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**Large Eddy - Lattice Boltzmann (LES-LB) Simulations of Fluid and MHD Turbulence**[1] BRIAN KEATING, William & Mary, MIN SOE, Rogers State University, GEORGE VAHALA, William & Mary, LINDA VAHALA, Old Dominion University, JEFFREY YEPEZ, ARFL, Hanscom Field, JONATHAN CARTER, NERSC, LBNL — For high Reynolds number turbulence, the resource requirements for a full space-time DNS simulation scales as $\mathrm{Re}^3$ – which is far beyond any foreseeable computational resources. For problems that require instantaneous fields, one is forced into an LES in which one filters out the unresolvable small scales in the simulation but must then deal with the effects of the subgrid scales on the resolvable scales. In the Lattice Boltzmann (LB) mesoscopic approach one sidesteps the stiff nonlinear convective derivatives in the nonlinear continuum equations by simple linear advection in kinetic space together with local collisional relaxation at each spatial node. The relaxation distribution functions have simple algebraic continuum nonlinearities. In LES, the Smagorinsky eddy viscosity is related to the mean rate of strain tensor. However this tensor can be computed from purely locally moments in LB. In a Smagorinsky LES-MHD, the subgrid magnetic Reynold stress can be determined from local kinetic moments.

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