Long time diffusive behavior of incompressible, randomly switched flows

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Consider a diffusive passive scalar that is advected by a periodic incompressible flow. On long time scales it is known that the effect of the periodic drift averages and the behavior is the same as that of a purely diffusive scalar with an effective diffusion coefficient. In all examples where the effective diffusivity is known it vanishes with the molecular diffusivity.Residual diffusivity is the remarkable pheonomenon where the effective diffusivity does not vanish with the molecular diffusivity. It is conjectured to happen in situations where the advecting drift is chaotic. In this talk we show that certain randomly switched, incompressible flows exhibit residual diffusivity. We also provide a deterministic discrete time example.

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