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Simulations of time-dependent non-linear multiple diffusive shock acceleration

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Abstract content

We present a new code (named MARCOS) aimed at the realistic simulation of diffusive shock acceleration in its full time-dependent non-linear developments, and more specifically at the simulation of multiple (ie successive) shocks acceleration as is believed to occur in many astrophysical places (most notably in superbubbles). We present briefly the numerical methods implemented, coupling the hydrodynamical evolution of a shock and the kinetic transport of the cosmic-rays momentum distribution function, as first done by Falle & Giddings. Following Kang and Jones and collaborators, we show how the adaptive mesh refinement technique (AMR) makes it possible to deal with the extremely demanding numerical requirements of realistic (Bohm-like) CR diffusion coefficients. To be even more efficient we have also parallelized the code (in momentum space, using MPI), in order to be able to run multiple shocks simulations at the cost of single shock simulations. We make use of all these numerical developments to present the first simulations of linear and non-linear multiple diffusive shock acceleration.

If this papers is presented for a collaboration, please specify the collaboration

Summary

Reference

Proceedings of the 30th International Cosmic Ray Conference; Rogelio Caballero, Juan Carlos D'Olivo, Gustavo Medina-Tanco, Lukas Nellen, Federico A. Sánchez, José F. Valdés-Galicia (eds.); Universidad Nacional Autónoma de México, Mexico City, Mexico, 2008; Vol. 2 (OG part 1), pages 267-270

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