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The direct observation of the vertical profile of the Jovian H2 and H3+ IR auroral emissions

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Jupiter has the strongest and largest magneto-sphere in the solar system, energized by its strong magnetic field and fast planetary rotation. It is

driven by the dynamical and electromagnetic coupling between the Magnetosphere, Ionosphere, and Thermosphere.

This MIT coupling system is the key element for the energy transfer from planetary rotation to overall electro-magnetic activities like intense aurora.

The investigation of this strong system is important for comparative understanding of other magnetospheres, i.e., Earth, Sun, stars, high-energy objects, etc.

We have studied this system by numerical simulations (ex. Tao et al., 2009, 2010) and have compared them with infrared aurora (2-4 microns) taken with a ground-based telescope.

These emissions are from the Jovian polar atmos- phere at sub-microbar pressure level (the Pedersen conducting layer), where is the key region for the MIT coupling.

Since the Jovian atmosphere mainly consists of hydrogen molecules, the dominant auroral emission lines are H3+ and H2.

The former represents the plasma component, produced by high-energy electrons injected from the magnetosphere through ion chemistry and excited by thermal collisions in the ionosphere.

The latter is from the neutral component, caused by the thermal excitation.

The evolution of the techniques of infrared observation enabled the detection of the infrared aurora of the outer planets from ground-based telescope.

In our CSHELL observation in Aug.-Sep. 2009, we got the maps of brightness of Jovian H3+ aurora at 4 um and H2 aurora at 2.12 um.

It clearly shows morphological difference in the southern polar region.

In Sep.-Oct. 2010, we have observed Jovian H2 and H3+ lines at 2.1 um in the auroral zone using SUBARU/IRCS.

The wide spectral coverage (1.96 - 2.42 um) and high spectral resolution (R = 20,000) of SUBARU/IRCS, allowed us to derive the spatial distributions of neutral temperature.

But, no obvious difference of H2 and H3+ morphologies was detected, due to the CML which unsuitable for Northern aurora.

Keywords: Jupiter, infrared, aurora, H3+, H2