Math 248 - Analysis Seminar

In-Jee Jeong
KIAS

On the Cauchy problem for the Hall-MHD system without resistivity

Abstract:

The Hall-magnetohydrodynamics (MHD) system is obtained from the ideal MHD system by incorporating a quadratic second-order correction, called the Hall current term, that takes into account the motion of electrons relative to positive ions. In recent work with Sung-Jin Oh, we investigated the Cauchy problem in the irresistive case. We first study the linearized systems around a special class of stationary magnetic fields with certain symmetries, and obtain ill- and well-posedness results, depending on the profile of the magnetic field. We then pass from linear to nonlinear results: near a non-zero constant magnetic field, the system is well-posed but it is ill-posed (in the strongest sense of Hadamard) near the trivial magnetic field. We are mainly guided by the behavior of bicharacteristics for the principal symbol. The key tools are: dispersive smoothing in the well-posedness case and construction of degenerating wave packets together with a systematic use of a generalization of the energy identity in the ill-posedness case.

Host: Tarek Elgindi

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