NUMERICAL SIMULATIONS OF SMALL-SCALE FLUCTUATIONS AS OBSERVED IN SPACE PLASMAS: COMPRESSIBLE TURBULENCE IN HALL MAGNETOHYDRODYNAMICS

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The nonlinear dynamics of a compressible Hall magnetohydrodynamic (HMHD) plasma is investigated by direct numerical simulations in a $2.5D$ geometric configuration. Two main features occurr at small scales where the Hall effect dominates, namely: i) an increse of the compressibility of the system; ii) the excitation of small–scales fluctuations characerized by an anti–correlation between density and magnetic field intensity. This is an evidence for the excitation of a different turbulent regime that can be interpreted as the small–scale signature of the break–down of the nonlinear MHD energy cascade due to Hall effect. Similar small–scale structures have been observed by the Cluster mission in space plasma during different magnetopause crossings.