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Viscomagnetic Effects in Astrophysical Plasmas

Abstract content

The study of transport processes in dilute plasmas in the presence of magnetic fields is a subject that has attracted astrophysicists for over five decades.First attempts to deal with this problem date back to the mid twentieth century with the work of Spitzer and Braginski. The results obtained by the second author, who dealt with the problem using Landau's equation, are still regarded as those providing the most reliable answers. They where, however challenged by Balescu in 1988 who, in probably the most comprehensive treatise in the subject, also using Landau's equation, repeated the calculation solving the kinetic equation by the moments method and filling a gap namely, to place the whole scheme within the formalism of Classical Irreversible Thermodynamics(CIT). The complete solution to this whole endeveour requires however of the use of the full Boltzmann kinetic equation , a task left unfinished in the early work of Chapman and Cowling and W. Marshall.In this talk I will present the full calculation of the stress tensor of a dilute inert plasma in the presence of a magnetic field. The structure of the resulting tensor is identical to the one predicted by CIT with analytical expressions for the five independent viscosities as functions of the particle density, the temperature and the magnetic field.Use of these results in astrophysical problems will be mentioned as time allows.Comparison with Balescu's results will also be presented.

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

Summary

Reference

Primary author(s) : Prof. GARCÍA-COLÍN, Leopoldo (Universidad Autónoma Metropolitana, Iztapalapa)

Presenter(s) : Prof. GARCÍA-COLÍN, Leopoldo (Universidad Autónoma Metropolitana, Iztapalapa)

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