

Abstract Submitted  
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**The Emergence of Two Invariants from One in MHD Turbulence<sup>1</sup>**

HUSSEIN ALUIE, XIN BIAN, University of Rochester — In incompressible MHD flows, it is only total energy that is conserved and not magnetic or kinetic energy separately. As a manifestation of order emerging out of chaos (or permanence out of turbulence), we have found in [1] that they are in fact conserved separately over a range of scales in turbulent flows. This essentially gives us two global invariants (kinetic energy and magnetic energy) instead of just one (total energy). I will discuss this seemingly counter-intuitive result and how it is to be reconciled with the strong magnetic-flow coupling and the role of waves in MHD turbulence. I will put this result in the context of cascade theories and briefly examine its potential implications on the energetics and dissipation of plasma flows, magnetic reconnection, and also on modeling efforts. [1] X. Bian and H. Aluie, Phys. Rev. Lett. 122, 135101 (2019).

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