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Non-local models of nondiffusive transport in magnetically confined plasmas[1] A. KULLBERG, UCLA, D. DEL-CASTILLO-NEGRETE, ORNL, G.J. MORALES, J.E. MAGGS, UCLA — The standard diffusion model assumes that the heat flux is determined by the local value of the temperature gradient. Although this paradigm is highly successful, there are situations in which it does not hold; instead, the flux at a point may depend non-locally on the gradient throughout the entire spatial domain. Examples include perturbative experiments in tokamaks and stellarators, numerical simulations of turbulent plasmas, and generalized random walk models. Going beyond the previously studied case of 1D models in slab geometry, we construct 2D non-local models in bounded domains. The new models incorporate effects and boundary conditions relevant to magnetically confined fusion plasmas. Analytic and numerical results are presented comparing 1D slab non-local models to 2D isotropic nonlocal models. Problems investigated include: profile peaking due to off-axis heating, fast pulse propagation, and heat waves. In the context of 1-dimensional models, new results are presented of non-local transport in thermal wave resonators in bounded domains.

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Adam Kullberg
UCLA

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