Abstract Submitted
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Particle-in-cell simulations of particle energization from low Mach number fast mode shocks[1] JAEHONG PARK, University of Rochester, JARED WORKMAN, Colorado Mesa University, ERIC BLACKMAN, CHUANG REN, University of Rochester, ROBERT SILLER, University of Wisconsin — Low Mach number, high plasma beta, fast mode shocks likely occur in the outflows from reconnection sites associated with solar flares. These shocks are sites of particle energization with observable consequences, but there has been much less work on understanding the underlying physics compared to that of Mach number shocks. To make progress, we have simulated a low Mach number/high beta shock using 2D particle-in-cell simulations with a "moving wall" method and studied the shock structure and particle acceleration processes therein [Park et. al (2012), Phys. Plasmas, 19, 062904]. The moving wall method can control the shock speed in the simulation frame to allow smaller simulation boxes and longer simulation times. We found that the modified two-stream instability in the shock transition region is responsible for shock sustenance via turbulent dissipation and entropy creation throughout the downstream region long after the initial shock formation. Particle tracking and the particle energy distributions show that both electrons and ions participate in shock-drift-acceleration (SDA). The simulation combined with a theoretical analysis reveals a two-temperature Maxwellian distribution for the electron energy distribution via SDA.

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