

Variation of H₃⁺ emission in the Jovian sub-auroral region, and its relation to the Jupiter's IR aurora activity.

Satoyo Yaegashi[1], Akira Morioka[2], Hiroaki Misawa[3], Fuminori Tsuchiya[4], Hiromasa Nozawa[3], Yoshizumi Miyoshi[5]

[1] Planet. Plasma Atmos. Res. Cent., Tohoku Univ., [2] Planet. Plasma and Atmos. Res. Cent., Tohoku Univ., [3] Planet. Plasma and Atmos. Res. Cent., Tohoku Univ., [4] Planet. Plasma Atmos. Res. Cent., Tohoku Univ., [5] Planet. Plasma and Atmos. Res. Cent., Tohoku Univ.

The existence of the H₃⁺ emission region (sub-auroral region) around the Jovian auroral oval has been reported by Yaegashi et al. (2001). We studied the relation between Jovian auroral activity and H₃⁺ emission in the Jovian sub-auroral region. Used data sets are 3.53 micron images obtained with the NSFCAM at the NASA Infrared Telescope Facility. We found that the size of the sub-auroral H₃⁺ emission region is proportional to the auroral activity. This new evidence is very important to study the coupling between the Jovian ionosphere and magnetosphere. We examined three possible mechanisms.

1. Auroral precipitations cause the Joule heating in the polar atmosphere. The neutral wind induced by the Joule heating transports the atmospheric heat to lower latitudes (sub-auroral region). And then, the heat excites the thermal emission of the local H₃⁺ ions.

2. Auroral precipitations produced H₃⁺ ions in the auroral atmosphere as well as the heating of the neutral atmosphere. The produced H₃⁺ ions are transported by the neutral wind toward lower latitudes (sub-auroral region). Thus, the H₃⁺ emission is observed in the sub-auroral region.

3. Auroral precipitations take place not only in the auroral region but also in the sub-auroral region where the precipitations would be mild compared with that of the auroral region. Thus, the weak H₃⁺ emission would be observed.

We suppose that mechanism 1,2 are not possible, considering the characteristics of Jovian Ionospheric wind, which is demonstrated by Achilleos et al. (2001). On the other hand the mechanism 3 may have a possibility when the Galileo observation of the energetic particle distribution is referred.