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Early-Stage SEP Acceleration by CME-Driven Shocks with Realistic Seed Spectra

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An outstanding issue in heliospheric physics is understanding the acceleration of solar energetic particles (SEP) in coronal mass ejections (CMEs) and flares. A recent question is whether the acceleration occurs in interplanetary space (as has been accepted historically), or near the Sun. Recent work has shown that CME-driven shocks may produce SEPs during the early stages of eruptions, below 5 solar radii. In this work we explore SEP acceleration during the onset of CMEs and shocks even lower in the corona, using realistic suprathermal spectra, for a selection of events. We have calculated quiet-time, pre-event suprathermal particle spectra from 1 AU observations, and scaled them back to the low corona to serve as seed spectra. For each event, AIA observations and the CASHeW framework were used to model the compressive/shock wave kinematics and its interaction with the corona. The proton acceleration was then modeled using an analytic diffusive shock acceleration model as the shock waves propagate to 2 solar radii. We compare the results with the observed SEP fluxes at 1 AU.