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Non-diffusive tracer transport in a zonal flow with finite Larmor radius effects[1] KYLE GUSTAFSON, University of Maryland, DIEGO DEL-CASTILLO-NEGRETE, Oak Ridge National Laboratory, WILLIAM DORLAND, University of Maryland — Tracer particle transport simulations reveal non-diffusive transport in a prototypical quasi-two dimensional plasma. The plasma model contains two drift wave modes combined with a zonal $\boldsymbol{E} \times \boldsymbol{B}$ shear flow. Finite Larmor radii chosen from a Maxwellian distribution create gyrocenter tracers, which changes the appearance of the flow. Time evolution of the propagator of particle displacements is split into two regimes. Diagnostics are developed for examining non-diffusive transport in more general flows. For the flow considered here, these diagnostic techniques reveal power law dependence in the following: tails of the particle propagator, the first two statistical moments and the distributions of trapping and flight events. The gyroaveraged flow changes the exponent of the second moment of the tracer propagator as a smooth function of $k_\perp \rho_{th}$. Self-similar scaling of the particle propagator is consistent with a fractional diffusion model and good agreement is found between the numerical data and a specific solution of the fractional diffusion equation.

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