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Propagation and evolution of nonlinear MHD disturbances in space
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Propagation of nonlinear MHD waves is studied in the magnetosphere and the interplanetary space. As realistic variations of MHD disturbances in space become often nonlinear, it is important to examine time-dependent evolution of these fluctuations. We have examined how the fluctuations are changed by steepening processes and/or shock formation in both analytical and numerical approaches. Our results suggest that the pattern of disturbances tends to significantly change during the travel path between L1 and the Earth's magnetosphere unless the amplitude is extremely low or the disturbance time-scale is relatively long. It is shown how the initial profiles in the solar wind can be different from those observed near the near-Earth space owing to the nonlinear properties. Our theoretical model provides the time-dependent solutions at different locations, which can be useful in interpreting observations at the multiple locations.

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