Oberseminar Numerik

Prof. Agnieszka Swierczewska-Gwiazda

26.11.15, 14:15 Uhr
Raum 05-426
Staudingerweg 9, 55128 Mainz

### „*On various compressible models of fluid mechanics: problems of well-posedness* "

Abstract:
I will discuss the issue of existence of weak and measure-valued solutions to various systems of Euler type. The most attention will be directed to the system of shallow water type capturing flows of granular media, but I will also mention the pressureless Euler equations with pairwise attractive or repulsive interaction forces and non-local alignment forces in velocity appearing in collective behavior patterns.

The theory for gravity driven avalanche flows is qualitatively similar to that of compressible fluid dynamics. I will present one of the models describing flow of granular avalanches - the Savage-Hutter model. The evolution of granular avalanches along an inclined slope is described by the mass conservation law and momentum balance law. Originally the model was derived in one-dimensional setting. Our interest is mostly directed to two-dimensional extension. Solutions of the Savage-Hutter system develop shock waves and other singularities characteristic for hyperbolic system of conservation laws. Accordingly, any mathematical theory based on the classical concept of smooth solutions fails as soon as we are interested in global-in-time solutions to the system. I will show how the method of convex integration, recently adapted to the incompressible Euler system by De Lellis and Székelyhidi, can be applied to show that the Savage-Hutter and Euler-alignment systems are always solvable but not well posed in the class of weak solutions. Finally, I will discuss the issue of weak-strong uniqueness.

The talk is based on the following results:

[1] J. A. Carrillo, E. Feireisl, P. Gwiazda, A. Swierczewska-Gwiazda. Weak solutions the Euler system with non-local interactions, in preparation.
[2] P. Gwiazda. On measure-valued solutions to a two-dimensional gravity-driven avalanche flow model. Math. Methods Appl. Sci. 28 (2005), no. 18, 2201-2223.
[3] E. Feireisl, P. Gwiazda, A. Swierczewska-Gwiazda. On weak solutions to the 2d Savage-Hutter model of the motion of a gravity driven avalanche flow, arXiv:1502.06223.
[4] P. Gwiazda, A. Swierczewska-Gwiazda, E. Wiedemann. Weak-strong uniqueness for measure-valued solutions of the Savage-Hutter equations, Nonlinearity, 28 (2015) 3873–3890

Hierzu sind alle herzlich eingeladen.
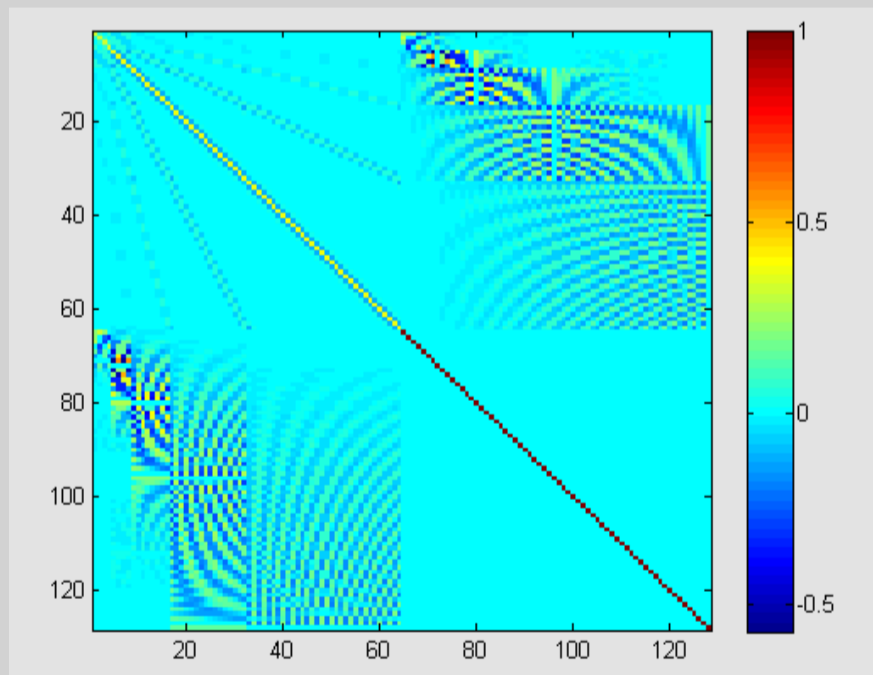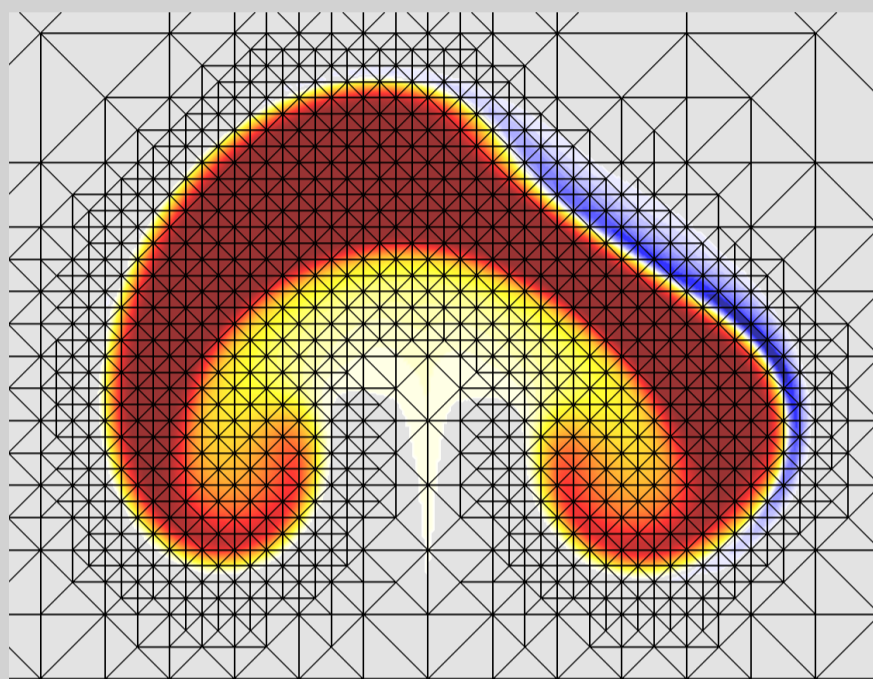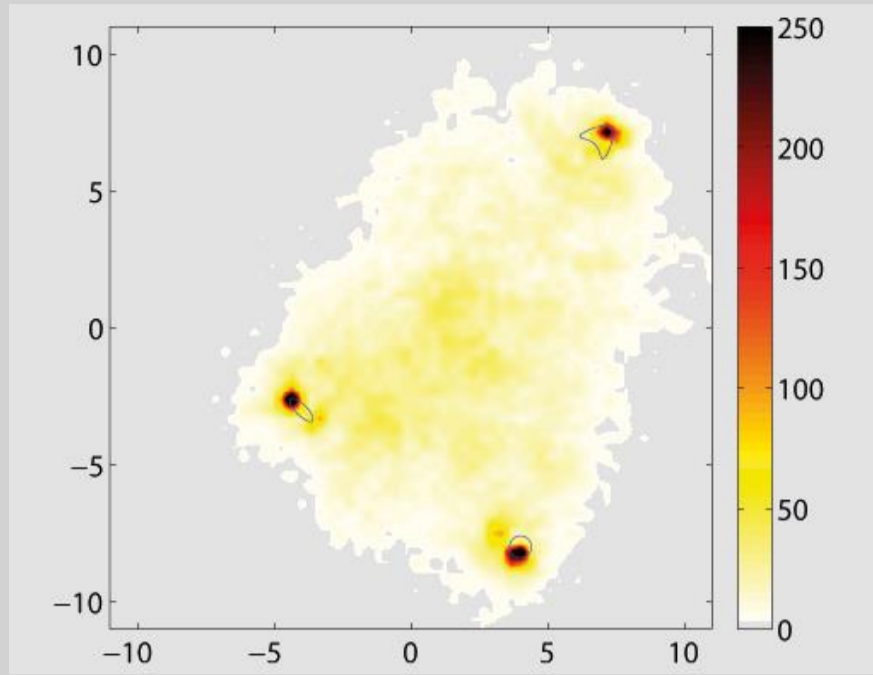
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