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Diffusive shock acceleration and the coupled hydromagnetic wave excitation in the low corona

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Acceleration of GeV protons in magnetically well-connected strong GLEs tends to begin at ˜2 solar radii whereas GLEs associated with shocks that begin above ˜3 solar radii tend to compensate by having higher shock speeds. We present an analytical stationary diffusive shock acceleration model discussing the dependence of the upstream particle escape rate on the proton excited waves in the turbulent sheath and the interplanetary waves in the ambient solar wind. The model indicates that increased seed particle density and wave excitation may effectively reduce the particle escape rate from the scatter-dominated turbulent sheath upstream of the shock into interplanetary space. The higher seed particle density and the stronger magnetic field strength at smaller solar radii may be responsible for the efficient acceleration of high-energy particles in GLEs.

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