Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Effect of counter-gradient subgrid-scale transport on turbulent mixing SIDHARTH GS, RAYMOND RISTORCELLI, Los Alamos National Laboratory — The present work explores the effect of subgrid-scale models on the statistics of turbulent mixing of passive and active scalars. We compare the commonly employed gradient diffusion model against the non-linear gradient model (related to Clark model/ Finite-scale equations). The aim is to investigate the consequence of isotropic eddy viscosity/ scalar diffusivity versus a tensorial viscosity and diffusivity that permits counter-gradient transport of resolved-scale variables. For an isotropic turbulent flow, unlike the gradient diffusion model, the non-linear gradient model can be shown to preserve the combined supergrid and subgrid scalar variance to the leading order in filter width. Therefore, the effect of the two classes of models on the evolution of the scalar variance (passive and active) is contrasted. Furthermore, in the active scalar case (variable-density mixing), we compare the turbulence and mixing statistics in the Reynolds- versus Favre-filtered representation of large-scale velocity and scalar variables (Sidharth GS and Candler JFM (2018)). The role of variable-density subgrid acceleration on the dynamics of subgrid velocity variance is of particular interest and compared with the well-studied specific-stress based production term.

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Date submitted: 23 Jul 2019 Electronic form version 1.4