

MODES MINIMISING THE DISSIPATION IN LOW- R_m MHD TURBULENCE BETWEEN WALLS

A. Potherat

We study the case of a turbulent flow of liquid metal confined between two parallel walls under an imposed steady magnetic field. In this case the governing equations reduce to the Navier-Stokes equations with a Lorentz force depending linearly on the velocity field. This particular type of turbulence is strongly anisotropic and contains structures which are more or less elongated in the direction of the magnetic field according to the relative intensity of the latter. Our goal is to derive an upper bound for the attractor dimension of the governing equations for this case. To this end, we look for the sequence of eigenmodes of the dissipation which minimise the dissipation rate. The sequence of those modes are found to strikingly resemble the actual flow. In particular, they feature the same anisotropic properties and tendency towards two-dimensionality. They also mimic very well the behaviour of the so-called Hartmann boundary layers which arise along the walls orthogonal to the magnetic field.