Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

**Temporal large-eddy simulation based on direct deconvolution** DANIEL OBERLE, Institute of Fluid Dynamics, ETH Zurich, CHARLES PRUETT, Department of Mathematics and Statistics, James Madison University (Ret.),, PATRICK JENNY, Institute of Fluid Dynamics, ETH Zurich — We propose an approach for Temporal Large-Eddy Simulation (TLES) with direct deconvolution. In contrast to previous TLES models like the Temporal Approximate Deconvolution Model (TADM) by Pruett et al., the non-filtered fields are recovered using a direct deconvolution given by the differential form of the filter operator rather than a truncated series expansion of the inverse filter operator. The closure is obtained by an evolution equation of the temporal residual-stress tensor, which is analytically derived from the relation of the filtered and the non-filtered fields. Thus, the Temporal Direct Deconvolution Model (TDDM) has the advantage of being more accurate and requiring less computational effort relative to the TADM. A secondary regularization term based on selective frequency damping is employed, similar as for TADM. The TDDM was implemented in the spectral element code Nek5000 to simulate different test cases such as homogeneous isotropic turbulence at $Re_\lambda$=50 and 190, turbulent channel flow at $Re_\tau$=180 and flow over a periodic hill at $Re$ =10595. The results demonstrate an improvement compared to the no-model solutions, while the computational cost is reduced dramatically compared to direct numerical simulation.

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Date submitted: 03 Aug 2020 Electronic form version 1.4