

昭和基地で観測されたOH回転温度の季節変動およびオーロラ発生時の擾乱現象

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OH airglow observation in Syowa Station. -Seasonal and aurora-related rapid variations of OH rotational temperature.

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OH rotational temperatures have been observed at the Syowa Station with a high-sensitivity spectrometer for the spectral region of the OH 8-4 band, Antarctica (69S) located in the middle of the auroral zone.

The total dataset consists of observations over 153 nights during the 2008 austral winter season at Syowa Station as first year observation. The dataset shows both short-term (several minutes) and long-term (seasonal) variations. Typical temperature trends (high in winter and low in summer) in the polar mesopause region are also evident (Figure 1). These trends are very similar to those observed at the Davis Station which is located at nearly the same latitude as the Syowa Station. In addition to the seasonal trend, large-scale heating and cooling is seen over a period of several days. Short-term variations which relate to auroral activity can also be observed. Only six nights of data was found to be suitable, in terms of weather conditions and auroral activity, to study the relationship between auroral precipitations and OH airglow variations. In particular, a significant increase in the rotational temperature and a decrease in the airglow intensity related to auroral activity were identified on the night of March 27-28, 2008, but no such variations were seen on other nights. The horizontal magnetic-field disturbance on the night of March 27-28 was the largest observed during the entire winter, and cosmic radio noise absorption was also very strong. These facts indicate that a large flux of high-energy auroral particles precipitated during this night.

It is suggested that the observed variations in the OH rotational temperature and airglow intensity were caused by a lowering of the average airglow altitude as a result of OH depletion in the upper part of the layer where high-energy auroral particles can reach.

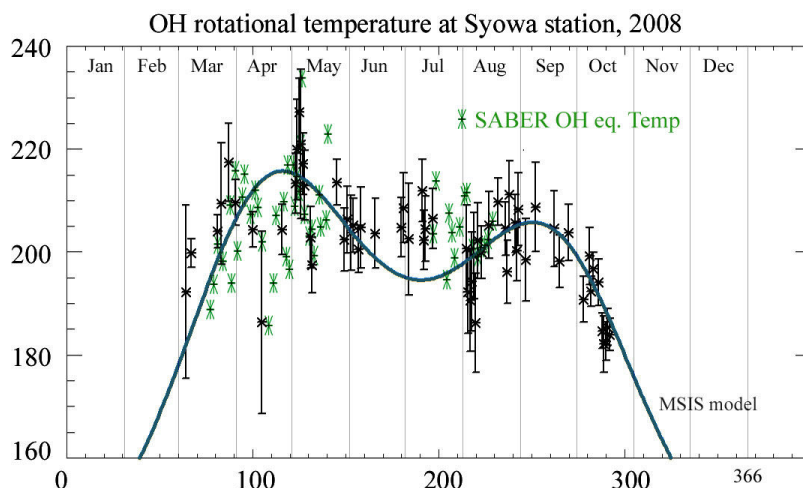


Figure 1. Seasonal variations in the daily mean OH rotational temperature (black asterisks) over Syowa Station in 2008, OH equivalent temperature (green asterisks) derived from SABER data, and MSISE-90 temperature at 70°S (thick solid line). Error bars represent standard deviations of the rotational temperature during a 1-day period.