



Universidad
Carlos III de Madrid

Seminario del Instituto Gregorio Millán

Diffusion front capturing schemes for a class of Fokker-Planck equations: Application to the relativistic heat equation

Antonio Marquina

(Universidad de Valencia)

Abstract

In this research work we introduce and analyze an explicit conservative finite difference scheme to approximate the solution of initial-boundary value problems for a class of limited diffusion Fokker–Planck equations under homogeneous Neumann boundary conditions. We show stability and positivity preserving property under a Courant-Friedrichs-Lewy parabolic time step restriction. We focus on the relativistic heat equation as a model of the mentioned limited diffusion Fokker-Planck equations. We analyze its dynamics and observe the presence of a singular flux and an implicit combination of nonlinear effects that include anisotropic diffusion and hyperbolic transport.

We present numerical approximations of the solution of the relativistic heat equation for a set of examples in one and two dimensions including continuous initial data that develops jump discontinuities in finite time. We perform the numerical experiments through a class of explicit high order accurate conservative and stable numerical schemes and a semi-implicit nonlinear Crank-Nicolson type scheme.

Día y hora: Jueves, 3 de noviembre de 2011 a las 12:30 horas

Lugar: Sala 2.1.D03 (Edificio Sabatini), Universidad Carlos III