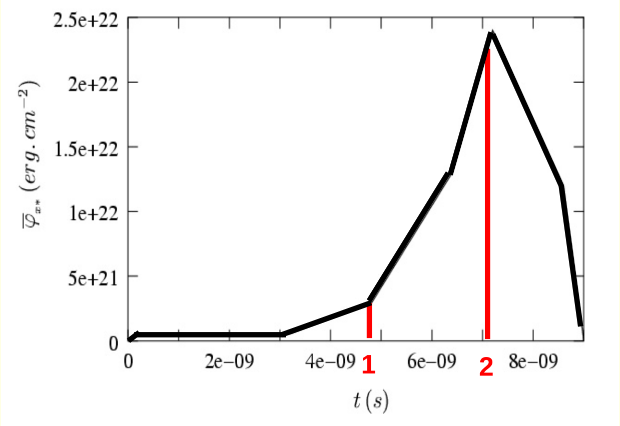
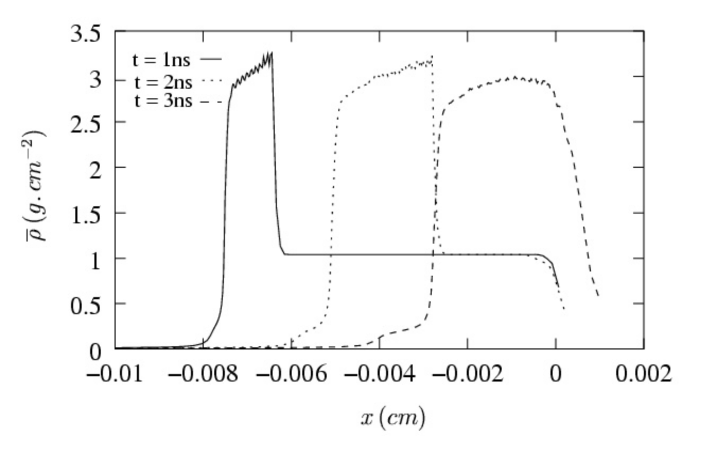
Realistic simulation LMJ : FCI1 code (CEA/DAM)

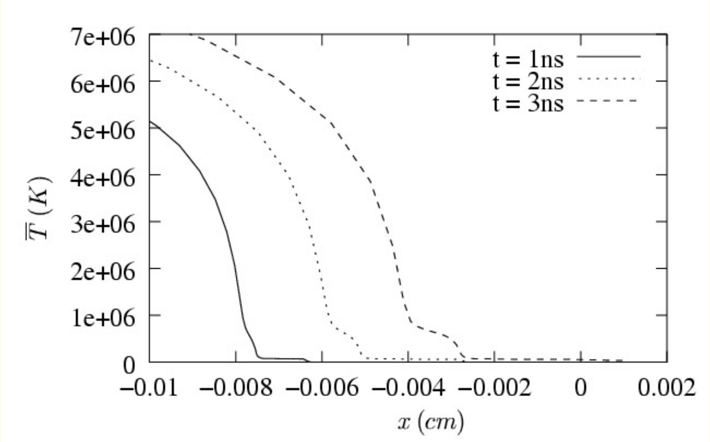
Method of successive shocks :
piecewise linearly increasing
flux at the origin



optimal compression

And … profiles close to self-similar solutions



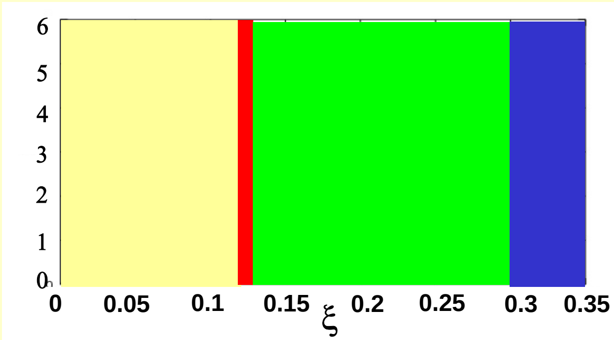


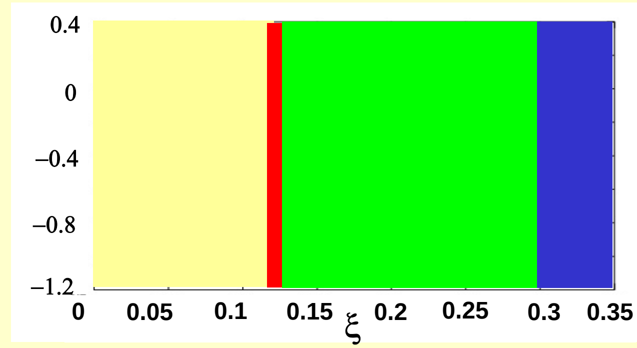
Broadening of the quantities, conservation of the density level, …

Flux & pressure in boundary conditions for different times ⇒ **Different couples of $\mathscr{B}_p$ & $\mathscr{B}_\varphi$**

realistic self-similar ablation layout

Mean flow result

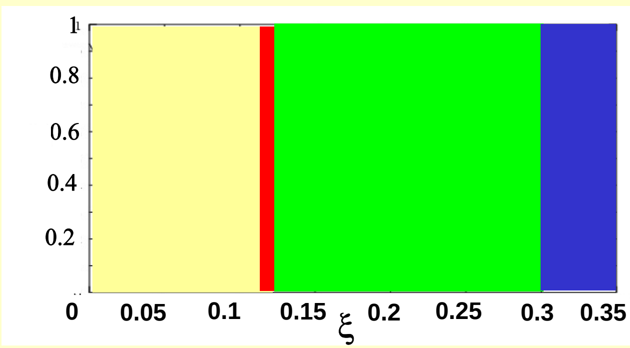


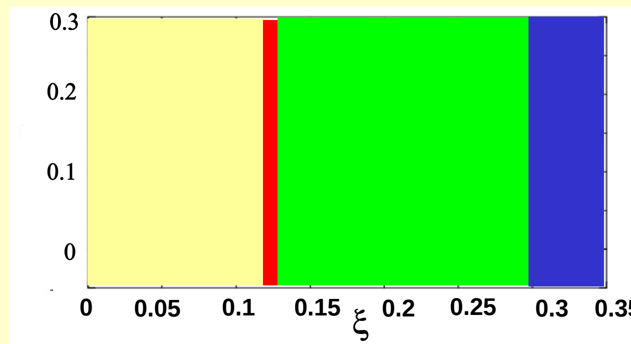


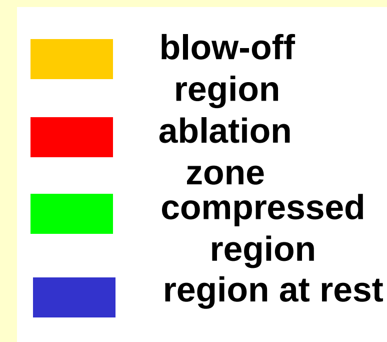
parameters

$\xi_c = 0.30$

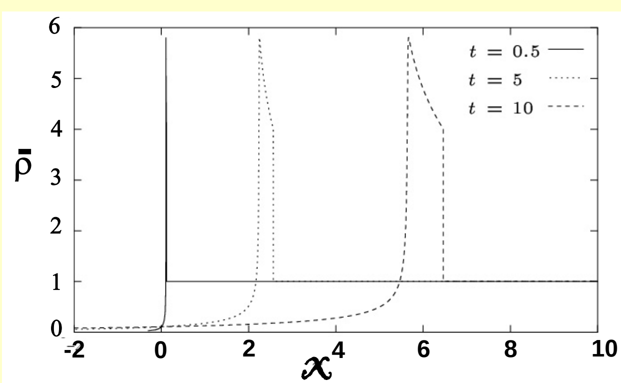
$\xi_f = 0.13$

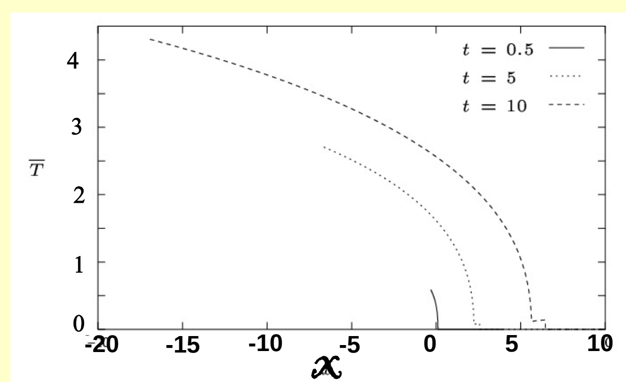




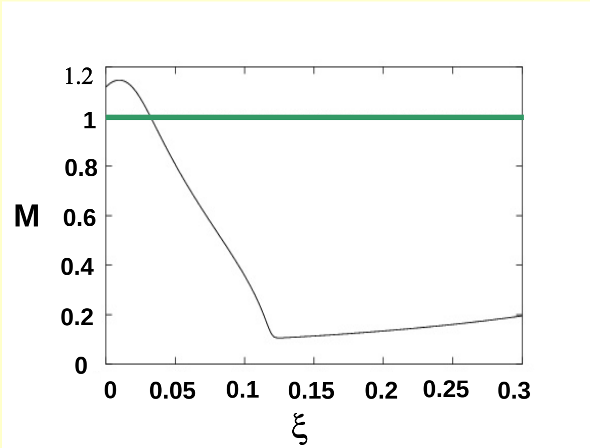


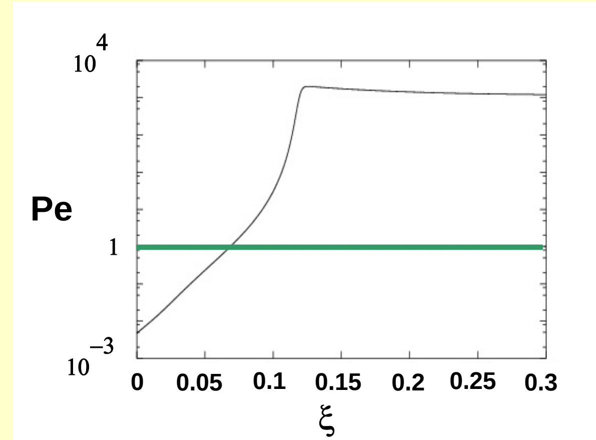
profiles are modified in physical variables(x, t)





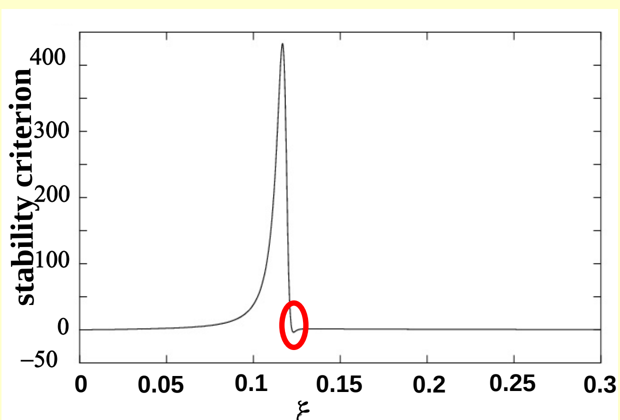
Mean flow results

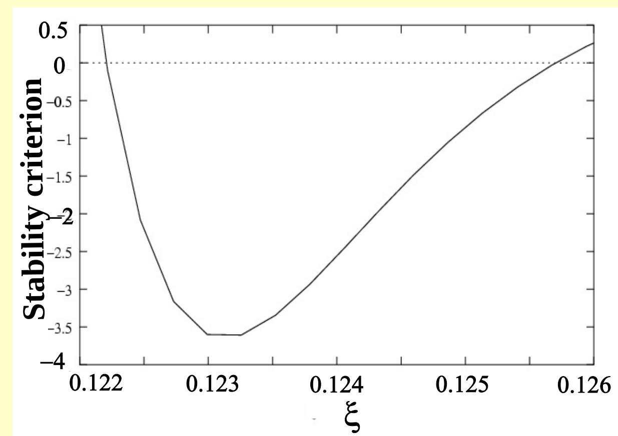




Supersonic region near the origin : low Mach Number hypothesis ?

Compressed region : convection dominate diffusion





Presence of a thicker instability region with downstream a region of high stabilization

We expect stabilization of perturbations

stability analysis of insteady flows

Search for the analogie of one growth rate

➡ **Overall mesure of perturbations : extremum of a physical variable in space of ξ for a given vwave number and time. Obtaining of a « dispersion sheet ».**

Particularities of self-similar solutions

- not defined in t = 0

- expansion of lengths during time

➡ **Ratio of characteristic lengths of self-similar flow on the transverse wave-length of perturbations decreases during time as $t^{-\alpha}$.**

Characteristic time of the flow and growth of perturbations

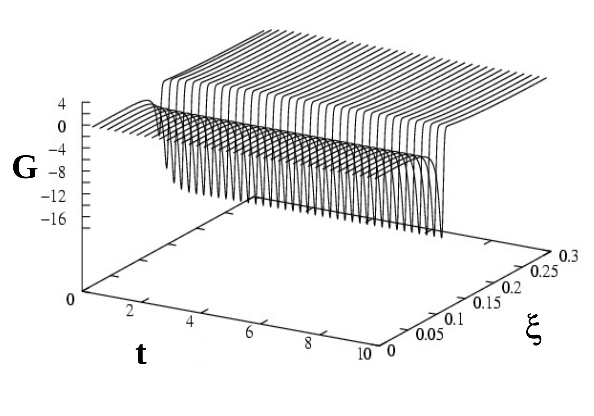
$k_\perp$	10^{-3}	1	5	10	25	50	100
		5,7[illegible]				0,30	0,18
		5,7[illegible]				0,31	0,18
						[illegible]5	4,49
t[illegible]						[illegible]10^2	$4{,}08.10^2$

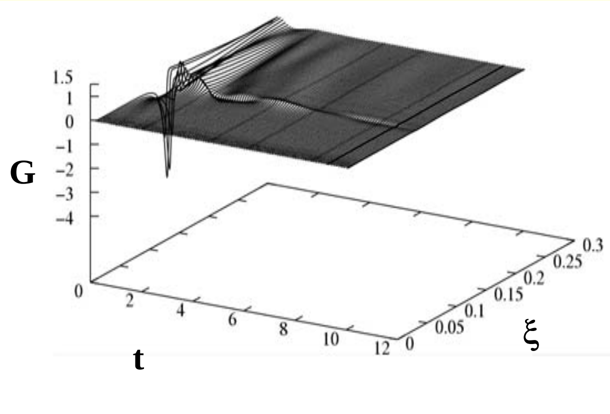
$$t_{ecoul} = \frac{L_{ABLA}}{\bar{U}_a}\, t$$

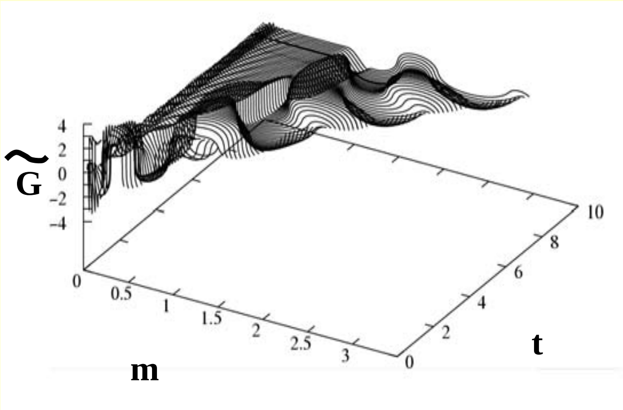
$$t_{croiss} = \frac{1}{\sqrt{k\,\bar{A}_a}}\, t^{1-\frac{\alpha}{2}}$$

$$\frac{t_{ecoul}}{t_{croiss}} = \frac{L_{ABLA}}{\bar{U}_a}\sqrt{\bar{A}_a}\,\sqrt{k\,t^{\alpha}} = 6,71.10^{-3}\,\sqrt{k\,t^{\alpha}}$$

Space-time structures of perturbations 1.







$k_\perp$ = 0,001 **$k_\perp$ = 7** **$k_\perp$ = 7**

Localisation of perturbations in the thin ablation layer,

Just downstream the unsteady layer

Oscillations in the ablation layer

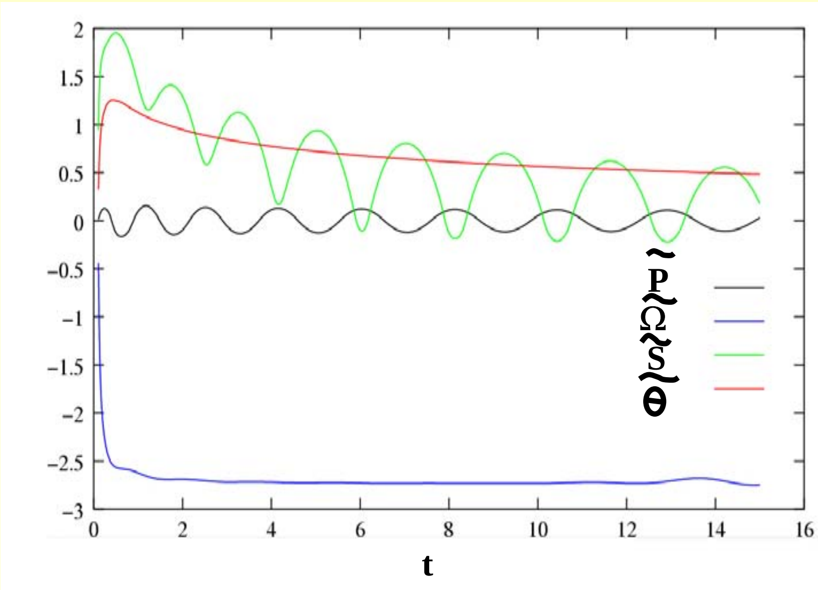
Are these oscillations confined ?

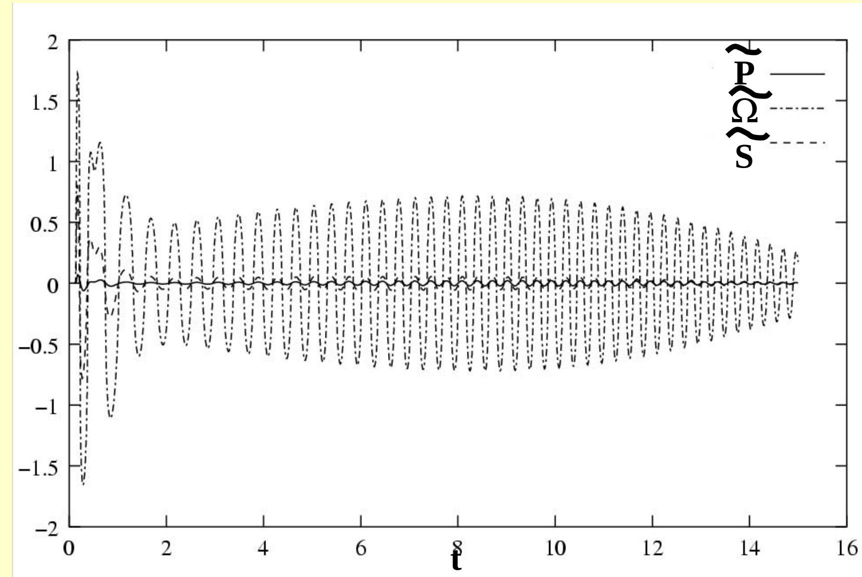
Idea : Application of a contrast function

As $k_\perp \nearrow$ structures appear in the compressed-shock region

couplage between the shock and the ablation front

Space-time structures of perturbations 3.





perturbations at the origin $k_\perp = 25$ **perturbations at the shock-wave** $k_\perp = 50$

At the origin:

Temporal modulation of the frequence of oscillations

➡ **Related to the expansion of the mean flow**

At the shock wave:

After a transient time, regular oscillations in phase of perturbation