A HIGH SPECTRAL RESOLUTION LIDAR DESIGNED FOR LONG-TERM ARCTIC CLOUD AND HAZE OBSERVATIONS.

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Global climate models have shown a strong sensitivity to conditions in the arctic and they indicate that the arctic climate is particularly sensitive to perturbation. Only very limited arctic cloud climatologies are available. Quantitative information on the optical properties of arctic clouds and hazes is needed to verify radiation codes in climate models. In addition, accurate synoptic information on cloud altitudes and cloud phase are needed in verification of forecast models.

The University of Wisconsin High Spectral Resolution Lidar (HSRL) provides vertical profiles of optical depth, backscatter cross section, depolarization and backscatter phase function. All HSRL measurements are absolutely calibrated by reference to molecular scattering which is measured at each point in the lidar profile (Grund and Eloranta 1991, Pirronen and Eloranta 1994). This enables the HSRL to measure backscatter cross section and optical depth without a prior assumptions about the scattering properties of the atmosphere. The depolarization observations allow robust discrimination between ice and water clouds. Rigorous error estimates can be computed for all measurements.

This paper describes a new HSRL designed for long-term observations of arctic clouds and hazes. Unlike the current HSRL which is housed in a 46 ft semi-trailer and requires continuous attention from a highly-trained operator, the new instrument is designed to operate unattended. It will operate as an Internet appliance, with operation and data transfer controlled remotely.

A initial 5-year deployment is planned for the North-slope of Alaska. Data will be made freely available via the Internet. Real-time data analysis programs will load processed image data on web site while numeric data is deposited in a publicly accessible archive. Image data will include altitude-time cross sections of backscatter cross section, and depolarization. These will also be available in numeric form along with vertical profiles of optical depth and particle phase.

References:

Grund, C.J. and E. W. Eloranta, 1991: The University of Wisconsin High Spectral Resolution Lidar, *Optical Engineering*, **30**, 6-12.

Pirronen, P and E. W. Eloranta, 1994: Demonstration of a High Spectral Resolution Lidar based on an iodine absorption filter, *Optics Letters*, **19**, *234-236.*