NEWSLETTER

of the Work Group Mathematical Fluid Mechanics

Newsletter no. 10 (2025)

News about 3 Active Flux papers:

Scientific committee of HYP 2026

For the *International Conference on Hyperbolic Problems (HYP2026)* next year in Stuttgart the scientific is as follows:

Rémi Abgrall (Zürich)
Sylvie Benzoni (Lyon, France)
Alberto Bressan (Penn State, USA)
Raimund Bürger (Chile)
Gui-Qiang Chen (Oxford)
Michael Dumbser (Trento, Italy)
Eduard Feiresl (Prague)
Helge Holden (Trondheim, Norway)
Shi Jin (Shanghai)
Christian Klingenberg
Jiang Song (Beijing)
Carlos Pares (Malaga, Spain)
Gabriella Puppo (Rome)
Chi-Wang Shu (Brown Univ, USA)
Eitan Tadmor (Maryland, USA)

The main job of the scientific committee is to decide on the invited speakers for this conference.

HONOM 2026

The next *International Conference on high-order nonlinear numerical methods for evolutionary PDEs (HONOM 2026)* will be held in Trento, Italy from March 30 to April 4, 2026, organized by Michael Dumbser, among others.

This is a bi-yearly series of conferences. The last one took place 2024 in Crete.

Paper by Wasilij Barsukow, Lisa Lechner and others accepted

The paper *Wasilij Barsukow, Janina Kern, Christian Klingenberg, Lisa Lechner: "Analysis of the multi-dimensional semi-discrete Active Flux method using the Fourier transform"* has been accepted for publication in *Communications on Applied Mathematics and Computation* (Springer Verlag).

Here a technique is presented that can identify those types of Active Flux numerical schemes for linear systems of PDEs, that have excellent properties: stationarity preserving, the low Mach property, identify dissipation and dispersion errors, etc. - The paper had also been mentioned *in this newsletter*.

Paper with Junming Duan submitted

The paper *Junming Duan, Praveen Chandrashekar; Christian Klingenberg: "Active flux for ideal magnetohydrodynamics: A positivity-preserving scheme with the Godunov-Powell source term"* has been submitted to a journal.

This is the first successful implementation of the Active Flux scheme for ideal magnetohydrodynamics. One obstacle had been to maintain the $\nabla \cdot \vec{B} = 0$ condition for the magnetic field $\vec{B}$, which is overcome by the use of the (Godunov-Roe-) Powell term.

Paper by Wasilij Barsukow submitted

The paper *Wasilij Barsukow: "An Active Flux method for the Euler equations based on the exact acoustic evolution operator"* has been submitted to a journal.

The original idea of Active Flux (AF) by Phil Roe is to explicitly update point values of the non-linear Euler equations in two and three space dimensions (there are no exact update formulas). Various approximations for this have been found in the past. This paper gives a seemingly simple approximation that works really well. This will be the go-to method for the explicit AF method applied to Euler from now on.
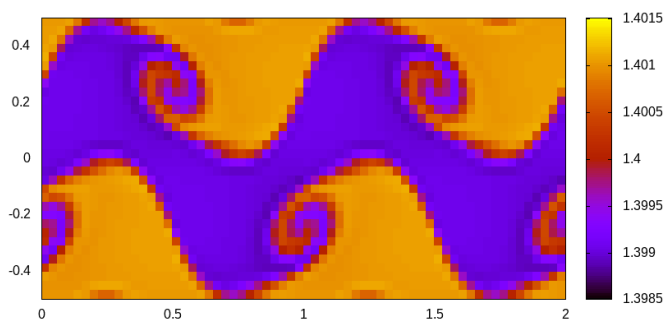

In this simulation a shear flow causing the roll up of vortices is seen. The simulation on the left is done on a coarse grid, but still the vortex is resolved extremely well.

Workshop 'Women in PDEs'

This 2 day workshop *Women in PDEs* in Karlsruhe Oct. 23 - 24, 2025 aims to bring together mainly but not exclusively female scientists working in PDEs.

Rémi Abgrall plans to visit us first half of 2026

Rémi Abgrall is a Humboldt Prize recipient. As part of his stay in Germany he will visit us in Würzburg sometime in the first half of 2026.
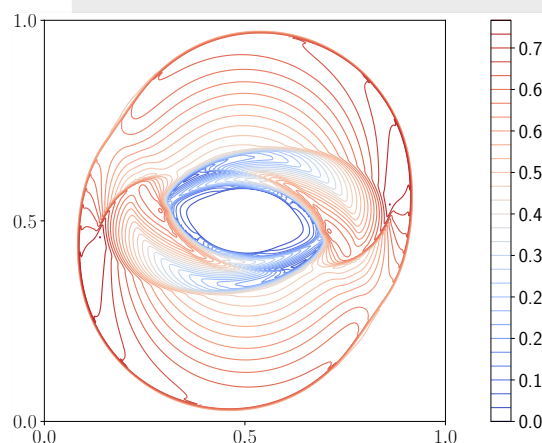

These are simulations taken from the MHD paper with Junming Duan (see page 1).

Above the rotar problem is seen, where the pressure of a rotating disc consisting of dense fluid is seen.

Below a shock - cloud interaction can be seen, where $\|v\|$ is shown of a planar shock that has moved through a circular cloud.

Both simulations were done on a 400 x 400 grid.

Compared to the literature, these are excellent simulations.
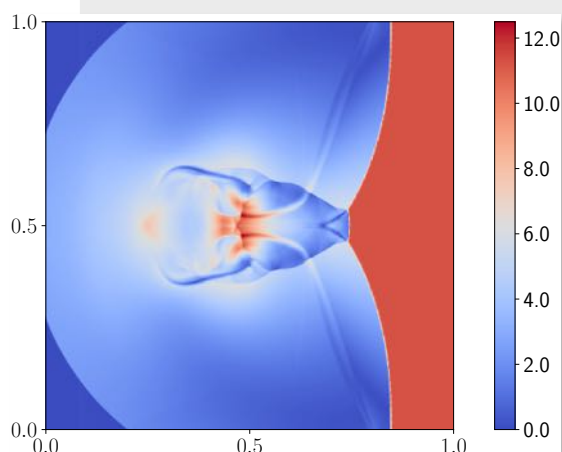
Upcoming scientific conferences

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

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

- June 25 - 27, 2025: *Mathematics of compressible fluids - analysis and numerics*, organized by Dominic Breit and Philipp Öffner in Clausthal, Germany

- 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

- 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

- 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