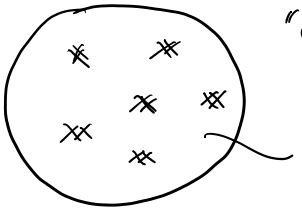
First: Kernels : $n \sim 32\text{-}64$ particles Monaghan is OK.

$n \gtrsim 80$



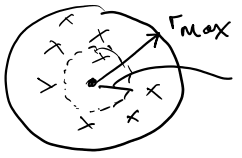
"Clumping Instability"

Kernel Sampling is ruined!

Wendtland Kernels – Quintic

$$f(q) = \sigma_d \cdot \begin{cases} (1-\frac{q}{2})^4 (1+2q) & , \ 0 \le q \le 2 \\ 0 & , \ q > 2 \end{cases}$$

$$q = \frac{|r_{ab}|}{h}$$



$$h = \frac{r_{max}}{2}$$

Normalizing Factor

$$\sigma_1 = \frac{3}{4h} \qquad \sigma_2 = \frac{7}{4\pi h^2}$$

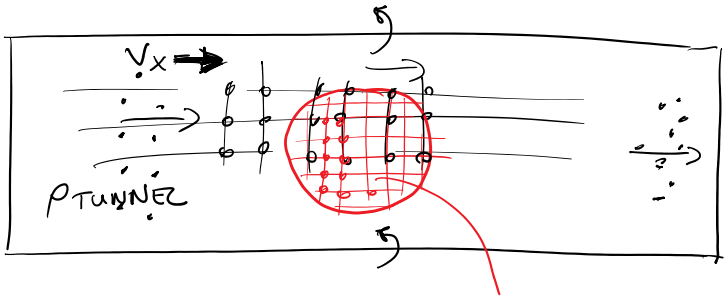
$$\sigma_3 = \frac{21}{16\pi h^3}$$

For the gradient

$$f'(q) = \frac{\sigma_d}{h} \cdot \begin{cases} -5q(1-\frac{q}{2})^3 & , \ 0 \le q \le 2 \\ 0 & , \ q > 2 \end{cases}$$

And no more clumping Instability!?

★ WIND TUNNEL:



$\rho_{BLOB} = 4 \times \rho_{TUNNEL}$

$V = 0$

$$P = \frac{\rho}{\mu m_H} k_B T$$

$$e = \frac{P}{\rho(\gamma-1)}$$

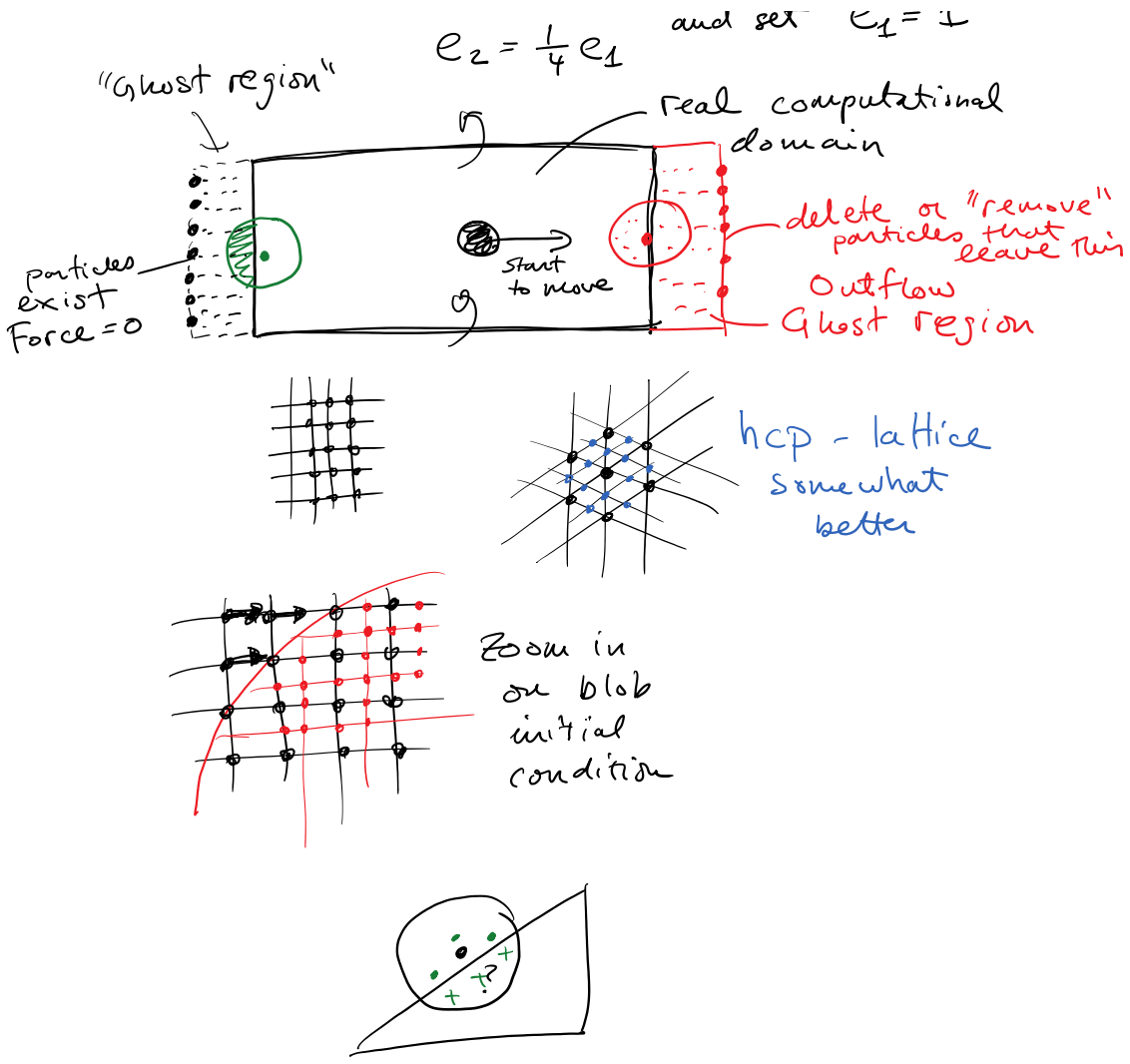
$$e_1 \rho_1 = e_2 \rho_2$$

$$c = \sqrt{\gamma(\gamma-1)e}$$

$\left[\frac{m}{s}\right]$ — $\Delta t \sim [s]$

$$\Delta t < \frac{0.1h}{c}$$

$\rho_2 = 4\rho_1$


$e_2 = \frac{1}{4} e_1$
and set $e_1 = 1$
"Ghost region"
Real computational domain
delete or "remove" particles that leave this
particles exist
Force = 0
start to move
Outflow
Ghost region
hcp - lattice somewhat better
Zoom in on blob initial condition