SIMULTANEOUS OBSERVATION OF MIDDLE-LEVEL CLOUDS BY A MICROWAVE RADIOMETER AND AN 8.6 mm RADAR (ABSTRACT)

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Simultaneous observation of middle-level clouds was carried out from 1700 6 to 0800 7 April 1985 by using a 19.35 GHz microwave radiometer and an 8.6 mm vertical pointing radar. The amount of vertically integrated liquid water (ILW) was deduced from the data of microwave radiometer, and radar-echo intensity was converted into the amount of vertically integrated ice water (IIW). Clouds observed can be divided into two different parts. In part 1, the top of the radar-echo was high and air temperature at the top was about $-30°C$. Clouds were almost glaciated and the ratio of IIW to total water amount (ILW+IIW) was larger than 50%. It can be said that upper-level clouds which provided a considerable amount of ice particles as seeder clouds existed above middle-level clouds and most of super-cooled water in middle-level clouds was glaciated. On the other hand, in part 2 the top of the radar-echo was lower (air temperature at the top was about $-15°C$) and liquid water was more abundant. The ratio of IIW to total water amount was less than 30%. Clouds were only one layer and sufficient ice particles were not produced in the upper part of middle-level clouds. The amount of vertically integrated liquid water was about 10 mg/cm^2 in part 1 and it exceeded 40 mg/cm^2 in some place of part 2.

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CLOUD STUDIES AT SYOWA STATION IN EAST ANTARCTICA BY MEANS OF LASER-RADAR (ABSTRACT)

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Studies of clouds and precipitation in the polar regions are important for not only cloud physics but also climate research of the world. A lot of studies, mainly on summer clouds in the Arctic region have been already carried out. However, observations for cloud physical approach have been few in the Antarctic region. A laser-radar was set at Syowa Station in East Antarctica since 1983 and clouds in the Antarctic region have been observed by means of the laser-radar. The results of observations are described in the present paper. The wavelength of this ruby laser is 0.6943 μm and laser power is 1.0 J/pulse. Seventeen observations of clouds were carried out from May to November in 1983, and the following results have been obtained by analyzing the data. Maximum backscatter coefficient in the clouds was 1.1 km^{-1}, and this value is larger than the value of backscatter coefficient which was obtained by the observations of clear sky precipitation at South Pole Station, but is much smaller than the value of backscatter coefficient which was obtained by the observations of clouds formed in the middle latitudes. According to a relationship between air temperature and mean depolarization ratio in a cloud, the value of mean depolarization ratio of the cloud in which air temperature was warmer than −27°C was 0.25 and that of the cloud in which air temperature was colder than −27°C was 0.45. If the air temperature becomes colder than −27°C, lots of ice crystals will be transformed from supercooled water droplets. According to detailed analysis of inner situation of a cloud, widely ranging values of depolarization ratio can be seen in the cloud. It seems that a region with supercooled water droplets and another region with ice crystals would be formed at the same time because of inhomogeneity of the contents of water vapor or the number density of ice nuclei in the cloud.

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DETECTION OF CLOUDS IN ANTARCTICA FROM INFRARED MULTISPECTRAL DATA OF AVHRR (ABSTRACT)

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A new method to detect clouds without sunlight in Antarctica from infrared multispectral data (channels 3(3.7 μm), 4(11 μm) and 5(12 μm)) of AVHRR on board NOAA-7 is proposed. It is found that clouds can be detected from the difference in the brightness temperature between channel 4 and channels 3 or 5. The brightness temperature difference comes from the difference in the radiative properties of clouds in each channel, which depend on the cloud thickness and microphysical properties. Therefore, classification of clouds is possible from the variation of the temperature difference. Clouds over the snow surface of Antarctica can be detected from the temperature difference of channels 4 and 5. For the cloud detection, the effect of the temperature difference from the difference in the snow surface emittance of channels 4 and 5 is corrected. It is found that the snow surface emittance has the dependence of the snow surface temperature and viewing angle. The effect from the atmospheric transmittance and radiance can be neglected. Ground truth measurements are indispensable to confirm the satellite determination of clouds and to verify the results of radiative properties of the snow surface.

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PRELIMINARY ESTIMATION OF HORIZONTAL DIVERGENCE OF DRIFTING SNOW IN MIZUHO PLATEAU, EAST ANTARCTICA (ABSTRACT)

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Horizontal divergence of drifting snow on Mizuho Plateau, East Antarctica, was estimated from ice sheet topography. Since katabatic winds depend on inclination of the surface slope, horizontal distribution of the katabatic wind speed is obtained from the topography. Horizontal distribution of drifting snow and consequently horizontal divergence of the drifting snow are obtained from this