Role of Hyperresistivity in Laboratory and Astrophysical Dynamos

A. BHATTACHARJEE, Space Science Center, University of New Hampshire — It has been known for about 25 years that within the context of mean-field dynamo theories, the turbulent electromotive force (emf) can be represented as the total divergence of a physical quantity that, in some cases of great interest, can be shown to be proportional the gradient of the parallel current density. This form of the turbulent emf is often referred to as hyperresistivity (or electron viscosity). When hyperresistivity is included in theories of alpha quenching for astrophysical dynamos, it can be shown that in the presence of non-trivial magnetic field topologies or differential flows, hyperresistivity remains as the only remnant due to a cancellation in the alpha and beta effects of kinematic dynamo theory. In this talk, we will discuss the relevance of this concept to the dynamo effect produced by the magnetorotational instability, as well as its role in producing fast reconnection in weakly collisional plasmas.

1 This is work supported by DOE, NASA, and NSF.