

NEWSLETTER

of the Work Group Mathematical Fluid Mechanics

Newsletter no. 7 (2023)

Paper by Simon Markfelder accepted

Simon's paper [D. W. Boutros, S. Markfelder, E. S. Titi: "On Energy Conservation for the Hydrostatic Euler Equations: An Onsager Conjecture", *Calc. Var. Partial Differential Equations* 62 \(8\) \(2023\)](#) has been accepted for publication.

Here an analogous result to the famous Onsager's conjecture for the Euler equations has been shown for the so-called *hydrostatic Euler equations*.

Note, this is in the general area of Maria Colombo's talk mentioned on the right.

Kathrin Hellmuth's paper accepted

The paper [Kathrin Hellmuth, Christian Klingenberg, Qin Li, Min Tang: "Kinetic chemotaxis tumbling kernel determined from macroscopic quantities", *SIAM Journal on Mathematical Analysis \(SIMA\)*, \(2023\)](#) has been accepted by a well regarded mathematical analysis journal.

For a kinetic PDE model of a biological phenomenon missing coefficients are determined using measured data without the use of regularization.

Note, this is in the general area of part of Alfio Quarteroni's talk mentioned on the right.

ICIAM 2023

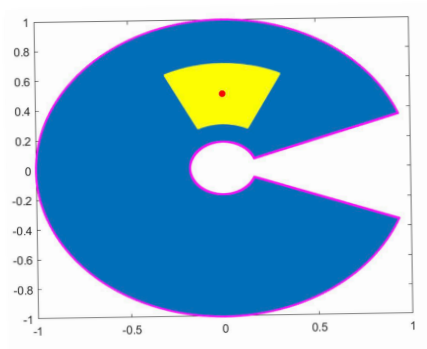


The [10th International Congress on Industrial and Applied Mathematics](#) (ICIAM 2023) took place August 20 - 25, 2023 in Tokyo. It tries to be the applied mathematicians analogous congress to the storied [International Congress of Mathematicians](#) (ICM). Analogous to the prizes at ICM, it has [ICIAM Prize Lectures](#), [see here](#).

The mathematical subjects represented by these *Prize Lecturers* represent what is considered important applied mathematics. I want to pick out [Maria Colombo](#) from Lausanne, who talked about the attempt to obtain a mathematical understanding of turbulence in the Euler- and Navier-Stokes equations. Part of [Alfio Quarteroni's](#) lecture dealt with modeling natural phenomena by PDEs using measured data from these models.

ICIAM takes place every four years. I attended the last one in Spain, which was extremely well attended, with maybe 4000 attendees (similar this year in Tokyo). For me this was too crowded. This fact plus the long distance to Tokyo had prevented me from having put this congress on my list of *"Upcoming scientific conferences"*.

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A fun picture from Kathrin's paper in SIMA on the left illustrating an analytic detail.

Kathrin paper submitted

The paper [Kathrin Hellmuth, Christian Klingenberg, Qin Li, Min Tang: "Numerical reconstruction of chemotaxis transition kernel", \(2023\)](#) has been submitted.

After proving that for a kinetic PDE modeling biological phenomena measured data can determine missing coefficients in the above paper accepted in SIMA, here this problem is solved numerically.

New scientific conferences in our list

- **NumKin 2023:** Eric Sonnendrücker at the Max Planck Institute for Plasma Physics in Garching organizes this yearly meeting on modeling and development of numerical methods for kinetic equations in plasma physics.

- **Chemnitz symposium on inverse problems:** The annual meeting of the German Inverse Problems Society is held in Würzburg in November. Kathrin Hellmuth will present her work there.

- **Oberwolfach workshop on Hyperbolic Balance Laws:** Oberwolfach has a tradition having workshops on conservation laws that meet about every two years. The next one will be in Feb. 2024. The Oberwolfach workshops are usually by invitation only. I have been invited.

DFG proposal submitted

Jun-ming Duan had submitted a DFG proposal "Efficient numerical simulation and reduced-order modeling using adaptive moving mesh and machine learning for aerodynamics" in March 2023.

The referee reports came in June (which is fast), suggesting revisions and resubmission. The revised proposal has now been resubmitted. If accepted, it would allow for hiring a post-doc in Würzburg.

Upcoming scientific conferences

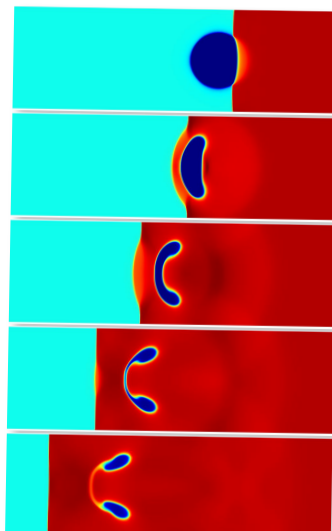
Click the links to check where you might want to participate.

- Sept. 10 - 16, 2023: [16th Hirschegg Workshop on Conservation Laws](#), in the Alps (Kleinwalsertal), organized by Gerald Warnecke and others
- Sept. 25 - 29, 2023: Sino-German workshop, in Beijing, organized by Gerald Warnecke and others
- 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.
- 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

Upcoming visitors

This winter semester we will have visitors:

- [Wasilij Barsukow](#) (Bordeaux, France) probably in October
- [Carlos Pares](#) (Malaga, Spain) Jan. 7 - 12, 2024
- [Philippe Helluy](#) (Straßburg) in Jan. or Feb. 2024



This picture is from the DFG proposal mentioned on the left:

A cut through a three space dimensional numerical simulation (by Jun-ming Duan) on a $325 \times 90 \times 90$ grid. This is a time-sequence from top to bottom. Here a planar shock wave moves from right to left through a spherical bubble. The PDEs of relativistic hydrodynamics are solved quite efficiently. An entropy stable adaptive moving mesh finite volume scheme is used.

The proposal suggests ways to make such simulations even more efficient.