

# NEWSLETTER

## of the Work Group Mathematical Fluid Mechanics

### *Second newsletter*

In this newsletter among other things I want to get you up-to-date on papers that have been submitted, are under revision or have been accepted since March (see p. 2). *Christian Klingenberg*

#### **Next lecture in the Seminar Structure Preserving Methods on Tuesday, Oct. 13**

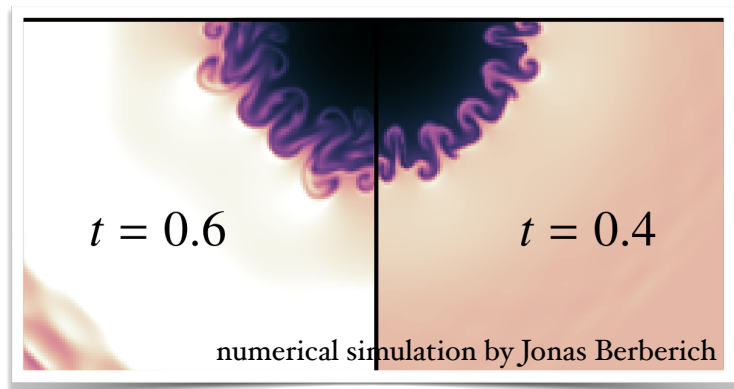
The upcoming lecture by Philippe Helluy (Strasbourg) in our seminar series "Structure preserving methods for hyperbolic equations" ([click here](#)) will take place on **Tuesday**, Oct. 13, see here. He will report among other things on work that our group participated in (Lukas Thanhäuser).

#### **recent birthdays:**

October 2: Eva Horlebein

October 10: Farah Kanbar

***Happy Birthday!***



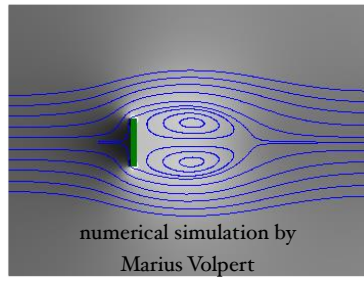
### **Jonas Berberich submitted his PhD thesis**

On Oct. 5 Jonas Berberich submitted his PhD thesis titled "*Fluids in Gravitational Fields - Well-Balanced Modifications for Astrophysical Finite-Volume Codes*".

This work results from a close collaboration with the astrophysicist Fritz Röpke from Heidelberg, where they compute the evolution of stars. He finds numerical schemes for compressible flows that exactly reproduce certain stationary solutions. This crucial for the astrophysical application at hand.

Jonas' PhD defense is tentatively planned for Friday, Dec. 18.

## Marius Volpert submitted his Bachelor thesis



On Sept. 22 Marius Volpert submitted his Bachelor thesis titled "Numerik der Euler- und Magnetohydrodynamik Gleichungen". He implemented finite volume schemes for these equations.

## Papers of by our group since March:

- These are papers that within the last half year
- i.) have been submitted to a journal,
  - ii.) are under revision after a first review with the journal (this is a good sign),
  - iii.) have been accepted to a journal.

### Wasilij Barsukow:

- Barsukow, W., Klingenberg, C.: "Exact solution and a truly multi-d Godunov scheme for the acoustic equations", submitted (2020) [view PDF](#)

- Barsukow, W. Berberich, J., Klingenberg, C.: "On the active flux scheme for hyperbolic PDEs with source terms", submitted (2020) [view PDE](#)

### Marlies Pirner:

- Herzing, T., Klingenberg, C., Pirner, M.: "Hypocoercivity of the linearized BGK-equation with stochastic coefficients", submitted (2020) [view PDF](#)

- G. Bae, C. Klingenberg, M. Pirner, S. Yun: "BGK model of the multi-species Uehling Uhlenbeck equation", accepted in Kinetic and Related Models (2020) [view PDF](#)

### Simon Markfelder:

- S. Markfelder: Convex Integration Applied to the Multi-Dimensional Compressible Euler Equations, submitted to Springer Lecture Notes in Mathematics

- E. Feireisl; C. Klingenberg; S. Markfelder, "On the density of 'wild' initial data for the compressible Euler system", accepted in Calculus of Variations (2020) [view PDF](#)

- C. Klingenberg, O. Kreml, V. Macha and S. Markfelder: "Shocks Make the Riemann Problem for the Full Euler System in Multiple Space Dimensions Ill-posed", accepted in Nonlinearity (2020) [view PDF](#)

### Jonas Berberich:

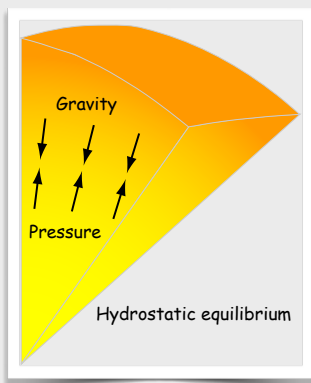
- Berberich, J., Käppeli, R., Chandrashekar, P., Klingenberg, C.: "High order discretely well-balanced methods for arbitrary hydrostatic atmospheres", submitted (2020) [view PDF](#)

- J. Berberich, C. Klingenberg: "Entropy Stable Numerical Fluxes for Compressible Euler Equations which are Suitable for All Mach Numbers", Proceeding of Numhyp 2019, SEMA SIMAI Springer Series (2020) [view PDF](#)

- Berberich, J., Chandrashekar, P., Klingenberg, C.: "High order well-balanced finite volume methods for multi-dimensional systems of hyperbolic balance laws, submitted & in revision (2020) [view PDF](#)

**new Master students:**

**On October 5  
Claudia Knorr began  
with her Master  
thesis.**



She plans to use the astrophysics code by Fritz Röpke (Heidelberg) to do parameter studies. Jonas Berberich will co-supervise this thesis.

**On October 12,  
Lena Baumann will  
begin with her Master  
thesis.**

$$\frac{\partial f}{\partial t} + \mathbf{v} \cdot \nabla_{\mathbf{x}} f + \frac{q}{m} (\mathbf{E} + \mathbf{v} \times \mathbf{B}) \cdot \nabla_{\mathbf{v}} f = 0$$

She plans to do theoretical work on the Vlasov equation.

Andrea Thomann:

-A. Thomann, G. Puppo, C. Klingenberg, "An all speed second order well-balanced IMEX relaxation scheme for the Euler equations with gravity", accepted in Journal Of Computational Physics (2020) [view PDF](#)

-A. Thomann, Zenk, M. G. Puppo, C. Klingenberg, "An all speed second order IMEX relaxation scheme for the Euler equations", accepted in Commun. Comp. Phys. (2020) [view PDF](#)

Farah Kanbar:

- Kanbar, Touma, Klingenberg: "Well-balanced Central Schemes for the One and Two-dimensional Euler Systems with Gravity", Applied Numerical Mathematics, Vol. 156, pp. 608-626, (2020) [view PDF](#)

- Emako, F. Kanbar, C. Klingenberg, M. Tang "The stationary preserving property of some asymptotic schemes for kinetic equations", submitted (2020) [view PDF](#)

Sandra Warnecke:

-Hahn, B, Kienle-Garrido, Klingenberg, C., Warnecke, S.; "Using the Navier-Stokes equation for motion estimation in dynamic imaging", submitted (2020) [view PDF](#)

Jayesh Badwaik:

- Badwaik, J., Klingenberg, C. Risebro, N.H.: "Multilevel Monte Carlo finite volume methods for random conservation laws with discontinuous flux", submitted, in revision (2020) [view PDF](#)

Christian Klingenberg:

- Klingenberg, C., Lai, R., Li, Q.: "Reconstruction of the emission coefficient in the nonlinear radiative transfer equation", accepted in SIAM Journal on Applied Mathematics (2020) [view PDF](#)

- Klingenberg, C; Kurganov, A.; Liu, Y.; Zenk, M.: "Moving-Water Equilibria Preserving HLL-Type Schemes for the Shallow Water Equations", accepted in Communications in Mathematical Research (2020) [view PDF](#)

- C. Klingenberg: book review for "Numerical Methods for Conservation Laws: From Analysis to Algorithms" by Jan Hesthaven, SIAM Review 62(3), pp. 729-739 (2020) [view PDF](#)

- Y. Hu, C. Klingenberg; Y. Lu: "Zero relaxation time limits to a hydrodynamic model of two carrier types for semiconductors": accepted in Mathematische Annalen (2020) [view PDF](#)

- Xue, Klingenberg, Lu, Zhang: "Zero relaxation time limits to isothermal hydrodynamic model for semiconductor", accepted in Applied Mathematics Letters, vol. 109 (2020) [view PDF](#)

- C. Klingenberg, Y. Lu, Q. Sun: "Global weak solutions for a nonlinear hyperbolic system", accepted in Acta Mathematica Scientia (2020) [view PDF](#)