

NEWSLETTER

of the Work Group Mathematical Fluid Mechanics

Why a newsletter?

Since March 23 we have been in home office. In the half year since then, even though we have daily group meetings via Zoom, I find it difficult to disseminate news on what happens in our group. This newsletter is an attempt to rectify this. I hope to send it out regularly. Christian Klingenberg

Seminar Structure Preserving Methods attended by over 50 persons

Our Zoom seminar series "Structure preserving methods for hyperbolic equations" is being attended by more than 50 researches from over 10 countries. For more details on this series [click here](#).

Next speaker in the Structure Preserving Methods seminar is a student of Godunov

The speaker on Oct. 8 in the seminar series "Structure preserving methods for hyperbolic equations", Evgeniy Romenskiy (Novosibirsk, Russia) obtained his PhD with Sergei Godunov in Novosibirsk. The work he will lecture on originates from his collaboration with Godunov.

[Click here](#) for the abstract of his lecture.



Marlies Pirner new postdoc with us

From Oct. 1 Marlies Pirner is our new postdoc. She obtained her PhD in 2018 here in Würzburg. Afterwards she stayed at Vienna University with Christian Schmeiser as her post-doc advisor. Her specialty are kinetic equations. For more details about here work [click here](#). Feel free to [contact her](#) if you have questions.

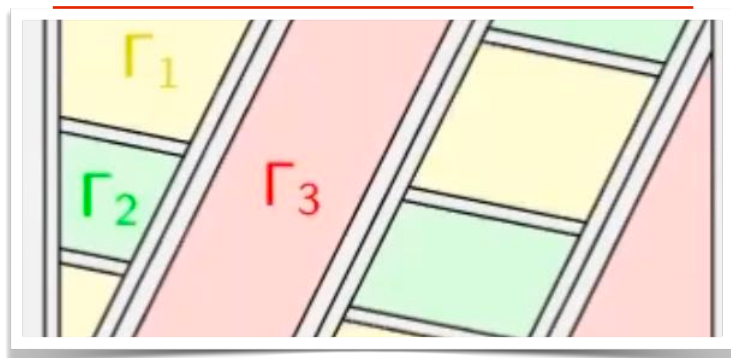
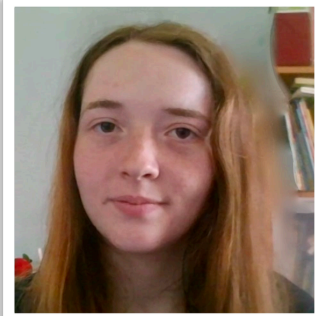


illustration by Simon Markfelder, see Fig. 5.4 in his book:

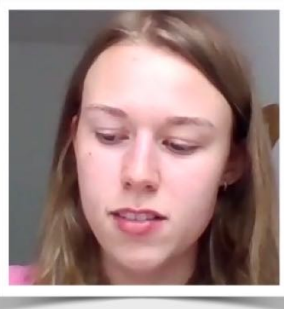
S. Markfelder: "Convex Integration Applied to the Multi-Dimensional Compressible Euler Equations", Springer Lecture Notes in Mathematics 2294, Springer (2021), [click here](#)

Eva Horlebein - new PhD student



From September on Eva Horlebein is a new PhD student with us. Her Master thesis was supervised by Prof. Waldmann. For her PhD she will switch to a new topic, studying solutions of the multi-dimensional compressible Euler equations. In some sense she will continue the work of Simon Markfelder.

Kathrin Hellmuth - new PhD student



From October on Kathrin Hellmuth is a new PhD student with us. She will work on inverse problems and uncertainty quantification. An important ingredient will be approximating macroscopic fluid models by kinetic equations.

Simon Markfelder's PhD defense on Oct. 20

Simon Markfelder submitted his PhD thesis "Convex integration applied to the multi-dimensional compressible Euler equations" on August 3. The evaluation letters for his thesis arrived by Sept. 15. The defense of his thesis is scheduled for Tuesday, Oct. 20 at 2 pm. The examination committee will be Prof. Schlömerkemper as the chairperson, Prof. Feireisl and myself as the examiners and Dr. Marlies Pirner as the "Beisitzerin".



Bachelor and Master theses submitted since March:

Kathrin Hellmuth submitted her Master thesis

On **May 5** Kathrin Hellmuth submitted her Master thesis "Computing the Black-Scholes equation with uncertain volatility using the stochastic Galerkin method and a Bi-Fidelity approach". She considered the Black-Scholes equation with a stochastic volatility coefficient and computed the stochastic solution using a stochastic Galerkin method. She made this computation quite efficient using a machine learning approach. Liu Liu (now in Hong Kong) gave valuable advice.

She now began as a PhD student with us.

Tobias Herzing submitted his Master thesis

On **June 26** Tobias Herzing submitted his Master thesis "On hypocoercivity for a kinetic BGK equation with uncertainty". This was co-supervised by Marlies Pirner. The thesis proved hypocoercivity for a stochastic kinetic equations for which this had not been proven before.

Tobias at first continued as a PhD student with us, but on Oct. 1 he left and began a PhD in economics in Bamberg.

Moritz Beck submitted his Bachelor thesis

On **July 2** Moritz Beck submitted his Bachelor thesis "Machine Learning For Audio Classification". He worked for part of this work with the company *Wölfel*. Using a machine learning tool he classified audio data.



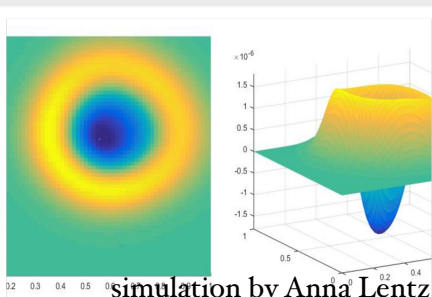
simulation by Lukas Berberich

new Bachelor and Master students since March 2020:

since April: Julian Meusel (Master), transforming a variant of the Einstein equations into a system of hyperbolic conservation laws, numerical simulation for these using a software package. This is closely related to work by Prof. Erdmenger.

since July: Lukas Krines (Bachelor), Computing the heat equation with a stochastic heat conductivity coefficient using the stochastic Galerkin method.

since October, Claudia Knorr (Master) using an astrophysics code to do parameter studies, in conjunction with Fritz Röpke (Heidelberg)



simulation by Anna Lentz

Kardelen Koc submitted her Master thesis

On **July 30** Kardelen Koc submitted her Master thesis “A Well-balanced Scheme for Friedrichs Systems with linear relaxation”. She had taken a method described by Bruno Després in *Després, Bruno, and Christophe Buet. "The structure of well-balanced schemes for Friedrichs systems with linear relaxation." Applied Mathematics and Computation 272 (2016)* and extended it to Euler with gravity.

Kardelen will begin a job with an insurance company in December.

Anna Lentz submitted her Bachelor thesis

On **August 5** Anna Lentz submitted her Bachelor thesis “Finite-Volumen-Verfahren mit Well-Balancing zur Lösung der Eulergleichungen”. She took the well-balanced method described in *Berberich, J., Chandrashekar, P., Klingenberg, C.: "High order well-balanced finite volume methods for multi-dimensional systems of hyperbolic balance laws, submitted (2020)* and implemented it.

Anna Lentz will be a HiWi for me this semester.

Lukas Berberich submitted her Master thesis

On **August 10** Lukas Berberich submitted his Master thesis “Linear Elasticity: Uncertainty Quantification”. His work is based on *Hahn, B., Kienle-Garrido, Klingenberg, C., Warnecke, S.: "Using the Navier-Stokes equation for motion estimation in dynamic imaging", submitted (2020)*, where the moving image reconstruction is accomplished by numerically simulating the moving body. Lukas Berberich numerically studied this movement by taking uncertainties into account.

Lukas is now looking for a job in industry.

Lukas Baumgärtner submitted his Master thesis

On **Sept. 9** Lukas Baumgärtner submitted his Master thesis “Total Generalized Variation with Finite Elements with Application in Image Processing and Shape Optimization”. He was supervised by Stephan Schmidt.

Lukas’ job as my *scientific coordinator* will be taken over by Kathrin Hellmuth. He is about to begin his PhD thesis with Stephan Schmidt in Berlin.