

Dissipation at collisionless shocks :Mach number dependence

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We have investigated a number of hybrid simulations in order to investigate the dissipation processes at collision less shock waves. In the hybrid simulations, we have included heavy ions as observed in the solar wind, and found that the heavy ions contribute to produce anomalous heating even in the high Mach number shocks (e.g. Alfvén Mach number is about 8 - 10).