

# NEWSLETTER

## of the Work Group Mathematical Fluid Mechanics

### Newsletter no. 12 (2026)

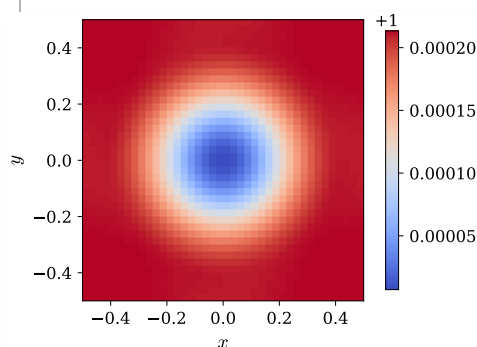
#### News about three new Active Flux papers from our group

#### Paper with Nikhil Manoj submitted

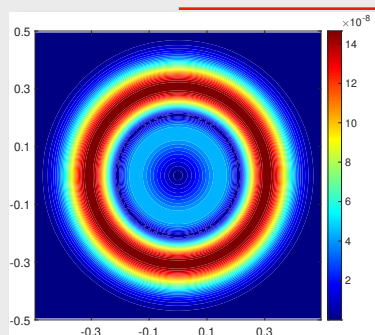
The paper [Nikhil Manoj, Wasilij Barsukow, Christian Klingenberg: "Semi-discrete active flux method for two-dimensional hyperbolic systems with coriolis source terms"](#) was submitted to a journal.

The 2- dim. shallow water equations with a Coriolis force are simulated using Active Flux (AF). For the linearized equations, AF is chosen such that it can be proven to be well-balanced. When applying this scheme to the non-linear equations, it works remarkably well - and all this without having to modify the scheme!

This is [Nikhil Manoj](#)'s first paper submission of his work here in Würzburg.



Water height of a stationary vortex of the 2- dim. shallow water equations with a Coriolis force is shown after time 200 is shown. It is remarkable how well this is maintained by the Active Flux scheme.



The evolution of velocity of a small perturbation on a background hydrostatic equilibrium of the 2-d Euler equations with gravity is shown.

#### Paper submitted with Jiahui Zhang

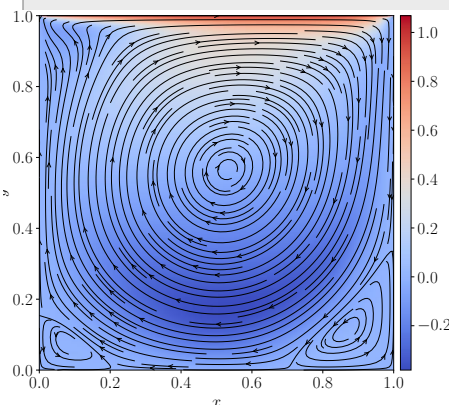
The article [Jiahui Zhang, Christian Klingenberg: "Structure-preserving Active Flux method for the compressible Euler equations with gravity"](#) has been submitted. Jiahui is a postdoc at Mainz Univ., Germany

Here the Active Flux method for the full Euler equations with gravity are made to be well-balanced for a given hydrostatic equilibrium while ensuring positivity preservation.

#### Paper with Junming Duan submitted

The paper [Junming Duan, Wasilij Barsukow, Christian Klingenberg: "A compact high-order and positivity-preserving Active Flux method for compressible Navier-Stokes equations on Cartesian meshes"](#) has been submitted to a journal.

This is a high order Active Flux discretization of the 2-dim. compressible N.-S. equations maintaining positivity even at high Reynards numbers. In numerical experiments the code runs a lot faster than a DG code.



A simulation of a lid driven cavity of the compressible Navier-Stokes equations at Reynolds number 1000 is shown. The horizontal velocity and streamlines are shown. This compare excellently with reference solutions.

#### upcoming visitors

19. Nov. 2026: Stefano Muzzolon (University of Verona)  
25 - 27 Nov. 2026: Gudrun Grünwald (Uni Bochum)

## News about a submitted Master thesis

### Johannes Roth submits his Masters thesis

Johannes Roth submitted his Masters thesis "Enhancing wave propagation and full wave form inversion through deep learning".

In order to determine the different rock layers below the ground one send acoustic signals through them and measures their reflection. In this thesis the inverse problem using optimal transport is solved using a neural network.

## News about two conferences

### ENUMATH 2027

The 16th European Conference on Numerical Mathematics and Advanced

Applications (ENUMATH) will take place from August 30 to Sept. 3, 2027 at the University of Padova, Italy. It covers exactly what it says in its title.

### Mathematics for planet Earth

The 2nd workshop Mathematics for planet Earth (M4E) will take place in Milano, Italy Nov. 9 - 11, 2026. It covers mathematical models of challenges facing our planet.

### Awards for Researchers in Active Flux Methods

Phil Roe's widow Jacqui Roe wants to encourage young researchers to push forward ideas on Active Flux, originated by Phil Roe. Thus she is sponsoring two awards at the Phil Roe symposium in Ann Arbor May 17-19, 2027.

Independent of that Jacqui will make addition funding available for young researchers working on Active Flux that would facilitate their pursuit of Active Flux research. More details will follow.



## Upcoming scientific conferences

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

- Sept. 28 - Oct. 2, **2026**: Numerical Methods for the Kinetic Equations of Plasma Physics (NumKin 2026) in Bochum (Germany) organized by Eric Sonnendrücker and Katharina Kormann
- Nov. 9 - 11, 2026: 2nd workshop Mathematics for planet Earth (M4E) in Milano, Italy.
- Feb. 22 - 26, **2027**: SIAM Conference on Computational Science and Engineering (SCE27), in Pittsburgh, Penn., USA.
- March 12 - 15, 2027: 24th IACM (International Association for Computational Mechanics) Computational Fluids Conference in Yokohama, Japan
- May 17 - 19, 2027: Phil Roe Symposium, in Ann Arbor, Mich. USA, organized by Karthik Duraisamy, myself and others
- June 20 - 25, 2027: Numerical Methods for Hyperbolic Problems (NumHyp 2027), in Verona 2027 organized by Elena Gaburro
- July 5 - 9, 2027: International Conference on Spectral and High-Order Methods (ICOSAHOM 2027), in Milan organized by Marco Verani, Paola Antonietti and others
- July 12 - 16, 2027: 11th International Congress on Industrial and Applied Mathematics (ICIAM), in The Hague, The Netherland
- Aug. 30 - Sept. 3, 2027: 16th European Conference on Numerical Mathematics and Advanced Applications (ENUMATH) in Padova, Italy.



## More thoughts on AI

AI advances so quickly that people no longer separate its fast-improving forms. So rather than saying AI agents, one simply says AI.

The growing power of AI draws more mathematicians toward its use, often creating the impression that AI produces good mathematics. Yet we should keep in mind the broader aim of mathematics. For me, that is to obtain an understanding of nature through the language of mathematics. In this context, AI may act as a useful instrument, but one should not be distracted by AI from pursuing one's own path toward that aim.

Consider signing the 'Leiden Declaration', which elaborates the above on a much more comprehensive way. For a summary of this declaration see here.

 **Leiden Declaration on Artificial Intelligence and Mathematics**