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Modification of the solar wind upstream of the Earth's bow shock: THEMIS observations

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Most space weather studies of the solar wind-magnetosphere interaction often rely on L1 observations that are propagated toward the Earth assuming a negligible evolution of upstream parameters along the solar wind path. We present statistical comparisons of multi-point THEMIS observations in the near-Earth solar wind with ACE L1 solar wind data. Our goal is to evaluate the influence of different factors on changes of mean solar wind parameters just upstream of the bow shock. The most pronounced effect is a systematic deceleration of the average solar wind speed with a decreasing distance to the bow shock that is controlled by the level of magnetic field fluctuations and by the flux of reflected and accelerated particles. We can conclude that the reflected particles not only excite the waves of large amplitudes but also modify mean values of quantities measured in an un-perturbed solar wind.