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Statistical study of plasma properties upstream the Earth's bow shock

Jaroslav Urbar, Zdenek Nemecek, Jana Safrankova, Karel Jelinek, and Lubomir Prech
Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic (jaroslav.urbar@gmail.com)

Observations of solar wind parameters at L1 are usually considered as a good measure for investigation of magnetospheric processes. On the other hand, several studies suggest observable changes of the solar wind speed in front of the bow shock.

We use five years of THEMIS-ARTEMIS observations in the solar wind and compare the speed measured by these spacecraft with the Wind solar wind speed registered at L1 and propagated to their locations. We have found that the changes (decrease) of the solar wind speed in front of the bow shock are well correlated with the amplitude of upstream magnetic field fluctuations and/or with a content of accelerated ions. The effect is as large as 6% and it is notable up to 30 RE from the bow shock, i.e. at larger distances than previously reported. The released energy is spent partly on an acceleration of reflected particles and excitation of foreshock waves but a significant heating of the solar wind beam is also observed.