Master *Mathematical Modelling*
Ecole Polytechnique and
University Pierre & Marie Curie

Course given by C. Chalons and F. Coquel

Practical work subject: a simple method for compressible multifluid flows

Standard conservative discretizations of gas dynamics equations in Eulerian coordinates generally develop non physical pressure oscillations near contact discontinuities, and more generally near material fronts in multifluid flows. Here, we propose to study a simple method to avoid these pressure oscillations, derived in the paper entitled *A simple method for compressible multifluid flows* by R. Saurel and R. Abgrall, published in SIAM J. SCI. COMPUT., Vol. 21, No. 3 (1999).

First, we ask to implement and validate the HLL approximate Riemann solver as given in subsection 3.5.1 for the classical gas dynamics equations with stiffened gas equation of state. Then, we ask to implement the proposed discretizations of the nonconservative equations (3.14) and to test it on at least the following two Riemann problems. The first one such that the velocity u and pressure p are uniform (ρ, γ and π may vary) and the second one corresponding to the two-phase shock tube proposed in the paper.
We will focus on first-order simulations in one space dimension.