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<tr><td rowspan="2">cases</td><td>doc_1</td><td>doc_2</td><td>decision</td><td>id</td></tr>
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authors	• Downes, Turlough • O\u27Sullivan, Stephen
title	An Explicit Scheme for Multifluid Magnetohydrodynamics
publication_date	2006-01-01 00:00:00
source	SupportedSources.CORE
journal	
volume	
doi	None
urls	• https://core.ac.uk/download/301312394.pdf
id	id6825185801553863475
abstract	When modelling astrophysical fluid flows, it is often appropriate to discard the canonical magnetohydrodynamic approximation, thereby freeing the magnetic field to diffuse with respect to the bulk velocity field. As a consequence, however, the induction equation can become problematic to solve via standard explicit techniques. In particular, the Hall diffusion term admits fast-moving whistler waves which can impose a vanishing time-step limit.Within an explicit differencing framework, a multifluid scheme for weakly ionized plasmas is presented which relies upon a new approach to integrating the induction equation efficiently. The first component of this approach is a relatively unknown method of accelerating the integration of parabolic systems by enforcing stability over large compound time-steps rather than over each of the constituent substeps. This method, Super Time-Stepping, proves to be very effective in applying a part of the Hall term up to a known critical value. The excess of the Hall term above this critical value is then included via a new scheme for pure Hall diffusion
versions	

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authors	• Stephen O'Sullivan • Turlough P. Downes
title	An explicit scheme for multifluid magnetohydrodynamics
publication_date	2005-11-16 14:18:44+00:00
source	SupportedSources.ARXIV
journal	Mon.Not.Roy.Astron.Soc.366:1329-1336,2006
volume	
doi	10.1111/j.1365-2966.2005.09898.x
urls	• http://arxiv.org/pdf/astro-ph/0511478v3 • http://dx.doi.org/10.1111/j.1365-2966.2005.09898.x • http://arxiv.org/abs/astro-ph/0511478v3 • http://arxiv.org/pdf/astro-ph/0511478v3
id	id-3793703646682670713
abstract	When modeling astrophysical fluid flows, it is often appropriate to discard the canonical magnetohydrodynamic approximation thereby freeing the magnetic field to diffuse with respect to the bulk velocity field. As a consequence, however, the induction equation can become problematic to solve via standard explicit techniques. In particular, the Hall diffusion term admits fast-moving whistler waves which can impose a vanishing timestep limit. Within an explicit differencing framework, a multifluid scheme for weakly ionised plasmas is presented which relies upon a new approach to integrating the induction equation efficiently. The first component of this approach is a relatively unknown method of accelerating the integration of parabolic systems by enforcing stability over large compound timesteps rather than over each of the constituent substeps. This method, Super Time Stepping, proves to be very effective in applying a part of the Hall term up to a known critical value. The excess of the Hall term above this critical value is then included via a new scheme for pure Hall diffusion.
versions	

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