

## Structure-preserving discretization of incompressible MHD systems

*jeudi 4 avril 2024 17:00 (1 heure)*

The magnetohydrodynamics (MHD) systems have several important conservative properties, e.g., the magnetic Gauss law and the conservation of energy and (magnetic, cross, hybrid) helicity in the ideal limit. These conserved quantities encode various kinds of intrinsic symmetry of the equations. To achieve physical fidelity and numerical stability, it is desirable to preserve these conditions precisely in the numerical discretization (up to the machine precision).

In this talk, we first review the conservative properties of continuous MHD systems and the idea of Finite Element Exterior Calculus. Then we construct finite element methods that precisely preserve these properties. Discrete de Rham sequences play a vital role in the study.

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