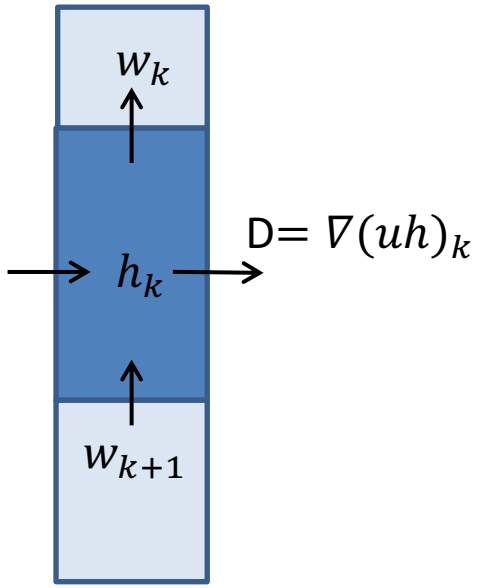
$\tilde{z}$ vertical coordinate: *Leclair and Madec (2011)*

$$\frac{\partial w}{\partial k} = -\mathrm{D} - \frac{\partial h}{\partial t}$$



Split divergence

$$D = \overline{D} + D'$$
$$= \overline{D} + D'^{hf} + D'^{lf}$$

barotropic baroclinic

$\tilde{z}$

$$\frac{\partial D'^{lf}}{\partial t} = -\frac{2\pi}{\tau}(D'^{lf} - D')$$

1) Low pass filtering

$$\frac{\partial h^{hf}}{\partial t} = -D'^{hf} - \frac{2\pi}{t_{relax}} h^{hf} - \nabla\left(\mu \nabla h^{hf}\right) + \mathrm{R}$$

2) hf baroclinic thickness equation

$$\frac{\partial h}{\partial t} = -\overline{D} + \frac{\partial h^{hf}}{\partial t}$$

3) Full thickness equation

From Leclair and Madec ideas to a practical (working) implementation

- Stick with explicit vertical advection vs implicit remapping.
- Simple 2nd order discretization of divergence has to be replaced by a positive definite thickness advection scheme (costly). Started with 2nd order FCT. May turn to PPM in the future.
- Should we deal with vanishing layers ? We assumed NO simply not to redesign the code elsewhere but that's certainly a weakness:
  - It precludes from turning to truly isopycnal coordinates later on.
  - This implies to find a clever way to maintain « reasonnable » thicknesses at the bottom. We currently revert to Eulerian coordinates at the bottom depending on local bathymetry slope. Hycom philosophy at the surface.
- Deal with split explicit free surface (Hallberg and Adcroft 2009).
- Can we afford more selective (i.e. higher order) high pass filters ?
- Need to get rid of CFL restriction on vertical advection (for inst. ROMS scheme)

Tidal interfacial waves at continental shelfbreak