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Intermittency in magnetohydrodynamic turbulence: DNS and Lagrangian averaged modeling JONATHAN GRAHAM, NCAR, PABLO MININNI, NCAR, ANNICK POUQUET, NCAR, DARRYL HOLM, LANL and Imperial College — The range of scales encountered in MHD problems of astrophysical interest is well beyond expected computer resolutions in the next decades. For this reason, closure schemes are often employed to model the effect of the unresolved scales. One such closure is Lagrangian-averaged magnetohydrodynamics (LAMHD) or the "alpha model." This model is an extension of the smoothing procedure in fluid dynamics which filters velocity fields locally while leaving their associated vorticities unsmoothed, and has proven useful for high Reynolds number turbulence computations. It differs from large eddy simulations in that it preserves the invariants of a given flow. We present DNS and LAMHD simulations of forced and free decaying two-dimensional magnetohydrodynamic turbulence. The exponents of structure functions of the velocity, the magnetic field, and the Elsässer variables are studied. LAMHD is found to have the same intermittent behavior as the DNS. The statistics of sign cancellations of the current (and vorticity) at small scales are also studied using both the cancellation exponent and the fractal dimension of the structures. LAMHD is found to have the same scaling behavior between positive and negative contributions as the DNS. At large Reynolds numbers, an independence of the cancellation exponent with the Reynolds numbers is observed.

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