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Study of turbulence of Lower Hybrid Drift Instability origin with the Multi Level Multi Domain semi-implicit adaptive PIC method

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We study turbulence generated by the Lower Hybrid Drift Instability (LHDI [1]) in the terrestrial magnetosphere. The problem is not only of interest per se, but also for the implications it can have for the so-called turbulent reconnection.
The LHDI evolution is simulated with the PIC Multi Level Multi Domain code Parsek2D-MLMD [2,3], which simulates different parts of the domain with different spatial and temporal resolutions. This allows to satisfy, at a low computing cost, the two necessary requirements for LHDI turbulence simulations: 1) a large domain, to capture the high wavelength branch of the LHDI and of the secondary kink instability and 2) high resolution, to cover the high wavenumber part of the power spectrum and to capture the wavenumber at which the turbulent cascade ends.
The turbulent cascade proceeds seamlessly from the coarse (low resolution) to the refined (high resolution) grid, the only one resolved enough to capture its end, which is studied here and related to wave-particle interaction processes.
We also comment upon the role of smoothing (a common technique used in PIC simulations to reduce particle noise, [4]) in simulations of turbulence and on how its effects on power spectra may be easily mistaken, in absence of accurate convergence studies, for the end of the inertial range.

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