Geophysical Research Abstracts
Vol. 21, EGU2019-5127, 2019
EGU General Assembly 2019

Physics Based Model of Dust Impacts

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A picture of the generation of a signal on an electric antenna on a spacecraft in the solar wind, following a hypervelocity dust impact is now widely accepted. The dust impact causes the emission of a cloud of material, partly or fully ionized, but initially neutral. In the Solar Wind, spacecraft are charged positive due to photoemission, and so the electrons of the cloud are attracted back to the spacecraft, making it go negative. The antennas, being coupled more closely to the surrounding plasma, do not go so negative, making a positive signal on the antennas relative to the spacecraft,
Recently, a part of this picture has received further confirmation. Dust impacts on the antennas themselves leave the antenna strongly negative. In this case the mechanism for charging the antenna is simple and unambiguous, and shows that the antenna itself is left negative. .
In this note, I attempt some further description of the cloud emitted by a dust impact, and on its effect on the potentials of the spacecraft and on the antennas.
Much of the work supporting the picture above was published in an important work by A. Zaslovsky. In this present work, further support for this picture will be found using, mostly, data from the two, nearly identical, STEREO spacecraft. The rising part of the signal was not considered by Zaslavsky, and contains some information verifying the picture. Further, there is information to be found from the relative sizes of the signals on the three STEREO antennas. These will be discussed.