

# NEWSLETTER

## of the Work Group Mathematical Fluid Mechanics

### 2nd newsletter 2021

#### Paper submitted

The paper: J. Haack, C. Hauck, C. Klingenberg, M. Pirner, S. Warnecke, "A consistent BGK model with velocity-dependent collision frequency for gas mixtures" has been submitted, [view PDF](#). This is a theoretical paper, where the Maxwellians needed to be generalized using a variational approach. In a future follow up paper this procedure lends itself to a numerical method.

#### Eva Horlebein is awarded a PhD stipend from the Heinrich Böll Stiftung



The [Heinrich Böll Stiftung](#) is the political foundation of the Green Party that, among other things, gives out PhD stipends. Eva has been awarded such a stipend for her PhD Project "Ermitteln eines geeigneten Lösungsbegriffs für die kompressiblen mehrdimensionalen Eulergleichungen".



#### Kathrin Hellmuth receives a prize by the Vogel Stiftung

The [Vogel Foundation](#) has awarded a prize in the field of artificial intelligence, machine learning and big data to Kathrin Hellmuth for her Master thesis (*Computing Black-Scholes with uncertain volatility - a machine learning approach*).

The prize ceremony will take place at the [Center for Artificial Intelligence in Data Science Würzburg](#) on Feb. 12 during their [AI-talks](#).

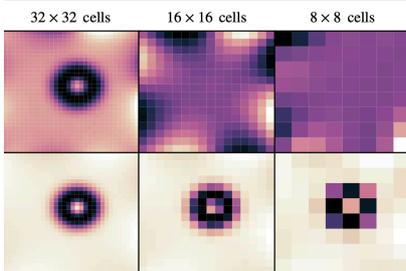
The basic idea is to show that the dual function  

$$z(\lambda; \varrho) = \mu^{kk}(\exp^k) - \lambda \cdot \varrho$$
 is differentiable and attains its minimum on  $\Lambda$  for any  $\varrho \in \mu^{kk}(D_{kk})$ .

*The theorem that proves the above statement from the paper is tricky and subtle.*

## Paper accepted

The paper: Berberich, J., Chandrashekar, P., Klingenberg, C.: "High order well-balanced finite volume methods for multi-dimensional systems of hyperbolic balance laws" has been accepted for publication in [Computers and Fluids](#) [view the PDF of the paper](#). This is a nice numerical method to exactly preserve any solution of the PDE given a-priori, using what we call the subtraction method.



Here is a stationary solution (a vortex) of the equations of ideal magnetohydrodynamics. This vortex gets smeared out by a standard numerical method as the grid is coarsened, which can be seen in the top row. The numerical method introduced in this paper captures this vortex even on a very coarse grid, see the bottom row.

## Upcoming scientific conferences

I encourage you to click the links and check, where you may want to participate.

### 2021:

- Feb. 8 - 10: [Methods and models of kinetic theory 2022](#) in Torino, Italy, organized among others by Maria Groppi
- March 1 - 5: Oberwolfach: [Hyperbolic Balance Laws: modeling, analysis, and numerics](#), organized among others by Remi Abgrall and Maria Lukacova
- March 1 - 5, [SIAM Conference on Computational Science and Engineering](#), online
- March: Special program on Numerical Methods for Nonlinear Hyperbolic PDEs; at SUSTech, Shenzhen, China: organized by Alex Kurganov (still in its planning stage)
- March 22- 26: [Kinetic Equations: From Modeling, Computation to Analysis](#), in Marseille, France, organized by Shi Jin (still in its planning stage)
- March 22 - 26: [HIGH ORDER NONLINEAR NUMERICAL METHODS FOR EVOLUTIONARY PDES: THEORY AND APPLICATIONS \(HONOM\)](#) in Braga, Portugal, organized by Raphael Loubère und Stephane Clain
- April: [Nils-Henrik Risebro's birthday conference](#) in Oslo, Norway (still in its planning stage)
- May 24 - 28: [The Legacy of Carlo Cercignani: from Kinetic Theory to Turbulence Modeling](#) Milan, Italy, organized among others by Tommaso Ruggeri
- May: [Sharing Higher-order Advanced Research Know-how on Finite Volume \(SHARK-FV\)](#) in Portugal, organized by Raphael Loubère und Stephane Clain (still in its planning stage)
- June 21 - 24: [SIAM Conference on Mathematical & Computational Issues in the Geosciences \(GS21\)](#), in Milan, (still in its planning stage)
- June 28 - July 2: [18th International Conference on Hyperbolic Problems, Theory, Numerics, Applications \(HYP 2020\)](#), (still in its planning stage)
- July 5 - 9: [THE BOLTZMANN EQUATION: IN THE TRAIL OF TORSTEN CARLEMAN](#), near Stockholm, Sweden
- July 12 - 16: [International Conference on Spectral and Higher Order Methods ICOSAHOM 2020](#), Vienna (online only), Wasilij and myself plan to run a minisymposium there

### 2022:

- July 18 - 22, 2022: [When Kinetic Theory meets Fluid Mechanics](#), Zürich
- Sept. 5 - 9, 2022: [10th International Conference on Numerical Methods for Multi-Material Fluid Flow \(MULTIMAT 2021\)](#) in Zürich, organized by Remi Abgrall