Mach Number Scaling of Foreshock Magnetic Fluctuations at Quasi-Parallel Bow Shocks throughout the Solar System

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Abstract

Upstream of a quasi-parallel bow shock, reflected ions can drive instabilities propagating towards the planet. Using data from MESSENGER, MMS, MAVEN, Juno, and Cassini, we compare the foreshock environment at different planets by quantifying the maximum magnetic fluctuation amplitude for each quasi-parallel foreshock event. Results of this study can help to understand the shock environments at exoplanets and astrophysical objects with very high Mach number shocks.

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