ALPEN-ADRIA UNIVERSITÄT KLAGENFURT

Invitation to a Guest Lecture

Prof. Dr. Christian Wieners

Karlsruher Institut für Technologie

“Space-time DG for the linear transport equation”

Z.1.09 | Tuesday, 18 February 2025 | 10:00 a.m.

Abstract

We introduce the model for linear transport within the setting for linear conservation laws, where a density distribution is transported along a flux vector. An example is, e.g., the pollution of oil in the groundwater. In the first step, we recall established discretizations for this application class. Then we consider variational space-time discretizations for the linear transport equation with full upwind discontinuous Galerkin methods in space and time. Based on our convergence analysis for symmetric Friedrichs systems in a mesh-dependent DG we construct an error estimator and show numerically that the adaptive method is efficient. The linear system is solved by a multigrid method in space and time, and we show numerically that the convergence is of optimal complexity. We observe that convergence is obtained also in case of discontinuous solutions without regularity requirements. Finally, we show that in case of local sources and local goal functionals the computational domain can be restricted to a subset of the space-time cylinder and that then a suitable parallel strategy results in a significant reduction of the computational effect.

Barbara Kaltenbacher and the Department of Mathematics look forward to seeing you at the talk!