Microturbulence-induced modifications to the alpha particle distribution and associated effects

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It has previously been shown [1] that the turbulent transport of alpha particles can compete with collisional slowing-down at moderate energies ($\sim$ 300keV). Modifications to the energy distribution have the potential to impact the collisional heating by alpha particles, as well as the stability of Alfvén eigenmodes. Here, we present the results from turbulent transport simulations of alpha particles coupled in radius and energy, which has recently been made possible [2] by the T3CORE code. This tool couples to existing gyrokinetic simulation output and could in the future act as a module for other transport codes. The results presented indicate a non-monotonic alpha particle distribution and order-unity modifications to the alpha particle heating and pressure profiles, depending on the turbulent amplitude. The buildup and transport of helium ash and the transient behavior due to periodic ejection by sawtooth oscillations are also examined.

References

[1] G. J. Wilkie, I. G. Abel, E. Highcock, W. Dorland, "Validating modeling assumptions of alpha particles in electrostatic turbulence." *Journal of Plasma Physics*, **81**,3:905810306 (2015)

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