28PA5 LIDAR OBSERVATIONS OF ATMOSPHERIC AEROSOLS IN SVARBARD, NORWAY

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An interest of many scientists in the atmospheric aerosols comes not only from their possible impact on the global climate but also from their important role on the chemical processes in the atmosphere. The heterogeneous reactions on the surfaces of particulates, especially the Polar Stratospheric Clouds (PSC), have been recognized to be indispensable in the formation of ozone hole in the antarctic stratosphere. Although such a big ozone hole as in the Antarctic has not yet been observed, the similar process of ozone destruction is going on also in the arctic stratosphere.

We started the lidar observation of the aerosols in the troposphere and stratosphere at NyAlsund, Svarbard (79° N, 12° E) in Norway on January 1994 as a part of arctic aerosol campeign carried by Nagoya University and Fukuoka University. The arctic haze in the lower troposphere, an example of the contamination which appeares intensively in the arctic atmosphere, is also the objective of our observation.

Observations have been made using a Nd:YAG lidar system operated in the second harmonic mode (wavelength, 532nm) with an output energy of about 200 mJ per pulse at a repetition rate of 10 Hz. Backscattering light is collected by a 35 cm Schmidt Cassegrainian telescope and splitted into four channels of light detecting systems each includeing a photomultiplier, an interference filter and some other optics. Two channels are used to measure the atmospheric aerosols and their depolarization rate. The signals are detected in planes paralell and perpendicular to the primary polarization plane of the transmitted laser light. Other two channels are for the measurement of Raman scattering from N_2 and H_2O molecules.

The operation of the lidar system was made from January 22 to March 2,

1994. Quick look results of the observation of stratospheric aerosols are shown in the figures. A broad aaerosol layer the peak scattering ratio of which lies around 1.5 almost always appeared in the height region from 8 to 20 km. Peak values of the scattering ratio which are larger than those observed in Japan in the same period suggest that the arctic stratosphere forms a reservoir of the volcanic aerosols originated from the eruptions of Mt. Pinatubo in June, 1991, at least in this period.

Superposed on the broad layer, very strong and sharp scattering layers appeared at heights below 10 km in early February and around 20 km on Feb. 28. A profile of the scattering ratio simply calculated from the perpendicular component of return signals has also sharp layers with extremely large peak values on Feb. 28. The depolarization rate is more than 10 % about 1 km above the peak of the scattering layer. The large peak valus of the backscattering coefficient and remarkable enhancement of the depolarization rate indicate the appearance of PSC. Particulates in the upper part of the PSC are supposed to be crystallized.

Results of more careful examination of especially the stratospheric aerosol data are discussed comparing with the local meteorological data.

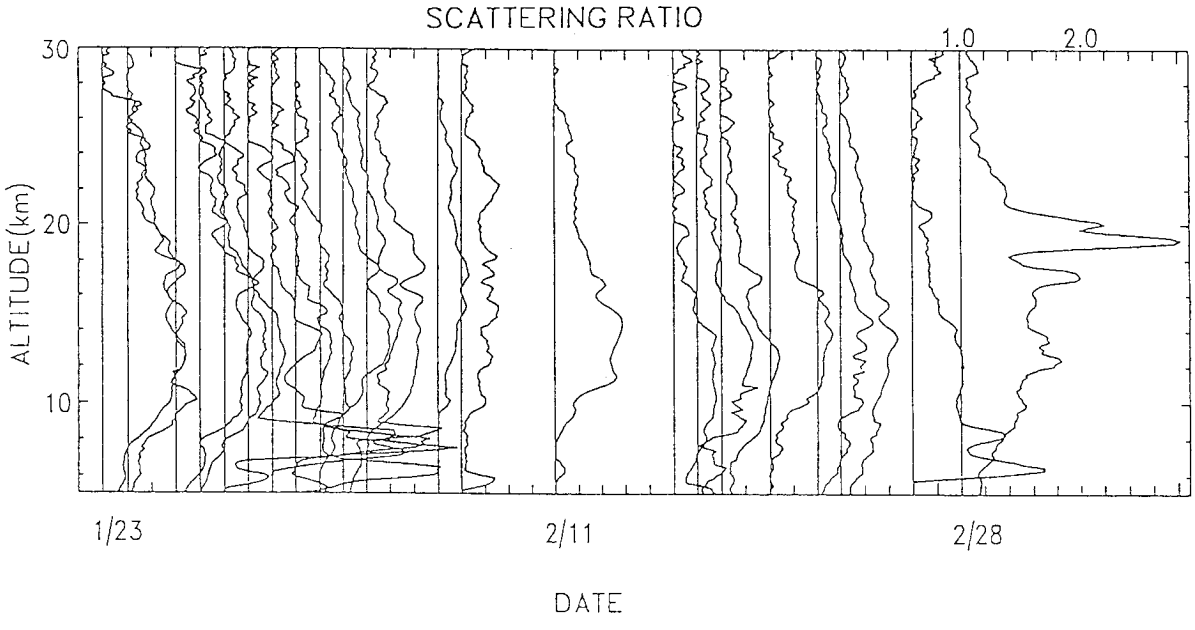

Fig.1 The height profiles of the scattering ratio (paralell component) observed from January 22 to Feb. 28 in Svarbard.

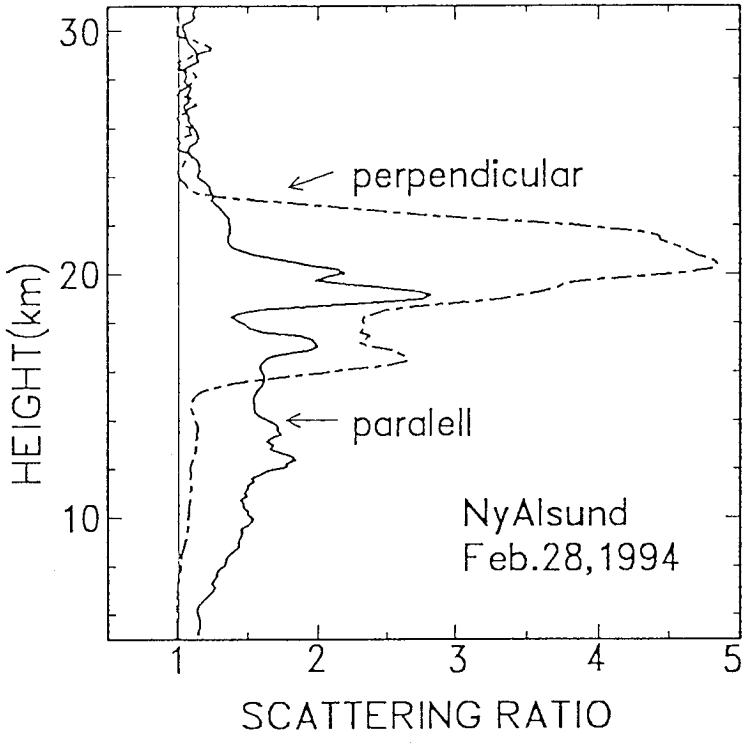

Fig.2 The height profilse of the scattering ratio (both paralell and perpendicular component) observed on Feb.28 in Svarbard.