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The Role of the Algorithm in the Design of LES to Capture Law-of-the-Wall GANESH VIJAYAKUMAR, JAMES BRASSEUR, Penn State, MATTHEW CHURCHFIELD, NREL, ADAM LAVELY, Penn State, PATRICK MORIARTY, NREL, MICHAEL KINZEL, Penn State, ERIC PATERSON, Penn State — Large-eddy simulation (LES) has been plagued by the inability to predict law-of-the-wall (LOTW). Brasseur & Wei, (*Phys. Fluids* **22**) presented a theory that explains the source of the difficulty and a framework within which LES can be designed to rectify the problem. The essential difficulty lies in (1) the nonphysical frictional content within the discretized equations, and (2) the extent to which that frictional content contributes to the inertial scaling underlying LOTW. The latter is determined by the relative contribution of mean resolved to subfilter scale (SFS) stress at the first grid level ($\Re$). The balance of inertia and friction is represented as an "LES Reynolds number," Re_{LES}. $\Re$ and Re_{LES} must exceed critical values to predict LOTW, defining a "High-Accuracy Zone" (HAZ) within an $\Re$-Re_{LES}parameter space. Frictional content has at least two sources: the model for SFS stress and the numerical algorithm. By comparing the same simulations with a finite volume code (using OpenFOAM) and a spectral code for channel flow and the neutral atmospheric boundary layer, we shall report on the effects of friction in the algorithm on the $\Re$- Re_{LES}parameter space and the HAZ, and on the requirements for the LES to capture LOTW. *Support: NSF, DOE.*

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