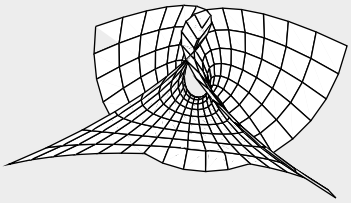

Oberseminar Mathematische Strömungsmechanik

Institut für Mathematik der Julius-Maximilians-Universität Würzburg

Hyperbolic equations - structure preserving methods & other topics

Lorenzo Pareschi

University of Ferrara , Italy

Implicit-Explicit time integration methods and multiscale hyperbolic PDEs

Abstract:

Many problems in physics and engineering involve multiple scales that if not treated properly lead to severe numerical limitations on the discretization parameters. In this talk, we discuss the time discretization of multiscale time dependent PDEs using Implicit-Explicit (IMEX) methods with a special focus on hyperbolic problems. We first review the classical approach within Runge-Kutta methods based on partitioning the transport and source terms that is suitable for the numerical solution of scaling limits dominated by a compressible fluid-dynamic type behavior. We then analyze the case of diffusive and/or low Mach number limits and show how to deal with the additional difficulties induced by the stiffness in the characteristic velocities of the system that can lead to a parabolic type behavior. In particular, this generates a close link between the temporal discretization and the spatial discretization of the equations. Finally, we present generalizations that allow combining the semi-implicit treatment of the stiff terms in the previous paradigm and some recent extensions of these methodologies to multi-step methods.

via Zoom video conference (request the Zoom link from klingen@mathematik.uni-wuerzburg.de)

Friday, Oct. 29 at 3 pm CET

Zu diesem Vortrag sind Sie herzlich eingeladen.

gez. Christian Klingenberg