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Entropic Lattice Boltzmann Algorithms for MHD Turbulence LINDA VAHALA, Old Dominion University, GEORGE VAHALA, William & Mary, MIN SOE, Rogers State University — To achieve high resolution simulations of MHD turbulence, one must have highly parallelized algorithms that scale to hundreds of thousands of cores. Direct lattice Boltzmann algorithms are such explicit schemes but they are typically restricted in the achievable Reynolds numbers due to numerical instabilities. Here we examine entropic generalizations of LB by introducing a scalar distribution for the magnetic field With the magnetic field arising as a first moment we can enforce positive definiteness on the magnetic scalar distribution and hence an entropic representation. This will permit simulations to be performed at arbitrary high magnetic Reynolds number - limited only by the number of cores available. Results will be presented for the Orszag-Tang vortex. Moreover large eddy simulation (LES) closures can be incorporated into LB without destroying the parallelization of the algorithm as macroscopic gradients are local moments in the LB representation. LB does not loose its parallelization when handling arbitrary boundary conditions. A semi-entropic LB scheme (using a vector distribution for **B**) will also be considered.

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