Second Workshop on Compressible Multiphase Flows

Report of Contributions

https://indico.math.cnrs.fr/e/4674

Contribution ID: **1** Type: **not specified**

Equations of state: capabilities and limitations

Monday, May 27, 2019 2:00 PM (1 hour)

Presenter: PRIVAT, Romain (Université de Lorraine)

Contribution ID: **2** Type: **not specified**

Two-fluid model hierarchy - thermodynamics, non-conservative terms and hyperbolicity/entropic symmetrization

Monday, May 27, 2019 3:30 PM (1 hour)

Presenter: CORDESSE, Pierre (École Oolytechnique)

Contribution ID: **3** Type: **not specified**

Uncertainty principle in two–fluid mechanics

Monday, May 27, 2019 4:30 PM (1 hour)

Hamilton's principle (or the principle of stationary action) is one of the basic modelling tools in classical mechanics. It states that the reversible motion of a mechanical system is completely determined by the corresponding Lagrangian which is the difference between the kinetic and potential energy of the system.
The extension of Hamilton's principle to the continuum mechanics involving fluid-fluid and solid-fluid interaction can be performed (cf. [1, 2]). The motion of a multi–fluid continuum is described by a coupled system of "Newton's laws"for each component that are completely determined by the Lagrangian. The introduction of dissipative terms compatible with the second law of thermodynamics and natural mathematical restrictions on the potential energy allow us to derive the governing equations having nice mathematical properties.
I will present here a simplest example of two-velocity flows where one of the phases is incompressible (for example, flows of dusty air, or flows of compressible bubbles in an incompressible fluid). A very surprising fact is that one can obtain different governing equations from the same Lagrangian. Different types of the governing equations are due to the choice of independent variables and the corresponding virtual motions. The equations differ from each other in the presence (or not) of gyroscopic forces (also called "lift"forces). The total energy does not depend on these forces, but the velocity distribution depends on them. The gyroscopic forces are not usually taken into account in two-fluid models. Even if these forces have no influence on the hyperbolicity of the governing equations, their presence drastically changes the distribution of the energy of each component.
To the best of my knowledge, such an uncertainty in the governing equations of multi-phase flows was never a subject of discussion in a "multi-fluid"community.
[1] S. Gavrilyuk, Multiphase flow modelling via Hamilton's principle, In the book : F. dell'Isola, S. L. Gavrilyuk (Editors), Variational Models And Methods In Solid And Fluid Mechanics, Springer, 2011.
[2] S. Ndanou, N. Favrie, S. Gavrilyuk, Multi-solid and multi-fluid diffuse interface model: applications to dynamic fracture and fragmentation, J. Comput. Phys. 295(2015) 523–555.

Presenter: GAVRILYUK, Sergey (Aix-Marseille Université)

Contribution ID: **4** Type: **not specified**

A Saint-Venant type model to simulate the dynamics of thin partially wetting films

Tuesday, May 28, 2019 9:00 AM (1 hour)

Presenter: VILLEDIEU, Philippe (Onera)

Contribution ID: **5** Type: **not specified**

A multiphase model to understand how aggressive tumor cell behavior is linked to elevated fluid flow

Tuesday, May 28, 2019 10:30 AM (1 hour)

Presenter: EVJE, Steinar (University of Stavanger)

Contribution ID: **6** Type: **not specified**

TBA

Tuesday, May 28, 2019 11:30 AM (1 hour)

Presenter: PERRIN, Charlotte (CNRS & Aix-Marseille université)

Contribution ID: **7** Type: **not specified**

A three-phase flow model with two miscible phases

Tuesday, May 28, 2019 2:00 PM (1 hour)

Presenter: MATHIS, Hélène (Université de Nantes)

Contribution ID: **8** Type: **not specified**

Derivation and analysis of a model for N-phase non miscible compressible flows

Tuesday, May 28, 2019 3:30 PM (1 hour)

Presenter: SALEH, Khaled (Université de Lyon 1)

Contribution ID: **9** Type: **not specified**

Transcritical Hydrogen/Oxygen flames

Tuesday, May 28, 2019 4:30 PM (1 hour)

Presenter: GIOVANGIGLI, Vincent (École Polytechnique)

Contribution ID: **10** Type: **not specified**

Poster session

Tuesday, May 28, 2019 5:30 PM (1h 30m)

Contribution ID: **11** Type: **not specified**

On Brenner's Two Velocity Hydrodynamics

Wednesday, May 29, 2019 9:00 AM (1 hour)

In a series of papers over 9 years (2004-2012), Howard Brenner (1929–2013) [who was emeritus professor at MIT in chemical engineering] proposed a new theory in compressible fluid mechanics with high gradient of density based on the concept of two different velocities: the mass and the volume velocities. At the same time, D.B. with B. Desjardins discovered (with E. Zatorska later on) that a structure with two velocity hydrodynamics already exists in standard models (i.e. with one velocity field) if the shear and the bulk viscosities satisfy the BD algebraic relation. In this talk, I will try to to give an historical overview of this mathematical story and explain at the end a recent mathematical result with A. Vasseur and C. Yu.

Presenter: BRESCH, Didier (CNRS & Université Savoie Mont Blanc)

Contribution ID: **12** Type: **not specified**

A Multiscale Sharp Interface Approach for Resolved Liquid-Vapour Flow

Wednesday, May 29, 2019 10:30 AM (1 hour)

Presenter: RHODE, Christian (University of Stuttgart)

Contribution ID: **13** Type: **not specified**

TBA

Wednesday, May 29, 2019 11:30 AM (1 hour)

Presenter: KOKH, Samuel (CEA Saclay)