

DOUBLE DISCONTINUITIES IN SPACE PLASMA

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Double discontinuities were recently identified in interplanetary space and in the magnetotail when high-resolution plasma and magnetic field data were used to examine the detailed structure in the interior of slow shocks. A double discontinuity is a compound structure composed of a slow shock layer and an adjoining rotational discontinuity layer on the postshock side. Across the slow shock layer, the plasma density and temperature increase, the entropy increases due to shock heating, and the magnetic field intensity decreases. Through the rotational layer the magnetic field rotates by a large angle about the normal direction of the discontinuity surface while the plasma properties and the magnetic field intensity remain nearly unchanged. This compound structure looks like a new kind of MHD discontinuity; it may be called a double discontinuity. In the magnetotail double discontinuities are observed at the boundary surface between the tail lobe and the plasma sheet region. Plasma and magnetic field lines continuously move across the boundary surface from the tail lobe to the plasma sheet and there is a conversion of magnetic field energy into plasma energy. The rotational angle of the postshock magnetic field appears to be determined by the dynamic environment of the MHD flow in the plasma sheet.