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Analytical properties and exact solutions of anisotropic MHD equilibrium systems in three dimensions

For static reductions of isotropic and anisotropic magnetohydrodynamics (MHD) plasma equilibrium models, a complete classification of point symmetries and conservation laws up to first order is presented. It is shown that the symmetry algebra for the isotropic equations is finite-dimensional, whereas anisotropic equations admit infinite symmetries depending on a free function defined on the set of magnetic surfaces.

A direct transformation is established between isotropic and anisotropic equations, which provides an efficient way of constructing new exact anisotropic solutions. In particular, axially and helically symmetric anisotropic plasma equilibria arise from classical Grad–Shafranov and JFKO equations.

This is a joint work with S. Anco (Brock).