Abstract Submitted
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Single series skewness representation for passive scalar advection in laminar pipe and channel flow[1] RICHARD M. MCLAUGHLIN, FRANCESCA BERNARDI, ROBERTO CAMASSA, University of North Carolina, KEITH MERTENS, Leap Motion, UNC JOINT FLUIDS LAB TEAM — In this talk, we present an exact single series representation for scalar skewness time evolution. Prior studies have naturally derived multiple nested Fourier series solutions which suffer from slow convergence and cloud physical interpretation. Judicious change of variables and complex residue theory lead to single series representation formulae for the moments along streamwise slices from which quantities such as variance and skewness can be reconstructed. Instantaneous symmetry breaking gives rise to non-zero skewness on transient time scales arising as a non-trivial competition between advection and diffusion which is captured by the simplified formulae. Small and long time asymptotics will be discussed for the first three moments in both channel and pipe geometries in steady Poiseuille flow, and nontrivial Peclet dependence in the skewness along slices will be examined.

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