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Two dimensional non-local transport across zonal shear flows A. KULLBERG, UCLA, D. DEL-CASTILLO-NEGRETE, ORNL, G.J. MORALES, J.E. MAGGS, UCLA — The standard diffusive model assumes that the fluxes are entirely determined by the local value of the gradient. Although this paradigm has had considerable success, there are situations in which this prescription (i.e. Fick's law) does not hold; instead, the flux at a point may depend on the gradients throughout the entire spatial domain. Examples of this type of transport include perturbative experiments in tokamaks, numerical simulations of turbulent plasmas, and generalized random walk theoretical models. This presentation describes recent results on non-local transport in the presence of zonal shear flows. The study is based on a 2-dimensional equation that has a poloidal zonal flow coupled to a radial non-local transport channel. This work extends upon previous research by incorporating a cylindrical, 2-dimensional (albeit azimuthally averaged), non-local radial transport operator. Numerical results relating to several aspects of transport across the zonal shear flow are presented, including a numerical study of the creation of resonant traveling thermal waves inside the flow by an oscillating heat source, and the propagation of cold pulses across the zonal flow. In the case of thermal waves, resonance occurs when the source frequency matches the rotational angular frequency of the flow.

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