PHARE : Hybrid particle in cell code with adaptive mesh refinement

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Résumé

Modeling multi-scale collisionless magnetized processes constitutes an important numerical challenge. By
treating electrons as a uid and ions kinetically, the so-called hybrid Particle-In-Cell (PIC) codes represent

a promising intermediary between fully kinetic codes, limited to model small scales and short durations,

and magnetohydrodynamic codes used large scale. However, simulating processes at scales signicantly

larger than typical ion particle dynamics while resolving sub-ion dissipative current sheets remain extremely

dicult. This paper presents a new hybrid PIC code with patch-based adaptive mesh renement. Here,

hybrid PIC equations are solved on a hierarchy of an arbitrary number of Cartesian meshes of incrementally

ner resolution dynamically mapping regions of interest, and with a rened time stepping. This paper

presents how the hybrid PIC algorithm is adapted to evolve such mesh hierarchy and the validation of the
code on a uniform mesh, xed rened mesh and dynamically rened mesh.

*Intervenant