Temperature dynamics and velocity scaling laws for interchange driven, warm ion plasma filaments - DTU Orbit (09/11/2017)

Temperature dynamics and velocity scaling laws for interchange driven, warm ion plasma filaments

The influence of electron and ion temperature dynamics on the radial convection of isolated structures in magnetically confined plasmas is investigated by means of numerical simulations. It is demonstrated that the maximum radial velocity of these plasma blobs roughly follows the inertial velocity scaling, which is proportional to the ion acoustic speed times the square root of the filament particle density times the sum of the electron and ion temperature perturbations. Only for small blobs the cross field convection does not follow this scaling. The influence of finite Larmor radius effects on the cross-field blob convection is shown not to depend strongly on the dynamical ion temperature field. The blob dynamics of constant finite and dynamical ion temperature blobs is similar. When the blob size is on the order of 10 times the ion Larmor radius the blobs stay coherent and decelerate slowly compared to larger blobs which dissipate faster due to fragmentation and turbulent mixing.

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