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# Simulating Upstream Solar Wind Conditions at Mercury: Results From two Independent Solar Wind Models

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The knowledge of upstream solar wind conditions at Mercury is essential not only for modeling the Hermian magnetosphere-exosphere-surface system but also for interpreting the pioneering in situ observations made by MESSENGER during the January and October 2008 flybys. For this reason, and due to the fact that the MESSENGER plasma instruments cannot see the solar wind, we intend to provide upstream solar wind conditions at Mercury to the entire MESSENGER community. We do this using a combination of two independent solar wind models. The first is a steady-state 3-D magnetohydrodynamic (MHD) model of the solar corona and inner heliosphere, which simulates the solar wind propagation from the source surface outward to Mercury, using synoptic charts of the photospheric magnetic field as input (synoptic solar wind model). The second model is a time-dependent 1-D MHD model of solar wind propagation that employs actual solar wind data at 1 AU as boundary conditions and propagates the solar wind backward in time to Mercury (reverse propagation model). Although the reverse propagation model is a novel and rather unorthodox way of simulating the solar wind, the method has been sufficiently tested. We compare and validate the two models with each other as well as with actual magnetic field data from the MESSENGER Magnetometer instrument. Our combined method can produce the most accurate results for the solar wind speed and the sector structure of the interplanetary magnetic field. The advantages and shortcomings of both modeling approaches are discussed.