



Solar Wind Modeling with Slurm, a new MHD Particle-in-Cell Code

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A new Lagrangian MHD code, Slurm, has been developed at KU Leuven for modeling space weather events. Slurm implements the classic particle-in-cell algorithm for magnetized fluids and plasmas. It features particle volume evolution which damps the numerical finite grid instability, and allows simulations of key physical instabilities such as Kelvin-Helmholtz and Rayleigh-Taylor. The magnetic field in Slurm is handled via the electromagnetic potentials carried by particles. Numerical diffusion of the magnetic flux is extremely low, and the solenoidality of the magnetic field is preserved to machine precision. Thanks to computational particles, Slurm can handle spherical flows even in Cartesian geometry. Together with fast and efficient open boundary conditions it allows for modeling of the solar wind and CME propagation in the heliosphere. In this work we report simulations of the solar wind between the critical point and the Earth's orbit.