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Energy transfers in shell models for MHD turbulence THOMAS LESSINNES, Physique Statistique et des Plasmas, Faculté des Sciences, Université Libre de Bruxelles, MAHENDRA K. VERMA, Department of Physics, Indian Institute of Technology Kanpur, DANIELE CARATI, Physique Statistique et des Plasmas, Faculté des Sciences, Université Libre de Bruxelles — A systematic procedure to derive shell models for MHD turbulence is proposed. It takes into account the conservation of ideal quadratic invariants such as the total energy, the cross-helicity and the magnetic helicity as well as the conservation of the magnetic energy by the advection term in the induction equation. This approach also leads to simple expressions for the energy exchanges as well as to unambiguous definitions for the energy fluxes. When applied to the existing shell models with nonlinear interactions limited to the nearest neighbour shells, this procedure reproduces well known models but suggests a reinterpretation of the energy fluxes. This formalism also yields general constraints on the shell models that are independent of the shell model expressions for the helicities. The final structure of the shell model requires however explicit definitions for both the vorticity and the magnetic potential vector in terms of the shell variables.

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