A Hybrid Orbit-Finite Difference Treatment of Oblique Shock Acceleration

N. Sanguansak[1], **and D. Ruffolo**[2]
[1]*Physics Department, Chiangmai University, Chiangmai 50202, Thailand*
[2]*Physics Department, Chulalongkorn University, Bangkok 10330, Thailand*

Abstract

We present a hybrid numerical technique for solving a pitch angle transport equation for energetic particles near an oblique shock, without recourse to the approximation of magnetic moment conservation. The transport equation on either side of the shock, which incorporates convection and pitch angle scattering and may also include adiabatic focusing and deceleration, is solved using well-tested finite difference code. Calculations of particle orbits near the shock are incorporated into a transfer matrix that treats the transmission or reflection of particles at the shock. We examine the range of validity of the assumption of gyrotropy outside the immediate vicinity of the shock. This technique provides solutions of the spatial, pitch angle, and momentum distribution of particles near an oblique shock for previously unexplored regions of particle velocity and shock velocity.

This work was partially supported by a Basic Research Grant from the Thailand Research Fund.