An Analysis of LES models in Stably Stratified Flows[1] JEREMY
MELVIN, ROBERT D. MOSER, University of Texas at Austin — Large eddy sim-
ulations (LES) of complex turbulent flows, such as for the simulation of wind farms,
are limited by resolution requirements in boundary layers and modeling assumptions
for subgrid stress (SGS) models which are inconsistent with flow characteristics. In
this talk, we discuss limitations of standard SGS models based on a scalar eddy
viscosity and their performance in anisotropic turbulence. A set of DNS simulations
of homogeneous stratified turbulence is used to inform current efforts to develop
an improved SGS model for anisotropic turbulence. A priori and a posteriori error
analysis for a set of LES models is conducted using the DNS data. As expected, it is
found that these models are insufficient, especially under stronger levels of stratifica-
tion. Anisotropic filtering, which is necessary as a result of both the natural meshing
of boundary layers as well as the dynamics of the flow, interacts poorly with these
models. This emphasizes the need for the formulation of LES models to naturally
handle anisotropies present in both the grid and the underlying turbulence. We
provide a brief overview of current modeling efforts using a tensorial eddy viscosity
and other design choices to develop a more robust LES model.

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