Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

A dynamic subfilter-scale stress model for Large eddy simulations
AMIRREZA ROUHI, UGO PIOMELLI, Queen's University, Canada, BERNARD GEURTS, University of Twente, Netherlands — In conventional large eddy simulation, the filter width is related to the grid size; this decouples the filter width from turbulence physics and results in unwanted dependence of the subfilter model on the grid arrangement. Relating the filter width to the integral length-scale is a potential solution. We proposed an approximation for the integral length-scale, in which a single model parameter was determined based on the global contribution of unresolved (subfilter) scales to the resolved ones denoted as subfilter activity (Piomelli & Geurts, *Direct and Large-Eddy Simulation VIII*, pp. 15-20, 2011). We have devolped a localized model in which we assign a target value to subfilter activity locally, requiring the model parameter to adapt itself to the local state of the flow. This dynamic modification is coupled with a local formulation for the integral scale. The modified model was applied on channel flow at Re_τ up to $2,000$, accelerating boundary layer and backward-facing step flow at high Re with comparable accuracy as the Dynamic Smagorinsky model but with less computational expense.

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Date submitted: 17 Jul 2014 Electronic form version 1.4