

Solar Wind Interaction with Dust Streams

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Because dust particles in streams are ionized they will be accelerated by the electric field associated with the flowing magnetized solar wind. Evidence of such interactions were first observed in the Pioneer Venus magnetometer records when asteroid 2201 Oljato, possibly an extinct comet, passed inside of the Venus orbit. The signature of this interaction, about 5M km sunward of Pioneer Venus was a cusp-shaped peak in the magnetic field and a strong current sheet with strong perturbations in all three components. Similar structures have been seen by STEREO, Venus Express and Helios. Interesting variants on this signature are also seen on December 15, when the Earth was aligned with the intersection of the comet McNaught orbit and the ecliptic plane. STEREO saw a strong and unusual current sheet deep inside an ICME that seemed not to be intrinsic to the ICME. More frequent are such current sheets in the regular solar wind. They are particularly prevalent at 0.29AU in the Helios data but once their structure is understood one can recognize them even at 1AU. In fact much of the Alfvénic structure of the interplanetary magnetic field may be due to dust stream interactions. These interactions may be very important, both for the evolution of dust streams, and for the heating of the solar wind.