

# Supercriticality to subcriticality in dynamo transitions

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In this paper, we present a three-mode dynamo model which describes both supercritical and subcritical dynamo transitions. The nature of dynamo transition changes from supercritical to subcritical as the magnetic Prandtl number is decreased, consistent with the numerical results in the spherical-shell and the Taylor-Green dynamo. We also perform a detailed analysis of the hysteresis zone of a subcritical dynamo using direct numerical simulations. Numerical simulation and model analysis show that the sets of initial conditions, called the basin of attraction, of the no-dynamo and the dynamo states are separated by an unstable manifold.

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