R009-30
Zoom meeting D ：11/2 AM2 (10:45-12:30)
11:15〜11:30

磁場配置と中性大気密度の効果を検証するための火星ディフューズオーロラモデルの開発

#沖山 太心 [1)], 関 華奈子 [1)]
(1 東大理・地球惑星科学専攻

Development of Martian diffuse aurora model to investigate effects of the magnetic field orientation and neutral density profile

#Taishin Okiyama[1)],Kanako Seki[1)]
(1Dept. Earth & Planetary Sci., Science, Univ. Tokyo

The diffuse aurora at Mars (e.g., Schneider et al. 2015) is thought to be caused by solar energetic particles (SEPs) penetrating into the Martian atmosphere along the interplanetary magnetic field lines draped around the planet. The diffuse aurora emission consists of significant $CO_2{}^+$ ultraviolet doublet emission and its peaking around 60-70 km altitude. Schneider et al. (2018) showed that the time variation of the auroral emission does not always correlate with the variation of the SEP flux. The emission correlate also with SEP protons in some events. The cause of the time variations of the auroral emission is far from understood. The horizontal induced magnetic field is developed when interplanetary magnetic field is draped around the Mars, and the structure of the induced magnetic field will change the flux of the penetrating SEPs. Therefore, one of the possibilities is that the change in the magnetic field orientation around Mars affects the auroral altitude profile. In addition, the density profile of Martian atmosphere will change depending on the local time (Slipski et al. 2018), so another possible candidate is the change in the Martian atmospheric density. The purpose of this study is to investigate effects of the possible candidates on the vertical emission profile of Martian diffuse aurora based on a Monte Carlo simulation.

We have developed a one-dimensional (1-D) model that calculates the vertical emission profile of $CO_2{}^+$ UVD and the CO Cameron bands, which are typical emission lines of the diffuse aurora. Our model is similar to the Monte Carlo model of Bhardwaj et al. (2009), which calculates the energy degradation of electrons below 1000 eV through collisions between CO_2 and electrons. The energy range of our models is expanded up to hundreds of keV with reference to the cross sections for collisional reactions between electrons and neutral atmosphere used in the model of Gerard et al. (2017), which calculates the electron flux to reproduce the emission profile of Martian diffuse aurora. A difference of our model from the previous models is that we trace the trajectories of each electron in the given magnetic field structure including the cyclotron motion of electrons to investigate the effect of the draped magnetic field structure. The results of our model showed that decreasing elevation angle of the magnetic field from the horizontal direction increased the peak altitude of the emission intensity. Difference of the altitude profile of the neutral atmospheric density also affected the peak altitude. The result suggests that the magnetic field orientation in the vicinity of the planet and the neutral atmospheric density altitude profile are the important factors to change the vertical emission profile of the diffuse aurora.