LIDAR OBSERVATIONS OF THE MESOSPHERIC SODIUM LAYER AT SYOWA STATION, ANTARCTICA (ABSTRACT)

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The mesospheric sodium layer has been measured on 42 nights during the period from April to October 1985 at Syowa Station (69°00′E, 39°35′E), Antarctica, by observation of the resonance scattering of a tuned dye laser beam, which has been made as part of the Middle Atmosphere Program (MAP). There are no pronounced seasonal variations in abundance, the peak height and the width of the sodium layer. No enhancement of aboundance in winter has been observed, which is different from those obtained at mid-latitudes in the northern hemisphere. It is, however, interesting to show the oscillatory variation in abundance with a period of about 40 days. The nocturnal variations of sodium profile show wave-like structure with a vertical wavelength of 10 to 16 km and a period of 4 to 8 h, which suggests the existence of gravity wave. During sodium lidar measurements under auroral activity, it has been observed by chance that the layer is disturbed by auroral break-up associated with the change of cosmic noise absorption (CNA).

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NEUTRAL WIND OBSERVATION IN 1985 BY THE SYOWA STATION METEOR RADAR (ABSTRACT)

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Neutral winds at altitudes of 80–100 km were almost continuously observed in 1985 using a 50 MHz meteor radar located at Syowa Station (69.0°S, 39.6°E), Antarctica. The radar has a nominal peak power of 15 kW and narrow antenna beams (about 4° in the horizontal plane) in two directions (approximately geomagnetic and geographic south) with a crossing angle of 33°. It is possible to deduce a two-dimensional wind pattern from wind data obtained by each antenna beam. During an auroral substorm, the radar often detected auroral echoes, in addition to meteor echoes, due to the electron density irregularities in the *E*-region. By examining carefully

individual echo data stored on digital magnetic tapes, the auroral echoes were removed and only the meteor echoes were collected for the analysis.

Hourly and monthly variations of north-south and east-west winds versus altitude (79–99 km) were calculated. The diurnal and semi-diurnal components are discernible in the hourly variation. The monthly variation is more complicated than that from the CIRA 1972 model at 70°S, though the fundamental characteristics such as westward flow in summer and eastward flow in winter are similar to each other. Also found are the higher wind velocities above 90 km, which may be partly affected by the strong electric fields in the *E*-region during substorms.

In 1985 the lidar observations of the mesospheric sodium layer were also made at Syowa Station. It is found that the temporal fluctuations of the sodium abundance are sometimes correlated with the neutral wind fluctuations. This fact demonstrates clearly that atmospheric gravity waves are one of the important factors modifying the mesospheric sodium layer.

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FORMATION MECHANISMS OF EIGHTEEN-BRANCHED SNOW CRYSTALS (ABSTRACT)

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During the work involving snow crystals of low temperature types at Inuvik (68°22′N, 133° 42′W), Northwest Territories, Canada, eighteen-branched snow crystals were observed under relative warm temperature conditions on January 8 and 11, 1986. The formation mechanisms of these crystals were discussed in terms of rotation twinning on the basis of the concept of coincidence-site lattices which was first introduced into the formation mechanisms of twelve-branched snow crystals by KOBAYASHI and FURUKAWA (J. Cryst. Growth, **28**, 21, 1975). However, the mechanism of rotation twinning could not be always applied to the eighteen-branched snow crystals.

A new idea based on freezing experiments of supercooled water droplets was introduced to the formation (UYEDA and KIKUCHI, J. Meteorol. Soc. Jpn., **56**, 43, 1978). These experimental results showed that when the supercooled water droplets were frozen by means of contact with ice crystals, the supercooled water droplets froze and had several parallel straight cracks surrounding the droplets in a vertical direction to the principal axis of the frozen droplets. Further, numerous tiny air bubbles appeared around the cracks. Therefore, it was considered that when the cracks were formed simultaneously on the surface of droplets, a horizontal rotation around the cracks arose. After which the dendritic branches grew from the droplets in the temperature conditions suitable for dendritic growth. As described above, it was considered that multi-branched snow crystals including twelve- and eighteen-branched snow crystals were formed from the freezing of supercooled cloud droplets.

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