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Lie-Poisson discretization for incompressible magnetohydrodynamics on the sphere

Friday, 5 April 2024 11:30 (30 minutes)

We give a structure preserving spatio-temporal discretization for incompressible magnetohydrodynamics (MHD) on the sphere. Discretization in space is based on the theory of geometric quantization, which yields a spatially discretized analogue of the MHD equations as a finite-dimensional Lie-Poisson system on the dual of the magnetic extension Lie algebra, for which we develop structure preserving time discretizations. The full method preserves the underlying geometry, namely the Lie-Poisson structure and all the Casimirs. To showcase the method, we apply it to two models for magnetized fluids: incompressible magnetohydrodynamics and Hazeltine's model. This is a joint work with Klas Modin, arXiv:2311.16045.

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