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Non-local transport across zonal shear flows A. KULLBERG, UCLA, D. DEL-CASTILLO-NEGRETE, ORNL, G.J. MORALES, J.E. MAGGS, UCLA
— In the diffusive transport model, the flux is completely determined by the local value of the gradient. Despite the relative success of this approach, there are situations in which the local flux-gradient assumption does not hold. In particular, in the presence of non-local transport, the flux at a point might depend on the gradients throughout the entire domain. Evidence of this type of transport includes perturbative experiments in tokamaks, numerical simulations of turbulent transport, and generalized random walk theoretical models. The goal of this presentation is to study non-local transport in the presence of zonal shear flows. Zonal flows play a key role in the dynamics and transport in magnetically confined plasmas and it is of significant theoretical and practical importance to understand their impact on non-local transport. Our study is based on a simplified 2-dimensional advection non-local diffusion model consisting of a poloidal zonal flow coupled to a radial non-local transport channel. Extending previous work we model non-local transport using truncated fractional derivatives that allow the incorporation of finite size effects. Numerical and analytical results on non-local transport across the zonal flow are presented, along with a numerical study of truncation effects in fluctuation-driven transport.

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