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AEROSOLS IN THE ARCTIC TROPOSPHERE AT EUREKA, CANADA

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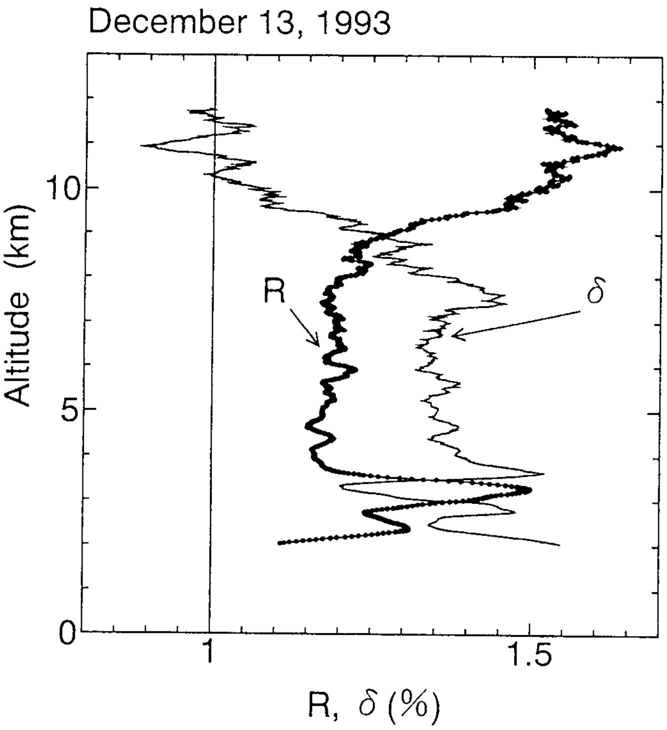
The behaviors of Arctic atmosphere is still not understood well, since the place is not easy to access, and to perform observations by modern techniques. But the atmosphere is not free from the anthropogenic pollution originated in the lower latitudes. Arctic Haze is a typical example of this kind of atmospheric pollution. Polar region is thought to be a place where the stratospheric materials come back into the troposphere. But observations have never directly proved the transport process from stratosphere to troposphere.

In order to monitor the tropospheric aerosol profile, we installed a compact receiver system in Canadian Arctic. Using the same transmitter of PSC lidar at AStrO(Arctic Stratospheric Observatory; Eureka (80°N, 86°W), CANADA), compact receiver system is installed to detect Arctic Haze and/or tropospheric aerosols. The diameter of the telescope is 208 mm. The receiver simultaneously detects the parallel and perpendicular components of backscattering at Nd:YAG-SHG wavelength. The configuration between the laser beam and telescope makes that the beam completely overlaps the field of view of the telescope higher than about 2 km. The analog signal from PMTs is averaged by a digital oscilloscope (LeCroy 9400) for about 1 min., and is stored in a personal computer usually for several hours consecutively in a day. The system was set up at AStrO in January 1993. Observation was made in February through March, 1993, and December,1993 through March 1994. The total observation time is about 200 hours for each winter. The figure is one of the examples of the observed profiles of backscattering and deporalization.

As it would be soon imagined that the echo that indicates the existence of ice crystal was often observed. The estimation of the existence (or amount) of ice crystal will be the most important procedure in interpreting lidar signal from Arctic troposphere.

In the case of the profile shown in the figure scattering ratio (R) shows increase at bottom of the stratosphere (7-10 km) in altitude) by probably the sulfuric acid aerosols because of the decrease of deporalization ratio (δ). On the other hand, where the R takes peak value at 3 km, δ takes minimum value, strongly indicating this layer was not made by ice crystals.



Scattering ratio (R) and deporalization ratio (δ) taken on December 13, 1993 by about 30 minutes average.