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A Wall Model for Large-Eddy Simulation of Compressible Channel Flows BARRETT MCCANN, ANTONINO FERRANTE, University of Washington — We have developed a new wall model for the large-eddy simulation (LES) of compressible channel flows with isothermal walls by extending the incompressible model of Chung and Pullin (*J. Fluid Mech.* 2009). The wall model computes the local, instantaneous wall shear stress and heat flux, which are then applied as wall boundary conditions, by solving two time-dependent, parameter-free ordinary differential equations (ODEs) at each time step. These ODEs are obtained by integrating the filtered momentum and energy equations in the wall-normal direction from the wall to the first grid point in the log layer. In contrast to so-called "wall resolved" LES, employment of this wall model allows use of relatively coarse computational meshes of fixed size, independent of Reynolds number. The wall model is first validated by comparing our LES results at $M = 0.15$ and $Re_\tau = 2003$ to the DNS results of Hoyas and Jiménez (*Phys. Fluids* 2006). We present LES results of channel flow simulations at $M = 0.15$ and $M = 0.75$, over a three-order of magnitude range of friction Reynolds numbers ($Re_\tau = 2 \times 10^3$, 2×10^4, 2×10^5 and 2×10^6), on a mesh with $256 \times 32 \times 128$ grid points in the streamwise, wall-normal, and spanwise directions.

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