大気光を用いた金星大気波動観測の初期結果

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Preliminary result of the Venus' atmospheric wave observations by mapping the O2 night airglow

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Venus 1.27-micron O_2 night airglow is the indicator of the general circulation at about 95 km in Venus. Recent observations reported that the airglow emission showed the temporal variations with a period of a few hours and days [e.g. Ohtsuki et al., 2008; Gerard et al., 2008]. The temporal variations are thought to be caused by the upward momentum transport and fluctuations by atmospheric waves. In recent years, the importance of planetary-scale waves on the general circulation of the Venus atmosphere has been recognized. Forbes and Konopliv [2007] suggested the propagation of planetary-scale waves originated in the cloud deck into the upper atmosphere. However, effects of planetary-scale waves on the Venus upper atmosphere has not been investigated yet. Now, GCM simulations considering the planetary-scale waves which are prominent at the cloud top (thermal tides, Kelvin wave and Rossby wave) is performing in order to understand effects of planetary-scale waves on the temporal night airglow variations and the general circulation in the Venus upper atmosphere. Our results show the Kelvin wave is the dominant wave in the planetary-scale waves. The Kelvin wave causes the shift the night airglow emission region between 00:00LT and 00:40LT and the large temporal intensity fluctuation of 0.7 to 1.0 MR (paper by Hoshino is in preparation).

In September 2010, we try to detect the atmospheric waves in the nightside upper atmosphere of Venus by 6-days monitoring the Venus 1.27-micron O_2 airglow and its rotational temperature. The cryogenic echelle spectrograph (CSHELL) of NASA's Infrared Telescope Facility is used for acquiring high-resolution spatially resolved spectra. Its resolution is high enough to show each emission line. The spatial resolution will achieve down to about 300km at the center of the Venus disk and be comparable with the planetary-scale waves (thermal tides, Kelvin wave and Rossby wave). These observations will provide us new information on the dynamics of the upper atmosphere.

In this presentation, we will report primary results of these observations.