R009-11
B 会場 ：11/24　PM2 （15:30-18:15）
16:00〜16:15

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Effects of magnetic field structure on the Martian diffuse aurora

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Mars does not have intrinsic magnetic field except parts of southern hemisphere, where crustal magnetic fields exist. In such an environment, solar wind magnetic fields drape around Mars and form induced magnetosphere, which is variable due to the variation of solar wind conditions. The nightside structures of the draped magnetic fields during extreme solar events are especially not well understood, despite the importance of these periods for understanding the ion loss from Mars. In some of extreme solar events, global auroras, called diffuse aurora, are observed. The Martian diffuse aurora are global ultraviolet emissions including CO_2^+ ultraviolet doublet (UVD) on the nightside, caused by solar energetic particles (SEPs) consisting of electrons and protons (Schneider et al., 2015; Schneider et al., 2018; Nakamura et al., 2022). The auroral emissions caused by the electrons can vary with nightside magnetic fields around Mars, while those by protons are less affected by the magnetic fields due to the larger Larmor radii than electrons. However, the effect of nightside magnetic fields on the electron-induced Martian diffuse auroras are far from understood. Our previous study indicates that the auroral emission at altitudes of 80-100 km caused by SEP electrons can systematically change with the dip angle of the magnetic fields. Since the diffuse auroral observations can be useful to infer the nightside induced magnetic field structures during extreme solar events, it is important to understand effects of the magnetic fields on diffuse auroral emission profiles.

In order to understand the effects, we investigated the relationship between Martian diffuse auroral emissions, SEP flux, and magnetic fields based on MAVEN observations. Basically, increase of precipitating SEP flux leads to increase of the auroral intensity. Therefore, we investigated the non-correspondence of time variations of auroral intensity to those of SEP proton and electron fluxes in the solar wind or magnetosheath regions, which may include the effects of magnetic fields. As diffuse auroral events, we use December 2014 and September 2017 events in this study. Results show that the time variations of the auroral intensity at low altitudes (50-70 km) corresponded to the time variations of the upstream SEP proton flux as expected. On one hand, the high-altitude (90-110 km) auroral emissions, which are mainly caused by SEP electrons, were sometimes enhanced even during the decreasing periods of upstream SEP electron flux. In order to understand the cause of this non-correspondence, we investigated those time intervals in detail with a focus on the effects of the draped magnetic field structure, crustal magnetic fields, and observational geometry on auroral emissions. Based on the results, possible effects of the magnetic fields on diffuse aurora will be discussed.