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Three-dimensional Evolution of Interplanetary Disturbances in the Inner Heliosphere

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In this paper, we review the three-dimensional evolution of the solar wind density and speed distributions in the inner heliosphere. The primary solar wind data used in this study has been obtained from the interplanetary scintillation (IPS) measurements made at the Ooty Radio Telescope, which is capable of measuring scintillation of a large number of radio sources per day and solar wind estimates along different cuts of the heliosphere, allow to image the three-dimensional structure of the ambient solar wind and propagating transients (CMEs or CIRs) in the Sun-Earth distance range. Results indicate that (1) the interaction between the CME (or the CIR) and the background solar wind determines the radial evolution of its speed and size, (2) the magnetic energy associated with the propagating transient (the magnetic cloud in the case of a CME and the high-speed stream for a CIR) is likely to play a crucial role in determining the effectiveness of the compression and propagation characteristics of the disturbance. The results of this study are useful to quantify the drag force imposed on a disturbance by the interaction with the ambient solar wind and it is essential in modeling the propagation of a disturbance. This study also has a great importance in understanding the prediction of CME/CIR-associated space weather at the near-Earth environment.