"A Fractional PDE Approach to Turbulent Mixing; Part I: an Anomalous Transport Theory"

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A Fractional PDE Approach to Turbulent Mixing; Part II: Numerical Simulation MEHDI SAMIEE¹, MOHSEN ZAYERNOURI², Michigan State Univ — We propose a generalizing fractional order transport model of advection-diffusion kind with fractional time- and space-derivatives, governing the evolution of passive scalar turbulence. This approach allows one to incorporate the nonlocal and memory effects in the underlying anomalous diffusion i.e., sub-to-standard diffusion to model the trapping of particles inside the eddied, and super-diffusion associated with the sudden jumps of particles from one coherent region to another. For this nonlocal model, we develop a high order numerical (spectral) method in addition to a fast solver, examined in the context of some canonical problems.

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