The relationship between the topological structures in turbulent flow and the distribution of a passive scalar with an imposed mean gradient

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Abstract

Data obtained from direct numerical simulations of isotropic homogenous turbulence and the diffusion of a scalar with an applied mean gradient is analysed using the topological techniques developed by Chong et al. (1990. Phys. Fluids 2(5), 765–777). Several simulations were run at various values of Taylor–Reynolds number ($Re_t$) and Schmidt number ($Sc$). Comparing the numerical results obtained, relationships between the scalar characteristics and the topological features in the flow have been identified. Results from this work may be useful in the development of improved mixing processes by isolating the effect of the various topologies on the distribution of a passive scalar. © 2005 Published by The Japan Society of Fluid Mechanics and Elsevier B.V. All rights reserved.

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