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Conservation laws of incompressible magnetohydrodynamics

A classification of all local conservation laws of kinematic type is obtained for the system of magnetohydrodynamic equations governing incompressible viscous plasmas in which the dynamic and magnetic viscosities are constant. As one new result, conservation of cross-helicity is shown to extend from the ideal case to a special viscous case. A similar classification of conservation laws is derived under reductions by translation symmetries, axial rotation symmetries, and helical symmetries. The results yield many new conservation laws which are expected to be relevant in various physical applications of magnetohydrodynamics.

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