Kinematic dynamos in spheroids and tri-axial ellipsoids

D. Ivers
University of Sydney

The self-exciting kinematic dynamo problem is considered in an electrically-conducting fluid, which occupies a spheroid or tri-axial ellipsoid and which is surrounded by an insulating exterior. Regeneration of the magnetic field is due to laminar flow or turbulent mean-field alpha-effect. Classes of spheroidal or ellipsoidal toroidal-poloidal solenoidal representations are used for the magnetic field and the velocity. The magnetic induction equation is transformed so that it differs from the spherical case by an anisotropic magnetic diffusion and an anisotropic alpha-effect in the mean field case. The equations are discretised spectrally in angle with finite differences in scaled radius. The current-free condition must be solved explicitly in the insulating exterior. Results are presented for various models.