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Interaction of the interplanetary shock and tangential discontinuity in the solar wind

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Collisionless shocks play a significant role in the solar wind interaction with the Earth. Fast forward interplanetary (IP) shocks driven by coronal mass ejections or by interaction of fast and slow solar wind streams can be encountered in the interplanetary space, while the bow shock is a standing fast reverse shock formed by the interaction of the supersonic solar wind with Earth's magnetic field. Both types of shocks are responsible for a transformation of a part of the energy of the directed solar wind motion to plasma heating and to acceleration of reflected particles to high energies. It is well known that the interaction of tangential discontinuities with the bow shock can create hot flow anomalies but interactions between IP shocks and tangential discontinuities in the solar wind are studied to a lesser extent due to lack of observations. A fortunate position of many spacecraft (Wind, ACE, DSCOVR, THEMIS, Spektr-R) on June 22, 2015 allows us detailed observations of an IP shock modification due to this interaction. We present an analysis of the event supported with MHD modeling that reveals basic features of the observed IP shock ramp splitting. However, a good matching of modeling and observations was found for DSCOVR and Spektr-R located above the ecliptic plane, whereas a timing of observations below this plane demonstrates problems of modeling of highly inclined discontinuities.