NEWSLETTER

of the Work Group Mathematical Fluid Mechanics

Newsletter no. 2 (2024)

Lena's paper has been accepted

The paper *Lena Baumann, Lukas Einkemmer, Christian Klingenberg, Jonas Kusch: "Energy stable and conservative dynamical low-rank approximation for the Su-Olson problem"* has been accepted by the SIAM Journal on Scientific Computing.

The low rank numerical method (attributed to Christian Lubisch and Lukas Einkemmer) holds the promise of being quite efficient for kinetic equations. This paper is an important first step to make this rigorous .

Paper with Yu-Chen Cheng submitted

The paper *Yu-Chen Chen, Christian Klingenberg, Rony Touma: "A Well-Balanced Method for an Unstaggered Central Scheme, the one-space Dimensional Case"* has been submitted to a journal. Based on *Yu-Chen's master thesis* it combines a central scheme with the deviation well-balanced method.

Philippe Helluy will give 3 lectures

Philippe Helluy (Strasbourg) will visit us Feb, 19 - 23 and give a series of 3 lectures on *Kinetic approximations to hyperbolic equations*. *This link* sends you to a 2004 paper of Perthame on this theoretical and numerical method. Philippe will explain *(see here)* today's status especially of the numerical method. It certainly will be worth your while to attend.

Simon Markfelder begins his Habilitation

A university career requires that after the PhD one continues to develop one's scientific abilities. On the average six year after a PhD one has reached a scientific maturity and breadth, so that one is qualified for a professorship. The ***habilitation*** is a degree that attests to this qualification.

At our math department one obtains the habilitation by going through a four year procedure that is supervised by a habilitation commission. Simon Markfelder has now begun his habilitation procedure under the supervision of Eduard Feireisl (Prague), Emil Wiedemann (Erlangen) and myself. The most important requirement for Simon is to continue to publish excellent papers. The main duty of the habilitation commission will be to assess Simon's scientific maturity at the end of the habilitation period.

Good luck, Simon!

My MathSciNet score

AMERICAN MATHEMATICAL SOCIETY
MathSciNet
Mathematical Reviews

Mathematical Reviews (founded 83 years ago) is a journal published by the American Mathematical Society (AMS) containing brief synopses of almost all mathematical articles. In addition it contains citation information of mathematicians. The idea is that the number of citations (called *MathSciNet* score) of a scientist attest to the impact their work has had on the field.

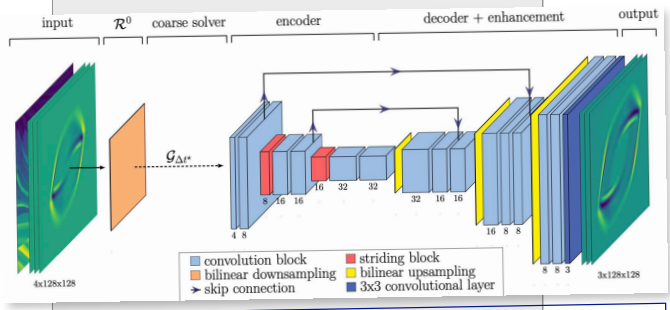
When I was a young mathematician I dreamt of reaching a high MathSciNet score. I am happy to report that this has now happened: this year my MathSciNet score has gone beyond 1000.

Naturally, to assess one's impact requirers more than this citation number. It varies with one's field of research. Also there are other numerical indices associated to a researcher. Still in math the MathSciNet score is often consulted when someone applies for an academic job or a grants, probably because it is easy to work with one number.

Luis Kaiser submitted his Master thesis

Luis Kaiser has submitted his Master thesis: *Fast, Accurate, and Scalable Numerical Wave Propagation: Enhancement by Deep Learning*. It was co-supervised by *Richard Tsai* from the Univ. of Texas in Austin.

The wave equation with strongly varying propagation speeds is solved numerically and made efficient using machine learning.



A schematic of the neural network used in Luis Kaiser's Master thesis

Paper with Luis Kaiser submitted

The paper *"Efficient Numerical Wave Propagation Enhanced by an End-to-End Deep Learning Model"* has been submitted to a journal. It summarizes his Master thesis (see above).

A workshop on Active Flux in Cambridge

Wasilij Barsukow (jointly with Remi Abgrall and Christiane Helzel) are organizing a small workshop in the presence of Phil Roe on the Active Flux method in Cambridge, UK. The workshop now has a *webpage*.

Active Flux is a 10 year old numerical method (first formulated by Phil Roe) for conservation laws. In this workshop this will be explored by learning from fields usually not featured in numerics of conservation laws, like finite elements that preserves structural properties of the PDE and moment methods.

Lisa Lechner and myself will attend.

Upcoming scientific conferences

Click on the links and check where you might want to participate.

- Feb. 26 - March 1, 2024: *Oberwolfach workshop on Hyperbolic Balance Laws* will be organized by Remi Abgrall, among others

- March 3 - May 31, 2024: *Numerical Methods for Nonlinear Hyperbolic PDEs*, in Shenzhen, China, organized by Alex Kurganov, Chi-Wang Shu and Alina Chertok

- March 6 - 8, 2024: *A Small Workshop on Active Flux*, in Cambrige, UK, organized among others by Wasilij Barsukow

- March 18 - 22, 2024: *Annual meeting of the GAMM* in Magdeburg, Germany, organized among many others by Peter Benner

- June 5 - 7, 2024: Analysis of dissipation in compressible and inviscid fluids, in Konstanz, Germany, organized among others by Emil Wiedemann

- July 1 - 5, 2024: *XIX International Conference on Hyperbolic Problems: Theory, Numerics and Applications (HYP 2024)* in Shanghai, China, at Shanghai Jiao Tong University, organized by Yachun Li & Ya-Guang Wang

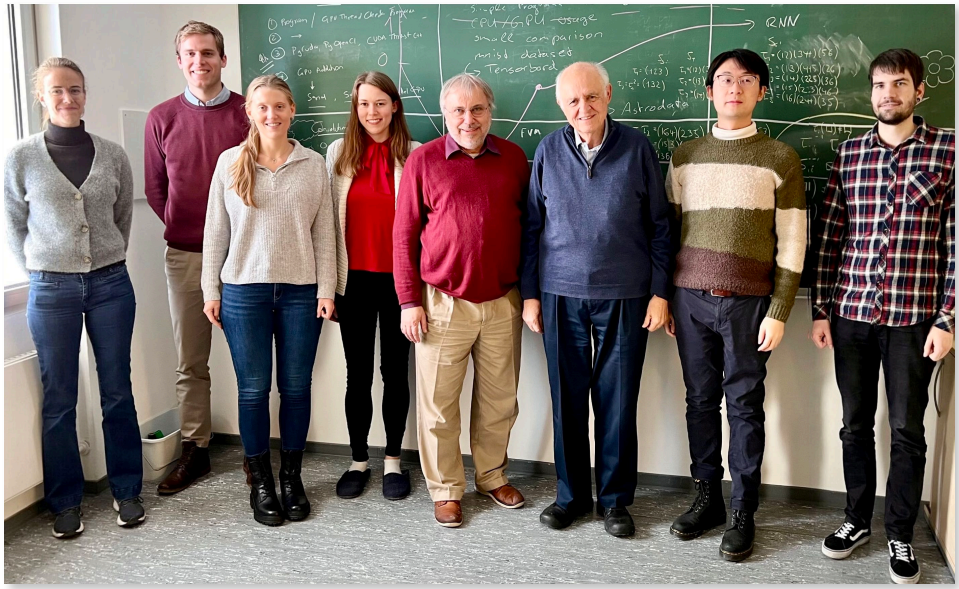
- July 8 - 11, 2024: *Modern Perspectives in Applied Mathematics: Theory and Numerics of PDEs* in Zürich, organized by Sid Mishra

- Sept. 9 - 13, 2024: *Conference on high-order nonlinear numerical methods for evolutionary PDEs* (HONOM2024) on the Crete Island, Greece, organized by Elena Gaburro

- June 9 - 13, **2025**: NumHyp 2025, in Darmstadt

- Sept. 14 - 20, 2025: Hirschegg Workshop, in the Kleinwalsertal, Austria, organized by Gerald Warnecke and others

- sometime in **2026**: Finite Volume and Complex Applications 11, in Münster, Germany



Constantine Dafermos visited us in Würzburg Jan. 23 - 26. We had lots of opportunities to talk with him both scientifically and personally, which was highly rewarding. Above you see part of our work group with him, PhD students and post-docs.

From l.t.r.: Lisa Lechner, Claudius Birke, Lena Baumann, Kathrin Hellmuth, myself, Costas Dafermos, Junming Duan, Simon Markfelder.