

# NEWSLETTER

## of the Work Group Mathematical Fluid Mechanics

### *Newsletter no. 8 (2023)*

#### **We received a DFG grant to buy a high performance computer**

A group of Würzburg professors from physics, computer science and mathematics (including myself) had applied for a high performance computer from the German Science Foundation (DFG). This has now been approved. The computer will sit in the Rechenzentrum, and we will have access to computing time on it from next year on.

#### **Paper submitted with Wasilij**

The paper "[Rémi Abgrall, Wasilij Barsukow, Christian Klingenberg: "The Active Flux method for the Euler equations on Cartesian grids"](#)", has been submitted. Recently, in [Abgrall, Barsukow 2023](#) a new high order version of the Active Flux method has been proposed and implemented in one space dimensions. This paper now give a first implementation in two space dimensions.

#### **Wasilij will visit us**

Wasilij Barsukow will visit us the week Oct. 22. - 28. With Wasilij we were awarded a DFG grant to study Active Flux as part of the [DFG Priority Program Hyperbolic Equations](#). With Lisa we will work on this project during that week.

#### **My visit to China Sept. 15 - 30**

I traveled to China Sept. 15 - 30. The first week I visited Shi Jin and Min Tang at Shanghai Jiao Ting University. The second week I attended a [workshop](#) in Beijing, and I also visited Peking University.

It has been four years since I visited China last. In the intervening time the political atmosphere has changed a lot. Before, Western companies participated in China's dramatic economic upswing, believing that this engagement would lead to democratization in China. Now China has an autocratic leader and also has a recession, the boom times are over. This now contributes to a political antagonism between the West and China.

Even in this poisoned atmosphere, in China I found a strong desire to move forward. The United States continues to serve as their model. I see progress in Chinese scientific quality compared to my last visit, with ambitions uninhibited.

A good way to get a sense of a country is through their contemporary art. I met artists, who were quite free in their minds, and managed to put on exhibitions without much government interference.

My conclusion from this trip is, that it is best to continue engagement with China.



At the "[Rockbund Art Museum](#)" in Shanghai there was an exhibition by the artist Tosh Bosco.

Notice the skillful way the picture is exhibited, by taking the cityscape of Shanghai into account. In a similar way I found some presentations of lectures by Chinese mathematicians at my Beijing workshop done very skillfully, something that used to be rare in China.

## Two new Master students

Two new students will begin their Master thesis with us:

- *Andrea Lörke* will work on a topic in numerics for the compressible Euler equations
- *Annika Gutzeit* plans to study low Mach and well-balanced numerical methods for Euler with gravity using relaxation Riemann solvers

## New Bachelor students

*Simon Krotsch* plans to write his Bachelor thesis on a topic in finite volume methods for conservation laws

## Master thesis submitted

Moritz Beck has submitted his Master thesis "Online Lernalgorithmen als Rekonstruktionsmethode in der optischen Tomographie". Based on a paper by Qin Li he studied an inverse problem for optical tomography.

## Conference in honor of F. Golse

At the ETH there will be a birthday conference for Francois Golse. He has made major contributions to proving the limit from Boltzmann to Navier-Stokes.



## Next Sino-German workshop in 2025

The next Sino-German workshop will be held in the summer of 2025 in Mainz, organized by Maria Lukacova.

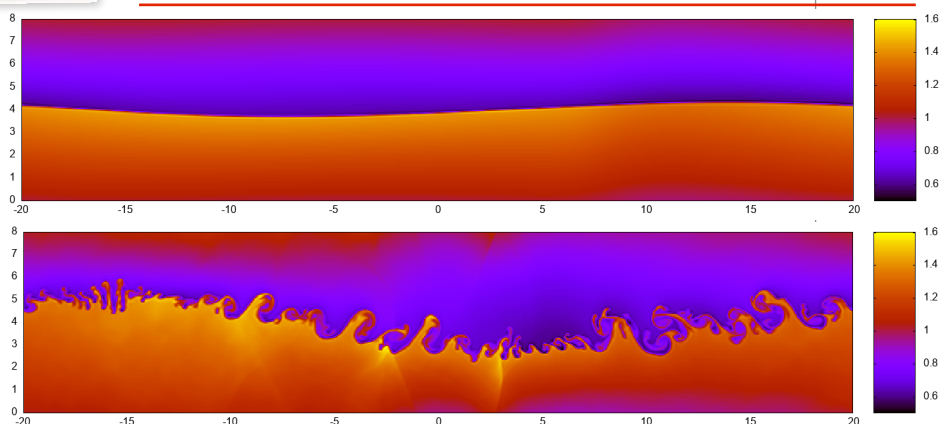
## Pares workshop

On 16. - 17. Nov. in Malaga there will be a birthday workshop for Carlos Pares organized by Manuel Castro. It is by invitation only.

## Upcoming scientific conferences

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

- Oct. 30 - Nov. 3, 2023: [Finite Volumes for Complex Applications in Strasbourg](#) in Strasbourg, France, organized by Philippe Helluy and others
- Nov. 6 - 10, 2023: "Numerical Methods for the Kinetic Equations of Plasma Physics", organized by Eric Sonnendrücker at the Max Planck Institute for Plasma Physics in Garching.
- Nov. 8 - 10, 2023: "[Chemnitz symposium on inverse problems](#)", in Würzburg, organized by Frank Werner among others.
- Nov. 16 - 17, 2023: "Workshop on behalf of Carlos Pares' birthday", in Malaga, organized by Manuel Castro
- 16. - 19. Jan. 2024: "[Kinetic and hydrodynamic PDEs \(Conference in honour of François Golse's 60th birthday\)](#)", at ETH Zürich, organized by Desvillettes and others
- Feb. 25 - 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
- 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 Shi Jin
- Sept. 9 - 13, 2024: [Conference on high-order nonlinear numerical methods for evolutionary PDEs \(HONOM2024\)](#) on the Crete Island, Greece, organized by Elena Gaburro
- summer of 2025: Sino-German workshop in Mainz, organized by Maria Lukacova



A numerical simulation from the paper submitted with Wasilij (mentioned above). The density is shown. On top one sees the initial data. This gets hit from the right by a planar acoustic wave, hitting the interface in a perpendicular way. At the bottom you see the outcome after some time. This is basically subsonic flow, with a few small shocks. This test was first shown in Munz, Roller, Klein, Geratz: "The extension of incompressible flow solvers to the weakly compressible regime", *2 Computers & Fluids*, 32(2):173-196, 2003.