MHD Simulations of Jets with Applications to the Sun

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Overview

Coronal Heating

- Sumerise the problem.

TRQ

- Explain the what it is
- Include images from scullions thesis

Scientific Goal

- Clearly state the problem you are investigating
- Why should they care or what the use in it?

History

- Talk a bit of VAC.
- Purpose of the code
- Strucutre of the code

AMR

- diagrams to explain
- example with single movie with moving mesh.

Local Error Estimation

Outline AMR criteria.

MHD Module

$$\partial_t \rho + \nabla \cdot (\mathbf{v}\rho) = 0 \tag{1}$$

$$\partial_t(\rho\mathbf{v}) + \nabla \cdot (\mathbf{v}\rho\mathbf{v} - \mathbf{B}\mathbf{B}) + \nabla p_{tot} = 0, \tag{2}$$

$$\partial_t e + \nabla \cdot (\mathbf{v}e - \mathbf{B}\mathbf{B} \cdot \mathbf{v} + \mathbf{v}p_{tot}) = \nabla \cdot (\mathbf{B} \times \eta\mathbf{J}), \tag{3}$$

$$\partial_t \mathbf{B} + \nabla \cdot (\mathbf{v}\mathbf{B} - \mathbf{B}\mathbf{v}) = -\nabla \times (\eta\mathbf{J}). \tag{4}$$

Where:

$$p = (\gamma - 1)\left(e - \frac{\rho\mathbf{v}^2}{2} - \frac{\mathbf{B}^2}{2}\right), \tag{5}$$

$$p_{tot} = p + \frac{\mathbf{B}^2}{2}, \tag{6}$$

$$\mathbf{J} = \nabla \times \mathbf{B}. \tag{7}$$

- Explain why the equations are in this conservative form.
- Explain the addition of source terms (ie gravity).

Set up

- Show line plots of profiles used. Compare against VALC data (see Ronnie PhD student thesis plots).
- Explain the BC conditons you are using.
- Video of the background being stable.
- Explain the driver of the jet.

Conclusion

Future Plans