Abstract Submitted
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Improving the Foundations for Large Eddy Simulation of Katabatic Flow KELSEY EVERARD, University of British Columbia, HOLLY OLDROYD, University of California at Davis, MARCO GIOMETTO, Columbia University, MARC PARLANGE, Monash University, GREG LAWRENCE, University of British Columbia — Large Eddy Simulations (LES) can pose an advantage over Reynolds Averaged Navier-Stokes in that only turbulence at and below the subgrid scale (SGS) is dictated by a closure model. At the same time, LES can pose an advantage over Direct Numerical Simulations (DNS) in that it can be used to simulate flows at large Reynolds numbers. However, LES results can be sensitive to the choice of SGS turbulence model, especially in the near-surface region of stably stratified flows, making simulation accuracy highly dependent on the near-wall treatment and on grid resolution. For katabatic flow, it is surmised, based on the observed anisotropy and surface-normal flux divergence, that results are sensitive both to the choice of SGS model and to the wall-layer model. However, a mathematically consistent and physically grounded choice does not yet exist in either case, posing a bottleneck for the applicability of LES for katabatic flow simulation. Here, we propose improved models that explicitly account for the physics important to a statically stable fluid flowing under the influence of gravity over a sloped rough boundary. In this way, we contribute to increasing the utility of LES for studies on katabatic flows.

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