A Spatial-Temporal asymptotic preserving scheme for radiation magnetohydrodynamics in the equilibrium and non-equilibrium diffusion limit

Speaker: Xiaojiang Zhang (SJTU)

Time: 2022-11-24, 16:10 to 17:00

Location: Rm 1801, Guanghua East Tower

Mentor: Min Tang (SJTU)

Abstract: Radiation magnetohydrodynamics (RMHD) systems couple the ideal magnetohydrodynamics equations with a gray radiation transfer equation. The main challenge is that the radiation travels at the speed of light while the magnetohydrodynamics changes with the time scale of the fluid. The time scales of these two processes can vary dramatically. In order to use mesh sizes and time steps that are independent of the speed of light, some asymptotic preserving (AP) schemes in both space and time are desired. We develop an AP scheme in both space and time for the RMHD system. The performance of the semi-implicit method is presented, for both optically thin and thick regions, as well as for the radiative shock problem. Comparisons with the semi-analytic solutions are given to verify the accuracy and asymptotic properties of the method.