Geophysical Research Abstracts
Vol. 19, EGU2017-3746, 2017
EGU General Assembly 2017

Hot Flow Anomalies and Their Geoeffects

Hui Zhang
Geophysical Institute, University of Alaska Fairbanks, United States (hzhang14@alaska.edu)

Hot flow anomalies (HFAs) are events observed near planetary bow shocks that are characterized by greatly heated solar wind plasmas and substantial flow deflection. HFAs are universal phenomena that have been observed near the bow shock of Earth, Venus, Mars, and Saturn. We performed a statistical study to determine what kinds of discontinuities are more efficient to generate HFAs. We used strict criteria to identify classic HFAs, excluding similar foreshock phenomena such as SHFAs and foreshock bubbles. Magnetic field on at least one side of the interplanetary discontinuities has to be connected to the bow shock in order to form HFAs. Discontinuities with large shear angles are more efficient to form HFAs. The thickness of current sheets and the thickness of HFAs are strongly correlated and current sheets with thickness from 1000 km to about 3162 km are more efficient to form HFAs. The electric fields on both sides of HFAs tend to point toward the current sheets. In addition, the variations of plasma parameters and the magnetic field of HFAs with E inward on both sides are more dramatic than those with E inward on only one side. HFAs are more likely to form when the reflected flow from the bow shock is along the discontinuity. We further investigated properties of HFA generated ULF waves observed by multiple spacecraft and ground stations. The ULF waves are standing Alfvén waves. The wave power of poloidal mode is stronger than that of toroidal mode. The Pc3 ULF waves were observed at dawn, noon and dusk sectors, indicating the magnetospheric response to the HFA is global.