NEWSLETTER

of the Work Group Mathematical Fluid Mechanics

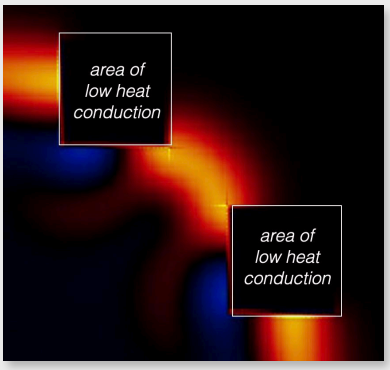
Newsletter no. 13 (2025)

News about a papers:

Junming Duan submitted a paper

The article *Junming Duan, Wasilij Barsukow, and Christian Klingenberg: "An asymptotic-preserving active flux scheme for the hyperbolic heat equation in the diffusive scaling"* has been submitted to a journal.

The solutions of a certain kinetic partial differential equation (under the right scaling) converge to those of a macroscopic equation, here the heat equation. Given a numerical discretization of this kinetic equation, and applying the same scaling to the discretization, this paper shows that using the Active Flux method leads to a discretization of the macroscopic heat equation. To achieve this, a modification of the scheme is not necessary. *Active Flux is automatically asymptotic preserving*, is the (simplified) message of this article.



Here we see a circular heat wave emanating from a small central region into a region with strongly varying heat coefficients. The temperature is shown (yellow/red is hot). It does not penetrate the square boxes with very low heat conduction. This simulation is done in the asymptotic regime without changing the algorithm of the kinetic equation.

Nikhil Manoj will join our workgroup

Nikhil Manoj is about to receive his PhD from the *Indian Institute of Science Education and Research* in Thiruvananthapuram (IISER TVM), which is near the southern tip of India. His supervisor, *Sudarshan Kumar K.*, received his PhD from the Tata Institute (TIFR) in Bangalore, having worked among others with Praveen, and has been a postdoc with us Würzburg.

Nikhil Manoj

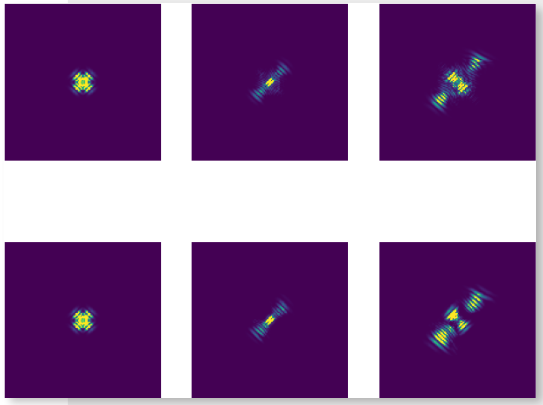
Nikhil Manoj's PhD work was on numerical analysis of conservation laws, see *here*. For his first post-doc position he will join our work group in Würzburg. He plans to begin in the fall of this year.

Nikhil will be working on a project funded by the Deutsche Forschungsgemeinschaft (DFG) together with its Spanish counterpart, the 'Agencia Estatal de Investigación' (AEI). With this grant we plan to move forward our research on a genuinely multi-dim. finite volume scheme called the Active Flux method.

Nikhil Manoj will obtain his PhD from the 'Indian Institute ...' in Thiruvananthapuram, which is marked on the map. It is in the state of Kerala, which has one of the highest living standards in India, due to good governance in that state. Noteworthy is the state's matriarchal tradition.

Miriam Schönleben submitted her Master thesis

The Master thesis *Enhancement of Numerical Wave Propagation Through Deep Learning* was submitted by Miriam Schönleben. She finds an efficient machine learning numerical solution to various types of wave equations. This is a follow-up to an *earlier work* by Richard Tsai and a later one by Luis Kaiser et. al., *see here*.



For $u_{tt} = \nabla \cdot \left((c^2(x))\nabla u\right)$ we see an initial pulse on the left. Time increases to the right. On the top row the equation is solved on a fine grid, on the bottom using a machine learning algorithm, which (after the training is complete) is much more efficient to solve.

Other news:

Mengni Li's Humboldt fellowship begins Feb. 1, 2026

Mengni Li from the Southeast University in Nanjing, China has been awarded a fellowship by the Humboldt foundation to visit us in Würzburg.

Her official Humboldt award letter has now arrived and the dates for her visit are set to be Feb. 1, 2026 until Jan. 31, 2028.

2nd period of the DFG priority program on hyperbolic problems

The priority program of the German Science Foundation (DFG) on hyperbolic differential equations (*see here*) consists of two periods of 3-year each. The second period will begin in Sept. 2026. Research proposals for participation in the 2^{nd} period are due in Jan. 2026. The in person review will be held on April 28, 2026.

Upcoming scientific conferences

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

- Aug. 18 - December. 19, 2025: *Kinetic Theory: Novel Statistical, Stochastic and Analytical Methods*, at the Simons Laufer Mathematical Sciences Institute in Berkeley, California.

- Sept. 1 - 5, 2025: *European Conference on Numerical Mathematics and Advanced Applications* (ENUMATH 2025) in Heidelberg, organized by Barbara Wohlmuth among others

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

- Sept. 24 - 26, 2025: *Workshop on Hyperbolic Problems*, in Nürnberg, organized by Emil Wiedemann and Nicola De Nitti

- Oct. 23 - 24, 2025: *Women in PDEs* in Karlsruhe, organized among others by Marlis Hochbruck

- Oct. 27 - 31, 2025: Numerical Methods for the Kinetic Equations of Plasma Physics (NumKin 2025), organized by Eric Sonnendrücker in Garching (near Munich)

- November 17 – 20, 2025: *SIAM Conference on Analysis of Partial Differential Equations* (PD25), Pittsburgh, Pennsylvania, USA

- December 6 - 8, 2025: Workshop on Active Flux, in Shenzhen, China, organized by Rémi Abgrall and Alexander Kurganov

- March 23 - 27, **2026**: *Hyperbolic problems – a comprehensive approach*, in Würzburg, Germany, organized by Wasilij Barsukow, Simon Markfelder, Marlies Pirner, Fritz Röpke, Emil Wiedemann

- March 30 - April 4, 2026: International Conference on high-order nonlinear numerical methods for evolutionary PDE (HONOM) in Trento, Italy, organized among others by Michael Dumbser

- May 25 - 29, 2026: *20th International Conference on Hyperbolic Problems (HYP2026)*: Theory, Numerics and Applications, in Stuttgart, Germany organized by Maja Lukacova und Christian Rhode

- Sept. 7 - 11, 2026: *12th International Conference on Numerical Methods for Multi-Material Fluid Flow* (MultiMat 2026) at Biarritz, France, organized by Raphael Loubère and others

- mid June **2027**: Numerical Methods for Hyperbolic Problems (NumHyp 2027), in Verona 2027 organized by Elena Gaburro

- late June/early July 2027: International Conference on Spectral and High-Order Methods (ICOSAHOM 2027), in Milan organized Marco Verani among others

Kathrin Hellmuth with Mengni Li at the *Applied Inverse Problems 2025* (AIP 2025), in Rio de Janeiro, Brazil in late July.

Kathrin spoke in a mini-symposium on *Optimal experimental design for inverse problems* that was organized by Barbara Kaltenbacher.