

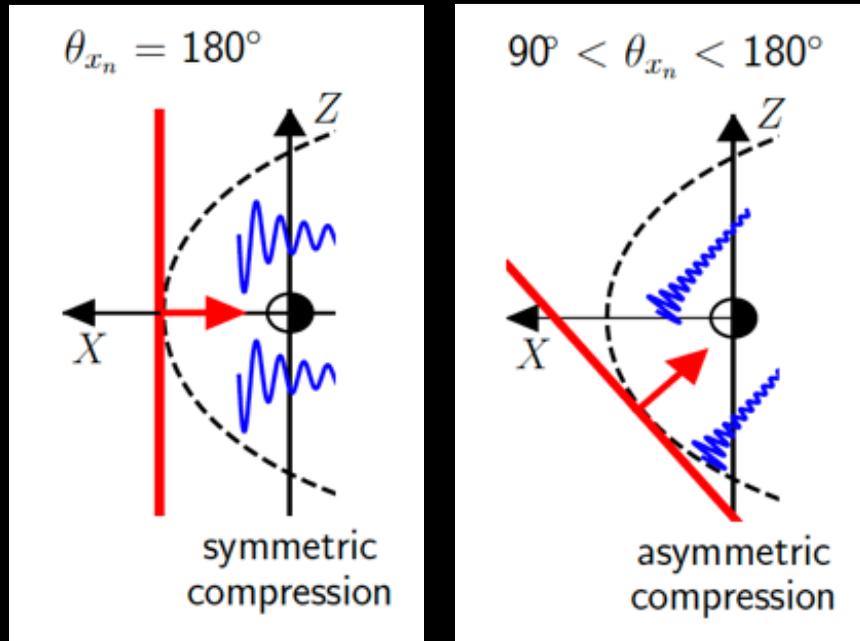


# Solar Shocks at Earth: Angle Matters



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This paper presents, for the first time, a clear observational connection between the angle of the impact from solar wind shocks on Earth's magnetosphere and the ultra-low frequency wave response, as indicated by magnetometers in space and on the ground, including NASA's MMS mission. This comparative study reveals that wave activity is stronger with nearly head-on impact compared to an inclined impact.



(a) Solar disturbances or shocks that are nearly head-on to Earth's magnetosphere have a stronger impact than (b) solar disturbances or shocks that hit Earth's magnetosphere at a side-on angle.

The interaction of solar perturbations with the Earth's magnetic field is of paramount importance in space weather investigations. The subsequent response is almost always characterized by magnetic field disturbances measured in space and on the ground, which in turn can modulate energetic particle populations that damage satellite electronics and cause electric current surges in large-scale power transmission lines. These disturbances are also manifested as geomagnetic pulsations which in part are responsible for the distribution of energy in the near-Earth space environment.

In this work, the researchers connect, for the first time, observational properties of these pulsations or waves with the impact angle of the perturbation. Since they found that nearly head-on impacts are associated with stronger wave response in comparison to inclined impacts, space weather forecasters should take the perturbation impact angle into account when predicting geomagnetic effects caused by solar perturbations. Datasets used in this study were obtained from NASA's Heliophysics System Observatory - HSO.