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Multi-Spacecraft Observations of Interplanetary Shocks

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Interplanetary (IP) shocks provide us with a unique opportunity to extensively investigate properties of collisionless shocks using in situ measurements under a wide range of upstream conditions. Here we report a case study of several IP shock crossings observed by the Wind, Solar and Heliospheric Observatory (SOHO), Advanced Composition Explorer (ACE), and Deep Space Climate Observatory (DSCOVR) spacecraft. By applying a simple timing method to multipoint measurements, we are able to investigate their characteristic spatiotemporal features. We assume that an IP shock can be represented by a moving plane with a constant velocity, when observed at closely separated points in space and time. We compared IP shock parameters obtained with the timing method with those obtained using the magnetic coplanarity, the mixed mode methods, and Rankine-Hugoniot jump relations.