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Hybrid compatible Finite Element and Finite Volume discretization for viscous and resistive MHD

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MHD simulations including small viscous and resistive effects are fundamental for simulations related to magnetic fusion.

However, due to the needed long time simulations and the very different wave speeds, implicit or semi-implicit methods are unavoidable.

On the other hand, div B = 0 as well as other symmetries and invariants need to be preserved by the numerical algorithm.

To this aim, we developed a method based both on Finite Volumes for handling the slow convection and robust for shocks and on the other hand Finite Element Exterior Calculus which enable exact conservation of the main invariant of the system.

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