Dissipative relativistic fluid dynamics and shock waves

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This talk compares various descriptions of dissipative relativistic fluid dynamics as second-order hyperbolic four- or five-field systems

$$\sum_{\beta=0}^{3} \frac{\partial}{\partial x^{\beta}} \left(T^{a\beta}(\psi) \right) = \sum_{\beta=0}^{3} \frac{\partial}{\partial x^{\beta}} \left(\sum_{c=0}^{N-1} \sum_{\delta=0}^{3} B^{a\beta c\delta}(\psi) \frac{\partial \psi_c}{\partial x^{\delta}} \right), \quad a = 0, ..., N-1, \quad N = 4 \text{ or } 5,$$

thus [1] and [2], regarding the question of whether all Lax shocks admit smooth dissipation profiles. Part of the results have appeared as [3].

Acknowledgements

References

[1] H. Freistühler, B. Temple: *Causal dissipation and shock profiles in the relativistic fluid dynamics of pure radiation*, Proc. R. Soc. A **470** (2014), 20140055.

[2] F. S. Bemfica, M. M. Disconzi, J. Noronha: *Causality and existence of solutions of relativistic viscous fluid dynamics with gravity*, Phys. Rev. D **98** (2018), 104064.

[3] H. Freistühler: Nonexistence and existence of shock profiles in the Bemfica-Disconzi-Noronha model. Phys. Rev. D 103 (2021), 124045.

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