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WITHDRAWN—On the dynamics of transition to incompressibility from compressible MHD turbulence DASTGEER SHAIKH, GARY P. ZANK, Institute of Geophysics and Planetary Physics — Compressibility is regarded as an essential characteristic of interplanetary, interstellar, and laboratory magnetohydrodynamic (MHD) plasmas, yet small scale low-frequency phenomena, and interplanetary or laboratory turbulence are frequently described on the basis of incompressible MHD. Understanding why magnetofluids observed in the solar wind or interstellar medium frequently behave as though they are incompressible has proved a major challenge to our understanding of small-scale dynamical processes in a plasma. The past 15 years have witnessed an effort to understand this apparent paradox of compressible MHD behaving as though it were incompressible in a variety of environments ranging from the solar wind to the interstellar medium. On the basis of 3D time dependent numerical simulations, we find that compressible magneto hydrodynamic fluids describing super-Alfvénic supersonic and strongly magnetized space and laboratory plasmas decay progressively to a state of near incompressibility. This transition is mediated dynamically by disparate spectral energy dissipation rates in compressible magnetosonic and shear Alfvénic modes. Dissipation leads to super-Alfvénic turbulent motions decaying to a sub-Alfvénic regime that couples weakly with (magneto) acoustic cascades. Consequently, the supersonic plasma motion dissipates into highly subsonic motion and density fluctuations experience a passive convection.

Prefer Oral Session
 Prefer Poster Session

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