



Modification of solar wind upstream of the Earth's foreshock: Multi-instrumental observations

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ULF waves that are created due to the interaction of the solar wind plasma with ions reflected at the bow shock are observed in the ion foreshock region and the interaction of these waves with the solar wind flow leads to its deceleration. However, according to our study, parameters of the solar wind plasma are modified not only few Earth radii upstream the bow shock. We observe the solar wind deceleration far upstream the bow shock in regions not magnetically connected to it. In such clear solar wind, without a presence of fast magnetosonic waves, i.e. under generally very low magnetic field and plasma fluctuations, the solar wind proton bulk speed deceleration is not dependent on the level of ULF waves. We found that a ratio of the speeds measured at the L1 point and near the Earth is a decreasing function of the interplanetary magnetic field cone angle. The effect is not strong—only a few percent, thus we compare different measurement methods (Faraday cups and electrostatic analyzers) and the spacecraft in various locations with motivation to rule out the instrumental effects.