THE UNIVERSITY OF CHICAGO | THE COMMITTEE ON COMPUTATIONAL AND APPLIED MATHEMATICS

COLLOQUIUM

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Batchelor spectrum and unexpected dissipation in a non-autonomous passive scalar flow.

THURSDAY, April 9th at 4:00 PM
Jones 303, 5747 S. Ellis Ave. Chicago, IL 60637

ABSTRACT

In 1959, Batchelor predicted that a passive scalar that is forced at large spatial scales and advected by an incompressible flow inducing exponential growth of scalar gradients develops a universal power-law energy spectrum, now known as Batchelor's law. In recent years, Batchelor's law has been proven when the scalar is driven by a white-in-time stochastic forcing.

Similarly, there have been a number of works that show that randomly advected passive scalars with molecular diffusion able to reach the theoretically maximal dissipation rate. A phenonium often called anomalous dissipation.

Both behavior are given by the creation of ever smaller spatial structures.

I a joint work with Kyle Liss and one with Liss and Tarek Elgindi that establish these results in which we study the setting of smooth, deterministic forcing. For a specific time-periodic velocity field, we prove that all sufficiently smooth initial scalars are attracted to a limiting solution that satisfies a cumulative form of Batchelor's law. This provides the first example for which a version of Batchelor's law has been established with deterministic forcing.

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