

Three-dimensional Structure of the Time-dependent Heliosphere Interacting with the Local Interstellar Medium

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In this brief overview, we describe observational and modeling aspects of the solar wind (SW) interaction with the local interstellar medium (LISM) paying particular attention to three-dimensional and time-dependent effects. We demonstrate that time-dependent phenomena may substantially affect the global streamline and magnetic field topology in the inner heliosheath (IHS) - a plasma layer between the heliospheric termination shock and the heliopause. It is shown that Voyager spacecraft observations cannot be easily interpreted without invoking solar cycle, magnetic reconnection, and MHD instability effects. In particular, the solar wind flow backward toward the Sun can be explained by the evolution of magnetic barriers developing in the IHS over the solar cycle. In view of the recent announcement of the Voyager1 penetration into the LISM, we discuss some issues related to numerical modeling of the heliopause instability. The behavior of the heliospheric current sheet in the inner heliosheath is discussed, which is sometimes accompanied by transition to a turbulent flow regime.

We also show the results of our numerical modeling of the SW-LISM interaction using observational boundary conditions.

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