Seminar 2023

Math

CRITICAL THRESHOLDS IN PRESSURELESS EULER-POISSON EQUATIONS WITH BACKGROUND STATES

구도완

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장소 과학관 225호

Abstract: We investigate the critical threshold phenomena in a large class of pressureless Euler--Poisson (EP) equations in one dimension. We propose a new method based on Lyapunov functions to construct the supercritical region with finite-time breakdown and the subcritical region with global-in-time regularity of C^1 solutions for the pressureless damped EP equations with background states. We identify for the first time critical threshold curves for the pressureless damped EP equations with repulsive forces and variable background. For the supercritical initial data, the lower and upper bounds on the blow-up time are analyzed, and the large-time behavior of solutions with the subcritical initial data is also obtained. We finally apply our new method to the study of critical thresholds in the damped EP system for a cold plasma, in which the density of electrons is given by the so-called Maxwell--Boltzmann relation. Our result shows the global-in-time existence and uniqueness of classical solutions to the damped EP system for a cold plasma only under the smallness assumption on the initial energy compared to the strength of damping.

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