Abstract Submitted
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Local and distant interactions in the Batchelor regime of scalar turbulence ROBERT RUBINSTEIN, None, WOUTER BOS, LMFA-CNRS Universite de Lyon, Ecole Centrale de Lyon FRANCE — Kraichnan's 1968 paper on the passive scalar reconsidered Batchelor's classic analysis of the persistence of scalar fluctuations in the dissipation range of the velocity field when the scalar diffusivity is much smaller than the fluid viscosity. Adopting the premise that the velocity field fluctuates rapidly, instead of Batchelor's hypothesis that the velocity field is essentially static, Kraichnan found that although Batchelor's prediction of a k^{-1} spectrum remains intact, the subsequent diffusive range falls off as $\exp(-k)$ instead of Batchelor's prediction $\exp(-k^2)$. We will show that these two hypotheses also make significantly different predictions of higher order statistics in the k^{-1} range, namely that in Kraichnan's analysis, a reduction of mean square advection analogous to the 'suppression of nonlinearity' in Navier-Stokes turbulence occurs, but that this effect is absent in Batchelor's analysis. This difference will be interpreted in the light of a suggestion of Yukio Kaneda that the difference between Kraichnan's and Batchelor's analysis originates in treating velocity-scalar interactions either as local (Kraichnan) or as asymptotically distant (Batchelor).

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None

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