Seminar/Talk

A 3D Helmholtz solver and efficient time integration methods for viscous flows in the

Patrick Blies

Host:

In fluid dynamics, depending on the nature of the flow, different time scales govern the physical processes. This is a significant hurdle for numerical simulations of these systems since the smallest formal time scale determines the size of the overall time step of the numerical simulation. This can slow down computations considerably. To overcome the obstacle of small formal time scales, and speed up the integration of the governing equations, different methods have been implemented into the ANTARES code the code used by our group to simulate, amongst other things, convection in pulsating and non-pulsating stars and double-diffusive convection. The first part of my talk will focus on the advancement of the applicability of one of these methods: a strong stability preserving implicit-explicit (IMEX) Runge-Kutta scheme for efficient time-integration of stiff equations.
The partial differential equation which results from the implicit part of the IMEX scheme has non-constant coefficients which are either dependent on space only in which case the equation to be solved is linear or are dependent on space and temperature, e.g. in which case the equation is nonlinear. To solve this arising (non-) linear equations of Helmholtz type, I have derived and implemented a multigrid method for both the linear and nonlinear, variable coefficients Helmholtz equation in three dimensions. This will constitute the second part of my presentation.

Wednesday, December 14, 2016 02:00pm - 03:30pm

Meeting room 2nd floor / Office Bldg West (I21.01.132)

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