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On the cascade reversal at the electron skin depth[1] GEORGE MILOSHEVICH, University of Texas at Austin, MANASVI LINGAM, Harvard University, PHILIP MORRISON, The University of Texas at Austin — There exist a wide class of systems that exhibit non-ideal effects such as Hall drift and electron inertia. The latter plays role on characteristic length scales smaller than the electron skin depth. To gain relevant understanding it is necessary to work with models such as extended MHD (XMHD) that capture these microscopic effects. XMHD is endowed with topological invariants two helicities emerging from the Hamiltonian structure and useful for the Hamiltonian Energy-Casimir method [1]. In MHD turbulence the inverse cascade of magnetic helicity is often invoked to explain dynamo action. However, we predict [2] analytically that the phenomenon is suppressed at the electron skin depth, i.e. it appears that the cascade reverses direction. The ongoing investigations focus on a simplified 2D case, which is more amenable to numerical analysis. The analytical queries reveal similar behavior to 3D cascade reversal so we are confident that our 2D case study should be representative.

[1] M. Lingam, G. Miloshevich and P.J. Morrison, Phys. Lett. A, 380, 2400 (2016)

[2] G. Miloshevich, M. Lingam and P.J. Morrison, New J. Phys. 19 (1), 015007, (2017)

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