

doc_1		doc_2		decision	id	
cases	authors	<ul style="list-style-type: none">M. BohmA. R. WintersD. DerigsG. GassnerS. WalchJ. Saur	authors	<ul style="list-style-type: none">Marvin BohmAndrew R. WintersDominik DerigsGregor J. GassnerStefanie WalchJoachim Saur	DUPLICATES	146
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	id	id2936689725232242791	id	id-7934571428348881698		
	abstract	This work presents an extension of discretely entropy stable discontinuous Galerkin (DG) methods to the resistive magnetohydrodynamics (MHD) equations. Although similar to the compressible Navier-Stokes equations at first sight, there are some important differences concerning the resistive MHD equations that need special focus. The continuous entropy analysis of the ideal MHD equations, which are the advective parts of the resistive MHD equations, shows that the divergence-free constraint on the magnetic field components must be incorporated as a non-conservative term in a form either proposed by Powell or Janhunen. Consequently, this non-conservative term needs to be discretized, such that the approximation is consistent with the entropy. As an extension of the ideal MHD system, we address in this work the continuous analysis of the resistive MHD equations and show that the entropy inequality holds. Thus, our first contribution is the proof that the resistive terms are symmetric and positive semi-definite when formulated in entropy space as gradients of the entropy variables. Moreover, this enables the construction of an entropy stable DG discretization for the resistive MHD equations. However, the resulting method suffers from large errors in the divergence-free constraint, since no particular treatment of divergence errors is included in the standard resistive MHD model. Hence, our second contribution is the extension of the resistive MHD equations with proper divergence cleaning based on a generalized Lagrange multiplier (GLM) strategy. We construct and analyze a DG method that is entropy stable for the resistive MHD equations and has a built-in GLM divergence cleaning mechanism. The theoretical derivations and proofs are then verified by several numerical examples...	abstract	This work presents an extension of discretely entropy stable discontinuous Galerkin (DG) methods to the resistive magnetohydrodynamics (MHD) equations. Although similar to the compressible Navier-Stokes equations at first sight, there are some important differences concerning the resistive MHD equations that need special focus. The continuous entropy analysis of the ideal MHD equations, which are the advective parts of the resistive MHD equations, shows that the divergence-free constraint on the magnetic field components must be incorporated as a non-conservative term in a form either proposed by Powell or Janhunen. Consequently, this non-conservative term needs to be discretized, such that the approximation is consistent with the entropy. As an extension of the ideal MHD system, we address in this work the continuous analysis of the resistive MHD equations and show that the entropy inequality holds. Thus, our first contribution is the proof that the resistive terms are symmetric and positive semi-definite when formulated in entropy space as gradients of the entropy variables. Moreover, this enables the construction of an entropy stable DG discretization for the resistive MHD equations. However, the resulting method suffers from large errors in the divergence-free constraint, since no particular treatment of divergence errors is included in the standard resistive MHD model. Hence, our second contribution is the extension of the resistive MHD equations with proper divergence cleaning based on a generalized Lagrange multiplier (GLM) strategy. We construct and analyze a DG method that is entropy stable for the resistive MHD equations and has a built-in GLM divergence cleaning mechanism. The theoretical derivations and proofs are then verified by several numerical examples...		
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