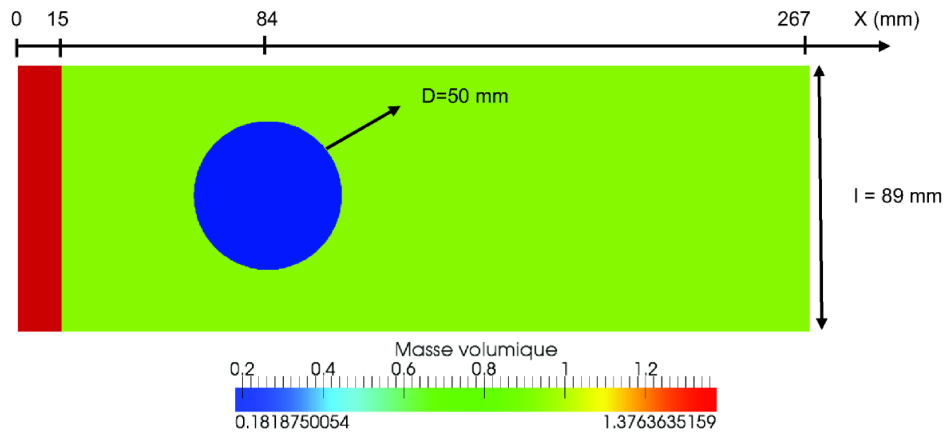


Exercise 6 – Richtmyer-Meshkov instability



Solution with CCFV (1.3 Million elements)

70

Geometric data:

Shock wave in a gas, impinging on a gas bubble at a different density and giving rise to a Richtmyer-Meshkov instability. 2D plane simulation by 1.3 million CCFV, second order in time and in space.

Boundary conditions:

Absorbing boundary conditions along the left and right sides of the domain.

Initial conditions:

Initial velocity in the initial shock wave region.

Materials

The various gases are modelled by the SG2P material model: this material models a mixture of gases and liquids according to a so-called stiffened gas relationship.

RMI02

The mesh generation file is:

```

opti echo 1;
OPTI DIME 2 ELEM QUA4 ;
opti trac psc ftra 'rmi02_mesh.ps' ;
L1=267E-3 ;
L2=89E-3 ;
LS1=15E-3 ;
X1=84.33E-3 ;
X2=45.5E-3 ;
R1=25E-3 ;
*
* 1.3 Millions de Vf
*
RAF = 22;
*
* pas de swap avec raf = 32
* 2.8 Millions de Vf
*
*raf = 32 ;
NN1=90 * raf ;
NN2=30 * raf ;
DX1=L1 / NN1 ;
P1=0. 0. ;
P2=0. L2 ;

LG1=P1 D NN2 P2 ;
LG2=LG1 PLUS (LS1 / DX1) ;
NN3=NN1 (LS1 / DX1) ;
SS1=LG1 REGL NN3 LG2 ;
LG3=LG1 PLUS (L1 0.) ;
NN3=NN1 - NN3 ;
SS2=LG2 REGL NN3 LG3 ;
PC1=(X1 X2) ;
PC2=PC1 PLUS(1.E-10 1.E-10) ;
NURL=SS2 POIN SPHE R1 PC1 PC2 ;
SPH1=SS2 ELEM APPUYE STRICTEMENT NUA1 ;
CT1=CONT (SS1 ET SS2) ;
SS2=DIFF SS2 SPH1 ;
CT2=CONT SPH1 ;
MUR1=DIFF CT1 (LG1 ET LG3) ;
TRAC (SS1 ET (SS2 COUL ROUGE) ET (SPH1 COUL VERT)) ;
TOUT=SS1 ET SS2 ET SPH1 ;
tass tout ROEP;
OPTI SAUV FORM 'rmi02.msh' ;
SAUV FORM TOUT ;
list (nbnoe tout) ;
list (nbel tout);
fin;

```

The input file is:

```

RMI02
ECHO
!CONV WIN
CAST tout
DPLA EULER
GEOM
Q4VF TOUT
CLDD LG1 LG3
TERM
MATE SG2P PINI 1.56980E5 PMIN 1e-3 PREF 1E5 NESP 2
COMP1 ROI 1.376363 PI 0. GAMM 1.4 ALPH 1 Q 0 CP 0 CV 0 QPRI 0
COMP2 ROI 0.192 PI 0. GAMM 1.4 ALPH 0 Q 0 CP 0 CV 0 QPRI 0
LECT SS1 TERM
SG2P PINI 1E5 PMIN 1E-3 PREF 1E5 NESP 2
COMP1 ROI 1 PI 0. GAMM 1.4 ALPH 1 Q 0 CP 0 CV 0 Qpri 0
COMP2 ROI 1 PI 0. GAMM 1.4 ALPH 0 Q 0 CP 0 CV 0 Qpri 0
LECT SS2 TERM
SG2P PINI 1E5 PMIN 1E-3 PREF 1E5 NESP 2
COMP1 ROI 0.181875 PI 0. GAMM 1.4 ALPH 0 Q 0 CP 0 CV 0 Qpri 0
COMP2 ROI 0.181875 PI 0. GAMM 1.4 ALPH 1 Q 0 CP 0 CV 0 Qpri 0
LECT SPH1 TERM
CLVF ABSO RO 1.0

```

```

INITIAL      LECT LG1 LG3 TERM
VITC VITX 394.728 VITY 0. LECT SS1 TERM
ECRI FREQ 10 NOPO NOEL
FICH PVTX TFREQ 1e-5
VARI DEPL VITE ECHO VCVI
GROUP 1 OBJET lect SS1 ss2 SPH1 TERM
FICH SPLI ALIC TFRE 1.E-5
OPTION NOTEST log 1
PASAUTO CSTA 0.5
VPCC PCOUV 6
ORDRE 2

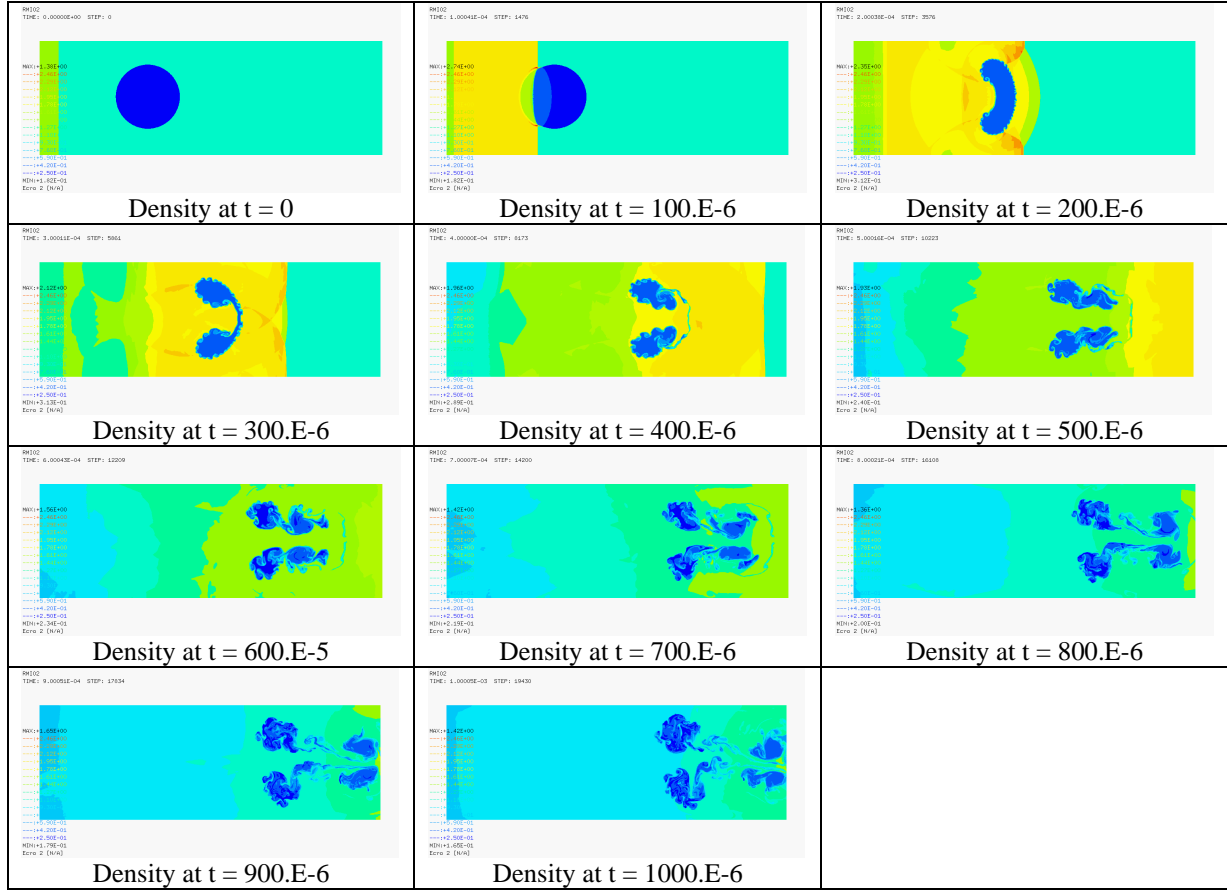
```

```

OTPS 2
RECONSTRUCTION 1
LMAS 3
LQDM 3
LENE 3
RMAS 0.75
RQDM 0.75
KENE 0.75
CENER ! avec correction de l'énergie Interne
CALCUL TINI 0. TFIN 1.E-3
FIN

```

The computed densities at some selected instants are shown below:



The computed pressures at some selected instants are shown below:

