数学与系统科学研究院

计算数学所学术报告

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报告题目：

Filtered Hyperbolic Moment Method for the Vlasov Equation

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报告时间：**2017** 年 **12** 月 **28** 日（周四）

下午 **16:00-17:00**

报告地点：　数学院南楼七层

N702 教室

报告摘要：

Landau damping is one of the fundamental problems in the applications of the Vlasov-Poisson equations. However, in

the numerical simulations of Landau damping, it is observed that an unphysical phenomenon called “recurrence” occurs for most grid-based solvers. In this paper, we study the unphysical recurrence phenomenon arising in the numerical simulation of the VP equations using hyperbolic moment method from a mathematical point of view. It is rigorously proven that all the non-constant modes are damped exponentially by the filters, and formally shown that the filter does not affect the damping rate of the electric energy in the linear Landau damping problem. Moreover, we propose a novel quasi time-consistent filter to suppress the numerical recurrence effect numerically. The filter preserves a lot of physical properties of hyperbolic moment equations (HME). Two viewpoints, collisional viewpoint and dissipative viewpoint, are presented to dissect the filter, and show that the filtered hyperbolic moment method can be treated as a solver of Vlasov equation. Numerical simulations of the linear Landau damping and two stream instability are tested to demonstrate the effectiveness of the filter.

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