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Modeling of Particle Acceleration at Multiple Shocks Via Diffusive Shock Acceleration: Preliminary Results

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We present preliminary results from a model that diffusively accelerates particles at multiple shocks. Our basic approach is related to box models (Protheroe and Stanev, 1998; Moraal and Axford, 1983; Ball and Kirk, 1992; Drury et al., 1999) in which a distribution of particles is diffusively accelerated inside the box while simultaneously experiencing decompression through adiabatic expansion and losses from the convection and diffusion of particles outside the box (Melrose and Pope, 1993; Zank et al., 2000). We adiabatically decompress the accelerated particle distribution between each shock by either the method explored in Melrose and Pope (1993) and Pope and Melrose (1994) or by the approach set forth in Zank et al. (2000) where we solve the transport equation by a method analogous to operator splitting. The second method incorporates the additional loss terms of convection and diffusion and allows for the use of a variable time between shocks. We use a maximum injection energy (E_{max}) appropriate for quasi-parallel and quasi-perpendicular shocks (Zank et al., 2000, 2006; Dosch and Shalchi, 2010) and provide a preliminary application of the diffusive acceleration of particles by multiple shocks with frequencies appropriate for solar maximum (i.e., a non-Markovian process).