On the accurate simulation of magnetohydrodynamic turbulence and magnetic reconnection MINPING WAN, University of Delaware, SEAN OUGHTON, University of Waikato, SERGIO SERVIDIO, Universita della Calabria, WILLIAM H. MATTHAEUS, University of Delaware — The issue of adequate spatial resolution in numerical simulations of turbulence is studied in the context of decaying two-dimensional magnetohydrodynamics. By comparing simulations at varying resolution and at varying Reynolds numbers, the familiar criterion that the dissipation scale should be resolved is found to enable accurate computation of the spectrum, but fail for precise determination of higher-order statistical quantities. Examination of two straightforward diagnostics, the maximum of the kurtosis and the scale-dependent kurtosis, enables the development of simple tests for assessing adequacy of spatial resolution. The efficacy of the tests is confirmed by examining the distribution of magnetic reconnection rates in turbulence. Over-sampling the Kolmogorov dissipation scale by a factor of 3 allows accurate computation of the kurtosis, the scale-dependent kurtosis, and the reconnection rates. These tests may provide useful guidance for resolution requirements in many plasma computations involving turbulence and reconnection. [Phys. Plasmas 17, 082308 (2010)]

Minping Wan
University of Delaware

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