Cloud Mask (Barrow, 2005)

Radar IWC (Shupe, 2005)

Effective Diameter
Number Density
Water Content

In-cloud Number Density

In-cloud Effective Diameter

In-cloud Ice Water Content

Sub-cloud Water Content

Sub-cloud Ice Water Content

Precipitation

Surface Temperature

Surface Wind Direction

Cloud Base Altitude

Effective Diameter

Optical Depth

Cloud Base Temperature

Vertical Motion

A View From Above

CloudSat Retrievals

Vertical Velocity Measurements May Help in Explaining the Horizontal Variability of the Observed Precipitation Structure. Here, the Doppler spectra are used to look at vertical motion in the cloud layer.

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Barrow
Eureka

North Pole

Figure courtesy of M. Shupe

The CloudSat and CALIOP platforms allow for greater spatial coverage of these clouds. Shown are examples from October 30, 2006. Similarities between the ground and space-based observations are shown at right.

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