Geophysical Research Abstracts
Vol. 19, EGU2017-3873, 2017
EGU General Assembly 2017


# MMS observations of kinetic-size magnetic holes

Shutao Yao (1,2) and the co-authors Team

(1) Shandong Provincial Key Laboratory of Optical Astronomy and Solar-Terrestrial Environment, Institute of Space Sciences, Shandong University, Weihai, 264209, China, (2) Department of Physics, Umeå University, Umeå, Sweden

Magnetic holes (MHs), a structure with observable magnetic field depression, are widely observed in the space plasma. Spatial scales of these structures ranged from tens to thousands of proton gyroradius with corresponding temporal scales from seconds to tens of minutes. Previous studies associated these large magnetohydrodynamics (MHD) scale holes with mirror instabilities. In this study, we report a series of KSMHs in the terrestrial magnetosheath. The main characteristics are summarized below. 1. These structures have a scale of $\sim$ 10 electron gyroradius and are typically crossed by a spacecraft in 0.3 seconds. 2. The magnetic field strength decreases along the background magnetic field line; the electron number density increases inside the magnetic hole and strong electron temperature anisotropy is found inside the hole. 3. The electron flow vortex is perpendicular to the background magnetic field. 4. The calculated current density is mainly contributed by the electron diamagnetic drift, and the electron vortex flow is the diamagnetic drift flow. 5. For the 90° pitch angle electrons, the flux is steady between 12 eV and 26 eV, decreases between 34 eV to 66 eV, and significantly increases between 109 eV to 1024 eV. 6. Electron magnetohydrodynamics (EMHD) soliton theory can be applicable to the observations.