

Convective dynamos: Symmetries and modulation

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We consider dynamo action driven by three-dimensional rotating anelastic convection in a spherical shell. Motivated by the behaviour of the solar dynamo, we examine the interaction of hydromagnetic modes with different symmetries and demonstrate how complicated interactions between convection, differential rotation and magnetic fields may lead to modulation of the basic cycle. For some parameters, Type 1 modulation occurs by the transfer of energy between modes of different symmetries with little change in the overall amplitude; for other parameters, the modulation is of Type 2 where the amplitude is significantly affected (leading to grand minima in activity) without significant changes in symmetry. Most importantly we identify the presence of 'supermodulation' in the solutions where the activity switches chaotically between Type 1 and Type 2 modulation; this is believed to be an important process in solar activity.
