



Dynamo regimes and transitions in the VKS experiment

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The VKS dynamo experiment yields a variety of dynamo regimes, when asymmetry is imparted to the flow by rotating impellers at different speed F_1 and F_2 . We show that as the intensity of forcing, measured as $F_1 + F_2$, is increased, the transition to a self-sustained magnetic field is always observed via a supercritical bifurcation to a stationary state. For some values of the asymmetry parameter $\theta = (F_1 - F_2)/(F_1 + F_2)$, time dependent dynamo regimes develop. They are observed either when the forcing is increased for a given value of asymmetry, or when the amount of asymmetry is varied at sufficiently high forcing. Two qualitatively different transitions between oscillatory and stationary regimes are reported, involving or not a strong divergence of the period of oscillations. These transitions can be interpreted using a low dimensional model based on the interactions of two dynamo modes.