ID de Contribution: **2** Type: **Non spécifié**

Symmetric-hyperbolic conservation laws to model viscoelastic flows as Maxwell fluids

mardi 6 juin 2023 09:00 (1 heure)

Invités Workshop Strasbourg 2023
https://indico.math.cnrs.fr/event/9225/
Conférences invitées:
Sébastien BOYAVAL
Titre : Symmetric-hyperbolic conservation laws to model viscoelastic flows as Maxwell fluids
Abstract: Many Partial Differential Equations (PDEs) have been proposed to model viscoelastic flows. Seminal hyperbolic PDEs have been proposed by Maxwell in 1867 for 2D elastic fluids with stress relaxation, to ensure propagation of 1D shear waves at finite-speed while capturing the viscosity of real fluid continua. But actual computations of multi-dimensional viscoelastic flows using Maxwell's PDEs have remained limited, at least without additional diffusion that blurs the hyperbolic character of Maxwell's PDEs. We propose a new system of PDEs to model 3D viscoelastic flows of Maxwell fluids. Our system, quasilinear and symmetric-hyperbolic, unequivocally models smooth flows on small times, while ensuring propagation of wavesat finite-speed. It is inspired by the K-BKZ integral reformulation of Maxwell PDEs (proposed independently by Kaye and Bernstein, Kearsley, Zapas), but it is purely differential with additional variables for the fluid material properties, therefore more versatile. Our system rigorously unifies fluid models with elasto-dynamics for compressible solids, and it can be manipulated for various applications of the viscoelastic flow concept in environmental hydraulics (shallow-water flows) or materials engineering (non-isothermal flows).

Orateur: BOYAVAL, Sébastien (Ecole des Ponts ParisTech, Laboratoire d'hydraulique Saint-Venant)