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Tracing fast forward shocks into the Earth's magnetosphere

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The interplanetary shocks found in the solar wind interact on their way with the Earth's bow shock and cause pressure pulses on the magnetopause and its movement. They also launch different waves into the magnetosphere. In our contribution, we study fast forward interplanetary shocks and we trace them into the Earth's magnetosphere. We selected various fast-forward-type shocks with different parameters from a set of interplanetary shocks covering 1995–2004 years because of their higher occurrence in the solar wind than other solar wind shock-type discontinuities. The shocks were observed simultaneously by several satellites as ACE, Wind, IMP-8, SOHO, Genesis, Interball-1, Geotail and their propagation speeds and other characteristics could be well described. Inside the magnetosphere we used various available data from Geotail, Polar, Cluster, Interball-1 and GOES series satellites.

The aim of this study is a comparison of propagation velocities of fast forward shocks in different parts of the dayside and near-Earth's magnetosphere as well as a probable influence of the foreshock on the interplanetary shock fronts in the magnetosphere. According to our study, the shock speeds are significantly higher in the Earth's magnetosphere than in the solar wind and propagation times substantially vary even in different places of the dayside magnetosphere. This fact documents a significant deformation of the shock front in the magnetosphere. Also, the shock may retain its sharp fronts in the magnetosphere as seen in high-time resolution data, while the front structuring can provide information on its interaction with the magnetosphere. The experimental results will be also compared with available global MHD models.