Space Science Seminar
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Flux Transfer Events in Mercury's Magnetosphere

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Mercury, the smallest and innermost planet in the Solar System, has a "miniature" magnetosphere under intense supersonic solar wind impact but without a significant neutral atmosphere. The magnetosphere can prevent most of the dayside surface from directly hitting of the streaming solar wind during most times. However, how the lowest solar wind Alfvénic Mach number (MA = VSW/VA) among the planets in the Solar System influences the magnetosphere and exosphere dynamics of Mercury is still unknown. Here we show a comprehensive survey on the magnetic reconnection-generated flux transfer events (FTEs) on the dayside magnetopause. FTEs are flux ropes that are generated by magnetic reconnection between interplanetary magnetic field (IMF) and planetary magnetic field. They are widely observed in the Solar System, which contain strong field line rotation and magnetic field enhancements. FTEs emerge extremely frequently (~ 10 FTEs in one minute) and are an important indicator of space weather at Mercury. They occur under any magnetic shear angle between the two sides of the magnetopause. The magnetosheath plasma β (ratio between thermal pressure and magnetic pressure) plays an important role in the formation of FTEs. Particles moving along open flux tubes inside FTEs could sputter the cusp surface at a precipitation rate of an order of magnitude higher than the average rate and would probably produce many atoms or molecules. In the last, FTE play a key role in driving Mercury’s magnetospheric activities. These results helps the further understanding of the dynamics of moons, for instance, Ganymede, which is located in low Alfvénic Mach number flow, or exoplanets close to their stars.

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