Christian Klingenberg 9. March 2025

NEWSLETTER

of the Work Group Mathematical Fluid Mechanics

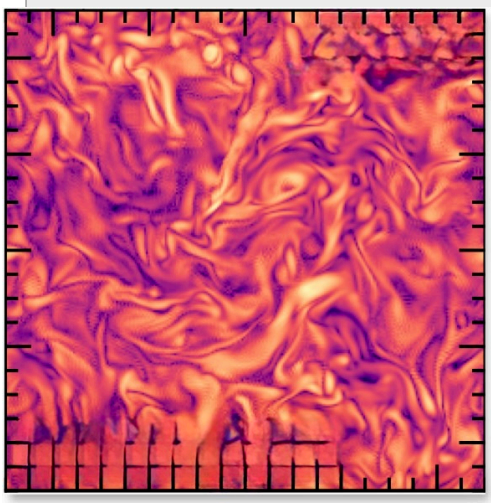
Newsletter no. 4 (2025)

News about a submitted paper:

Paper with Claudius Birke has been submitted

The paper *James Watt, Christoph Federrat, Claudius Birke, Christian Klingenberg: "Mitigating numerical dissipation in simulations of subsonic turbulent flows"* has been submitted to the *Monthly Notices of the Royal Astronomical Society*.

In astrophysics, Magnetohydrodynamic (MHD) simulations of subsonic turbulent flows are crucial. Claudius's PhD thesis introduced a numerical scheme based on an approximate Riemann solver, which is particularly effective for simulating low-Mach turbulent flows. The scheme performs quite well in simulations of turbulent dynamos.

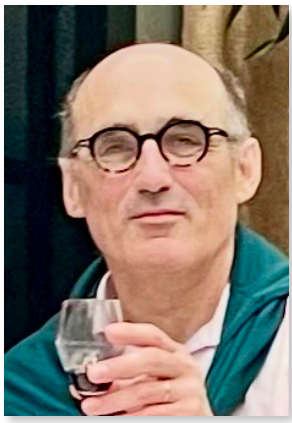


Simulating a turbulent dynamo at Mach 0.01, the vorticity vector $\omega = \nabla \times v$ is depicted. The simulations reveal that Claudius' low Mach solver captures more vorticity compared to competing schemes.

Bruno Després boycotts invitations to visit the USA

The current American administration's inclination to use authoritarian methods of governance has resulted in the violation of fundamental principles enshrined in their constitution, leading to a restriction of scientific freedom within the United States.

In particular, the abrupt and significant cuts in federal funding allocated to American universities have far-reaching consequences for all disciplines, also for applied mathematics. Moreover, the government's blatant disregard for inclusivity has the effect of what can be characterized as discrimination against minority scientists, despite the fact, that a good share of the America science is carried by immigrants.



Bruno Després

All this has prompted some European scientists to reconsider their travel plans to the USA. Notably, *Bruno Després* has decided to boycott invitations to visit the USA. However, not everyone shares his opinion, saying that science flourishes through open exchange, not by restricting it. Bruno argues that precisely these freedoms are being curtailed by the American government, and he feels he would be condoning this, by accepting invitations.

Upcoming conference in Würzburg: *Hyperbolic Problems – a comprehensive view*

A conference on Hyperbolic partial differential equations will be held in Würzburg March 23 - 27, 2026, organized by Wasilij Barsukow, Simon Markfelder, Marlies Pirner, Fritz Röpke and Emil Wiedemann.

Some of the speakers will be Rémi Abgrall, Bruno Després, Shi Jin, Qin Li, among many others.

This conference will be on the occasion of my 70^{th} birthday.

News about conferences:
Applied Inverse Problems 2025

AIP 2025 | Applied Inverse Problems

The biannual conference *Applied Inverse Problems* will take place next in Rio de Janeiro July 28 - Aug. 1, 2025, see here. Reconstructing quantities of interest from indirect observations is discussed there.

Kathrin Hellmuth has been invited to give a talk there in a mini-symposium organized by the Göttingen group on inverse problems.

Workshop Hyperbolic Problems in Nürnberg

Emil Wiedemann and Nicola De Nitti are organizing a workshop on the theory of hyperbolic equations Sept. 24 - 26, 2025 in Nürnberg. Their website now is up, see here.

Active Flux workshop in Shenzhen, China

There will be a workshop on the Active Flux numerical method Dec. 6 - 8, 2025 at *Southern University of Science and Technology* (SUSTech) in Shenzhen, China. It will be organized by Rémi Abgrall and Alexander Kurganov. Alex Kurganov has moved to SUSTech some years ago.

Upcoming scientific conferences

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

Kathrin is attending this Osaka conference

- March 11- 13, 2025: *Synergies of Machine Learning and Numerics*, in Osaka, Japan, organized by Leon Bungert among others

- March 10 - 11, 2025: *Annual Meeting of the DFG Priority program on Hyperbolic equations*, in Darmstadt, organized by Jan Giesselmann and Martin Oberlack

- April 7 - 11, 2025: *Kinetic equations and turbulence* (Bardos' 85th birthday conference) in Gif-sur-Yvette (France, near Paris), organized by François Golse among others

- June 9 - 13, 2025: *Numerical methods for hyperbolic problems 2025* (NumHyp25), in Darmstadt, organized by Jan Giesselmann and others

- June 24 - 27, 2025: *30th Biennial Conference in Numerical Analysis* in Glasgow, organized by persons from the University of Strathclyde, Glasgow

- July 13 - 18, 2025: *International Conference on Spectral and High-Order Methods* (ICOSAHOM), in Montreal, Canada

- July 28 - Aug. 1, 2025: *Applied Inverse Problems 2025* (AIP 2025), in Rio de Janeiro, Brazil

- 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

- 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

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

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

- 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

News about an upcoming visitor:
Visit by Jan Nordström

I had written about Jan Nordström in a previous Newsletter, see here (2nd page). Now the dates of his visit to Würzburg have been finalized. He will visit us **June 15 - 21** for a week. A further visit of his to Würzburg is planned for the week Sept. 7 - 13, 2025.

$$\int f \, \mathrm{d}g \;=\; fg - \int g \, \mathrm{d}f$$

$$\sum_{k=m}^{n} f_k \Delta g_k \;=\; (f_n g_{n+1} - f_m g_m) - \sum_{k=m}^{n-1} g_{k+1} \Delta f_k$$

As shown on the left, integration by parts has a direct analog to summations, known as "Summation by Parts". This is Jan Nordström's preferred technique for proving energy estimates for numerical schemes.