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**Transfer of passive scalar variance in decaying grid turbulence with a mean scalar gradient**[1] LUMINITA DANAILA, CORIA CNRS UMR 6614, Université de Rouen, 77801 Saint Etienne du Rouvray, France, LAURENT MYDLARSKI, Department of Mechanical Engineering, McGill University, Montréal, Canada — The present work focuses on the mixing of a passive scalar for $Sc = 0.7$ ($Sc$ is the Schmidt number) in decaying, homogeneous isotropic turbulence, where the scalar fluctuations are produced via a large-scale, mean scalar gradient. The overall philosophy is *to understand and predict the scalar behaviour, when the velocity field is known.* Of particular interest is the transfer of scalar variance and its comparison with that of the kinetic energy. The experimental evidence suggests that the scalar variance transfer is closer to the asymptotic value of 4/3 than its kinetic energy counterpart. This behaviour is explained analytically by modelling the scalar variance transfer as a function of the scalar variance at scale $r$, and a characteristic time resulting from the strain effected by a range of scales of sizes slightly larger than $r$, up to $r$ itself. This model is consistent with the experimental data, measured in grid turbulence with a mean scalar gradient, over a relatively wide range of Reynolds numbers ($R_\lambda$ up to 600). We highlight the fact that the cascade mechanism of the scalar variance appears to be insensitive to whether the scalar field is dominated by decay or by production.

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