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Quantitative description of mixing in non-perturbative flows RADFORD MITCHELL, ROMAN GRIGORIEV, Georgia Tech — Studies of near-integrable fluid flows have identified two independent and complementary quantitative metrics which are needed to describe their mixing properties: (1) the mixing rate and (2) the size (and shape) of the mixed region. In the limit of weak perturbation away from integrability both metrics can be computed using multi-scale averaging theory. In this talk we show how these metrics can be computed in the non-perturbative regime using the formalism of Periodic Orbit Theory. Using a Taylor-Couette-like steady flow as an example, we show that the boundaries of the mixed region are formed by heteroclinic manifolds of periodic (or relative periodic) orbits while the mixing rate can be quantified using a weighted sum over a set of both periodic and relative periodic orbits. A similar description is expected to be valid for time-periodic flows and other geometries as well.

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