Mathematics of the Weather 2024



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Further steps towards a Discontinuous Galerkin solver as an alternative dynamical core for the ICON model

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Currently, a new dynamical core for the weather and climate forecast model ICON, based on the Discontinuous Galerkin (DG) method, is under development at the Deutscher Wetterdienst (DWD). The DG method combines conservation of the prognostic variable via the finite volume approach with higher order accuracy via the finite element approach. Additionally it allows the use of explicit time integration schemes and is applicable on massively-parallel computers due to its very compact discretization stencils.

Some further steps in this development will be presented. Some optimizations have been achieved with the horizontally explicit-vertically implicit (HEVI) treatment by the use of the collocation method (DG-SEM) and implications with the use of HEVI together with the boundary conditions are discussed. Two different versions of the Euler equations with regard to the thermodynamic variable are compared and discussed. Now diffusion can be treated in the HEVI solver, too, and first results with a one-equation TKE turbulence model will be presented.

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