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					DUPLICATES	7
	authors	<ul style="list-style-type: none">Bin ChengQiangchang JuSteve Schochet	authors	<ul style="list-style-type: none">Bin ChengQiangchang JuSteve Schochet		
	title	Convergence rate estimates for the low Mach and Alfvén number three-scale singular limit of compressible ideal magnetohydrodynamics	title	Convergence Rate Estimates for the Low Mach and Alfvén Number Three-Scale Singular Limit of Compressible Ideal Magnetohydrodynamics		
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	abstract		abstract	Convergence rate estimates are obtained for singular limits of the compressible ideal magnetohydrodynamics equations, in which the Mach and Alfvén numbers tend to zero at different rates. The proofs use a detailed analysis of exact and approximate fast, intermediate, and slow modes together with improved estimates for the solutions and their time derivatives, and the time-integration method. When the small parameters are related by a power law the convergence rates are positive powers of the Mach number, with the power varying depending on the component and the norm. Exceptionally, the convergence rate for two components involve the ratio of the two parameters, and that rate is proven to be sharp via corrector terms. Moreover, the convergence rates for the case of a power-law relation between the small parameters tend to the two-scale convergence rate as the power tends to one. These results demonstrate that the issue of convergence rates for three-scale singular limits, which was not addressed in the authors' previous paper, is much more complicated than for the classical two-scale singular limits.		
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