2010年Subaru/IRCS観測による木星熱圏のH_2およびH_3^+温度分布

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The H_2 and H_3^+ temperature distributions in the Jovian thermosphere using Subaru/IRCS in 2010

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We tried the reliable measurement of the brightness and temperature distributions of Jovian plasma and neutral upper atmospheres. H_2 (neutral) and H_3^+ (plasma) molecules in this region emits the infrared aurora in 2-4 micron. Through these lines, we can get the information of energy injections (by ionospheric electric field and Joule heating) into and momentum transfers (by collisions) between plasmas and neutrals.

In our observation at IRTF/CHELL in Aug.-Sep. 2009, we performed a snapshot of Jovian H_2 aurora at 2.12 um for two nights. Consequently, we clearly detected the obvious morphological difference between H_2 and H_3^+ auroras. The origin of this morphological deference is still unknown. It potentially suggests the difference of emission altitude or the difference of energy injection to and the energy transfer between the neutral and plasma atmospheres. In this study, we focus on the temperature information to investigate neutral-ion coupling in the Jovian upper atmosphere: How and where does the energy input occur into the neutral and plasma upper atmospheres?

In Oct. 12 2010, simultaneous H_2 and H_3^+ observations near 2.1 um took place using the SUBARU/IRCS. The slit is set along rotational axis at northern/southern pole. In the polar region, H_2 emission lines $S_1(0)$, $S_1(1)$, and $S_1(2)$ at the wavelengths of 2.22, 2.12, 2.03 um and several H_3^+ emission lines are detected. The wide spectral coverage and the high sensitivity of SUBARU/IRCS enable us to the rotational/vibrational temperature measurement from the simultaneous observation of the distribution of emission lines. After the data reduction and analysis, we found the almost same morphologies of H_2 and H_3^+, against the observation in 2009. No clearly relationship between the H_2 emission and thermospheric temperature are detected. It seems that the same morphologies of H_2 and H_3^+ are due to the limb brightening effect, or the effect of the CML changes in the time of observation.

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