



Two-point observations of solar wind beam deceleration upstream the Earth bow shock

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The ion energy distribution in front of the bow shock is often strongly non-Maxwellian. It can contain a large portion (up to 10 %) of energetic particles streaming in different directions than the original solar wind beam. The solar wind speed is thus computed as weighted averages of the speeds of all populations covered by the measured distribution. The moments computed from this distribution indicate a decrease of the solar wind speed in such cases and, based on these moments, the solar wind deceleration upstream the bow shock was reported. Nevertheless, we have found that there are cases, when the solar wind beam itself is undoubtedly decelerated in the foreshock region. In the present paper, we demonstrate several examples of two-point observations of closely-separated THEMIS spacecraft in front of the bow shock. One spacecraft is located in the solar wind while the other is in the foreshock and observes also reflected and accelerated particles. The speed computed as the moment of the distribution is lower than that in the solar wind but the separation of the solar wind beam reveals its deceleration as well. The paper discusses possible physical processes leading to this deceleration.