Enhancement of the Jovian thermospheric temperature above the Great Red Spot based on the infrared spectroscopic data obtained with IRTF/iSHELL

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It is known that the thermospheric temperature of all giant planets including Jupiter is several hundred kelvins higher than that expected from solar heating. At mid- to low-latitudes, although the direct atmospheric heating caused by precipitating particles and the energy transportation from high-latitude auroral region have been considered, it is not enough to explain. Another candidate for the heating is energy transportation by atmospheric waves from the lower atmosphere. Recently, O'Donoghue *et al.* [2016] revealed the heating in the thermosphere above the Great red spot from the intensity ratio of two emission lines (3.383um/3.454um) of the vibrational-rotational spectrum of thermospheic H_3^+ taken by IRTF /SpeX (R~2500) in December 2012. They estimated that the temperature above the Great red spot is 1644±161K, and that on surrounding mid- to low-latitude region is 900±42K. They considered that the reason was the energy transport from the lower atmosphere in the Great red spot region, that is, the propagation of atmospheric gravity waves and acousitic waves generated in the Great red spot, the tropospheric anticyclonic storm, to the thermosphere. However, the infrared spectrum observed SpeX might be contaminated by CH_4 line due to its low-resolution capability.
In this study, we carried out the thermosphere temperature observation in the Jovian mid-latitude region near the Great red spot by IRTF/iSHELL on January 11, 2017. This observation was performed with the iSHELL's Lp1-mode (3.265-3.657um), and the data reduction was performed with NASA's data reduction tool Spextool ver. 5.0.1. Similar to the past study by O'Donoghue *et al.* [2016], we adopted the intensity ratio of two emission lines of H_3^+ (3.3839um/3.4548um), and estimated the temperature precisely distinguished from CH_4 line by iSHELL’s higher wavelength resolution (R~75000). As a result, we estimated the thermospheric temperature above the Great red spot to be 910±132K, and that in the surrounding region to be 583±30K, showing about 300K increase on Great red spot. The estimated temperature was lower than that in O’Donoghue *et al.* [2016], there is possibility that the thermosphere temperature varies in time. However, we confirmed the temperature above Great red spot is higher than that in the surrounding region. This suggests the existence of energy transport from the lower to the upper atmosphere in the Great red spot. In the presentation, we report the result of carefully reduction.

Keywords: Jupiter, Great red spot, Thermosphere

