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Scale interactions in MHD turbulence and dynamo action

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In recent years the increase in computing power, as well as the development of subgrid models for magnetohydrodynamic (MHD) turbulence has allowed the study of a numerically almost unexplored territory in MHD flows: the regime of low magnetic Prandtl number (P_M). This regime is of particular importance since several astrophysical and geophysical problems are characterized by $P_M < 1$, as for example in the liquid core of planets such as the Earth, or in the convection zone of stars as the Sun. Liquid metals used in dynamo experiments to generate magnetic fields are also characterized by $P_M < 1$. In this talk we will review some studies of dynamo action and MHD turbulence for $P_M \leq 1$, down to $P_M \sim 5 \times 10^{-3}$. In particular, we will focus on cases where a large scale flow is present and turbulence develops as the result of an instability. Interactions between scales will be discussed, and evidence of non-local interactions involving disparate scales in simulations of MHD turbulence with resolutions up to 1536^3 grid points will be presented. The implications of these results for universality will be briefly discussed.