Remeshed particle method at high Schmidt and Reynolds number

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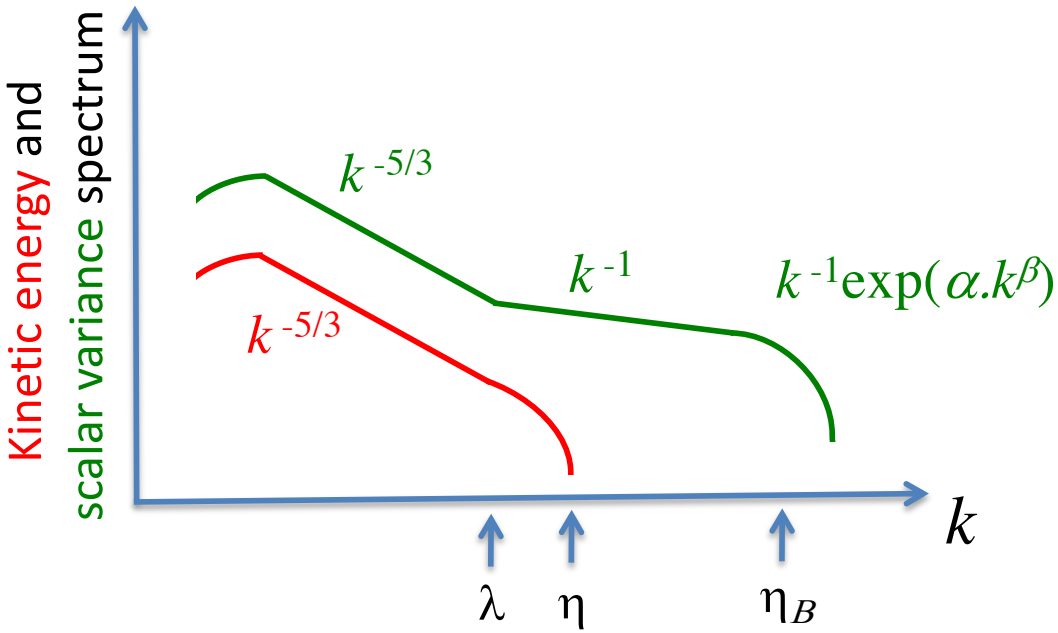
- Range of scales for high Schmidt number: Very small scales for scalar variance:

$$\Delta x^u / \Delta x^Z = \eta / \eta_B \approx \sqrt{Sc}$$

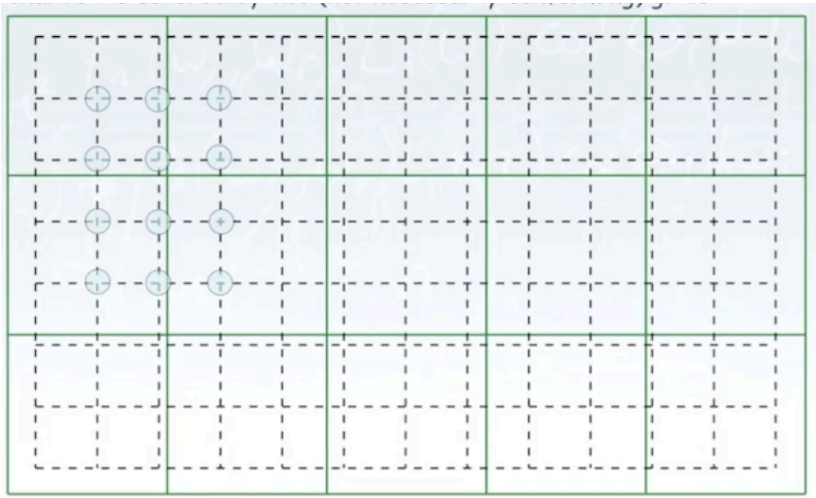
- "Classic" Eulerian approaches: CFL constraint

$$\Delta t^u = \frac{\Delta x^u}{2 \max |u|}$$



High Schmidt Number

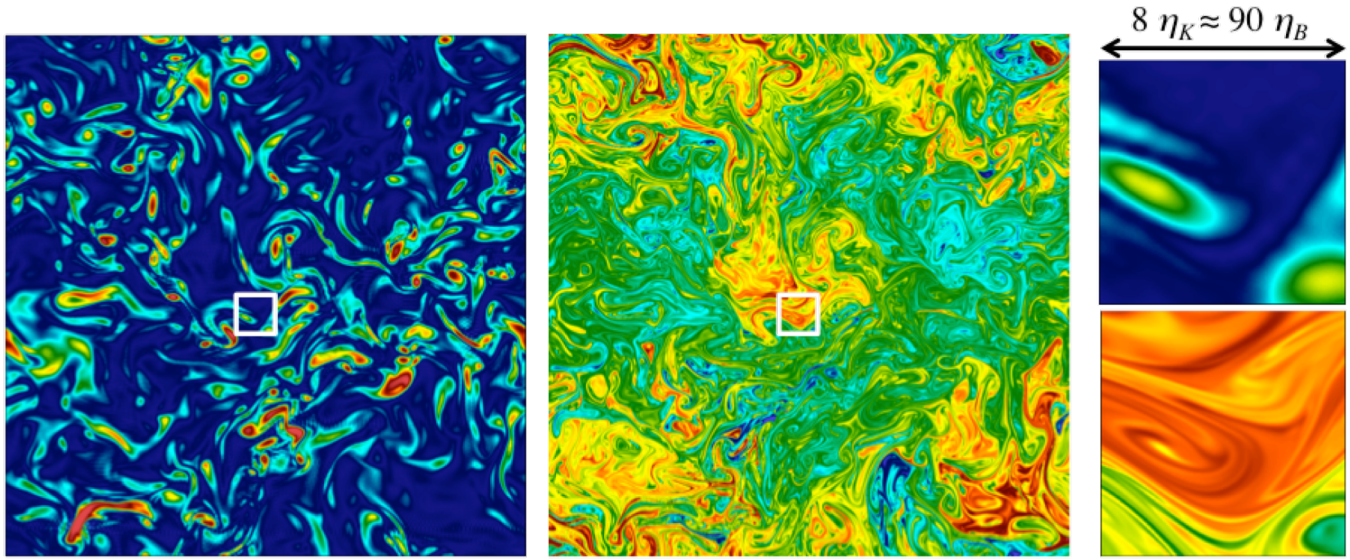
- Remeshed particle methods and coupling with grid-based methods



Particle method used for scalar equation (coupling with a NS solver).

For each time step of the scalar

- Move particles (grid points) using interpolated velocity
- Remesh on a regular grid with high-order non-dissipative schemes
- Solve on the grid for scalar diffusion, forcing, …

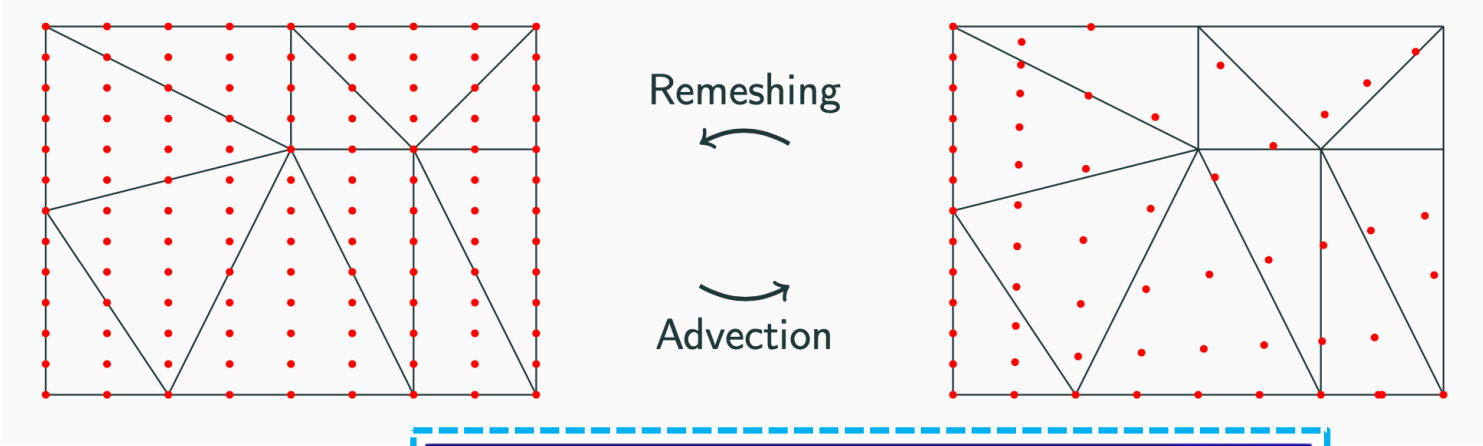


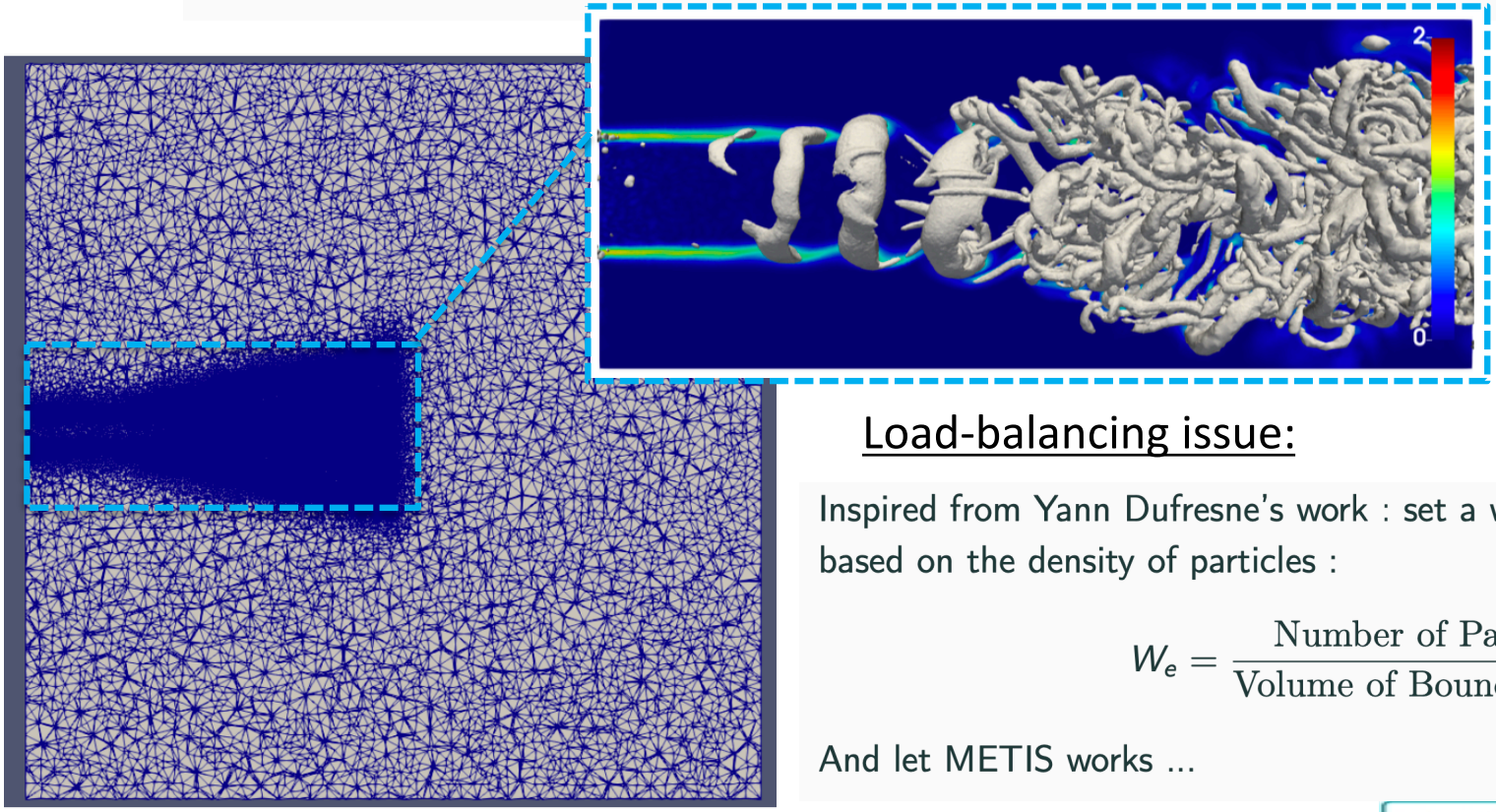
Sc = 128 et Re = 130

→ Lagrangian constraint on time step independent of space step

$$\Delta t^{\theta} = \left(\max|\nabla\vec{u}|\right)^{-1}$$

In YALES2…





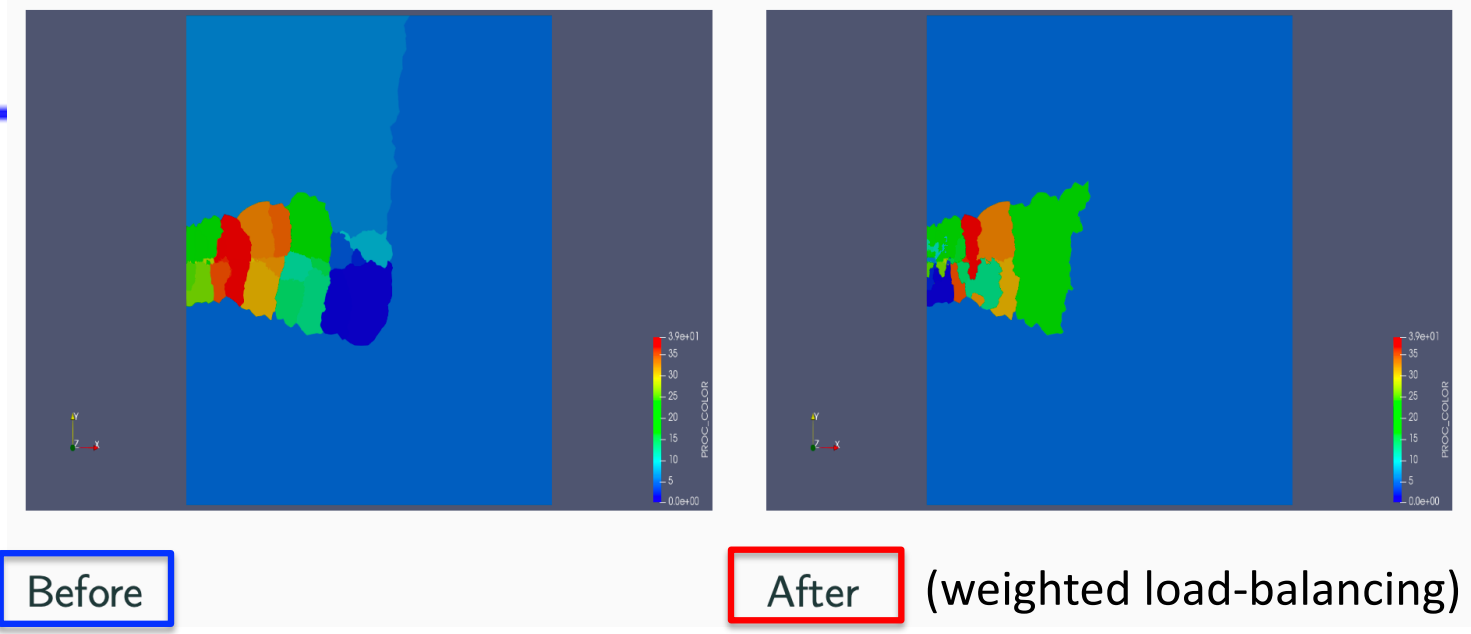
Load-balancing issue:

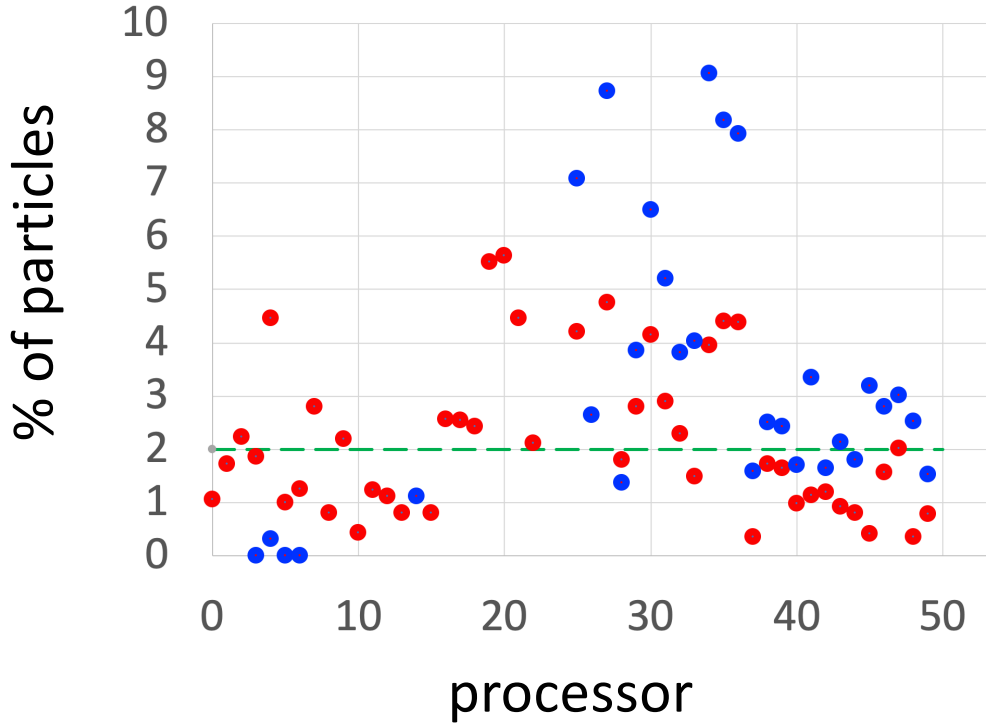
Inspired from Yann Dufresne's work : set a weight to element group based on the density of particles :

$$W_e = \frac{\text{Number of Particles}}{\text{Volume of Bounding Box}}$$

And let METIS works …

In YALES2…





… but the better balanced has a higher computational cost…

… and this is in the “particles” part!?

(communication?)