

Topology of the Martian multiple cusps' structures obtained from MAVEN energetic particles observations

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Abstract

During the passages of the Mars Atmosphere and Volatile Evolution (MAVEN) mission through low altitude crustal field regions its onboard instrument Solar Wind Ion Analyzer (SWIA) had regularly (in most of the passages) detected local enhancements in the ion fluxes of broad energy range (usually between from several eV till several hundreds of eV) and very short in time, sometimes also including relatively high energy ions of several keV. Those local enhancements (“spikes”) either correspond to the local maximum of the magnetic field, or locate in the close neighborhood. Simultaneous local enhancements in the electrons flux measurements by Solar Wind Electron Analyzer (SWEA) also often detected. We use those spikes in order to obtain the structure of the multiple cusps structure.

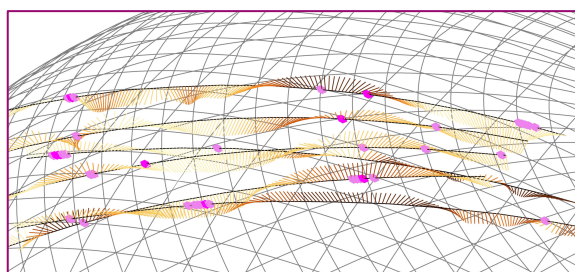


Figure 2: Several consecutive orbits showing the orientation of the magnetic field from MAG and location of strong spikes.

Characteristics of the “spikes”:

- Short in time, broad energy distribution
- Location of spikes correspond to the radial orientation of the magnetic field.
- Often with simultaneous signatures in the electron flux measurements by SWEA.
- Velocity distribution of ions in “spikes” is packed, similar for broad energy ranges and simultaneously moved in the frame of the SWIA field of view
- The intensity of the spikes changes with changing parameters; however, their presence is mostly independent from the local time and solar wind conditions.

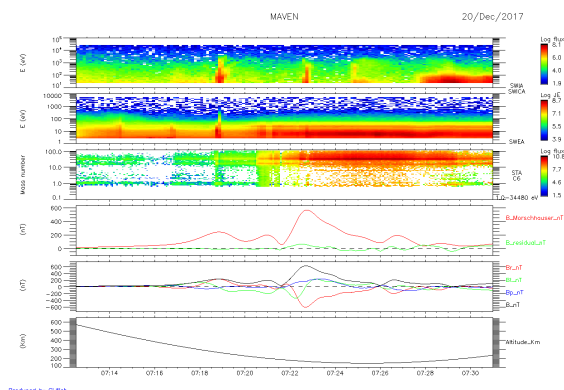


Figure 1: Example of detected “spikes”.