- **rhos_eos**: calcul de l'anomalie de densité

$$\rho^n = \rho(T^n, S^n, z)$$

- **set_HUV**

$$\text{Huon} = \text{Hz}\ u^n$$

- **omega**

$$w^n = -\text{div Huon}$$

- **prsgrd**

$$\text{ru} = \frac{\partial p}{\partial x}^n$$

- **rhs3d**

$$\text{ru} = \text{ru} + \text{rhs3d}(u^n), \qquad \text{rufrc} = \sum_{n=1}^{N} ru(k)$$

$$\text{rhs3d}(u^n) = \text{friction fond - surface, Coriolis, advection 3D}$$

- **pre_step3d**

$$\text{Hz\_half} = \left(\frac{1}{2}+\gamma\right)\text{Hz} + \left(\frac{1}{2}-\gamma\right)\text{Hz\_bak} - (1-\gamma)\,\Delta t\ \text{div}\ (\text{Hz}\ u^n)$$

$$t^{n+1/2} = \left(\frac{1}{2}+\gamma\right)\text{Hz}\ t^n + \left(\frac{1}{2}-\gamma\right)\text{Hz\_bak}\ t^{n-1} - (1-\gamma)\,\Delta t\ \text{div}_{\text{h}}\ (\text{Huon}\ t^n)$$

$$t^{n+1/2} = \left[t^{n+1/2} - (1-\gamma)\,\Delta t\ \frac{\partial}{\partial z}\ (\text{Hz}\ u^n\ t^n)\right]/\text{Hz\_half}$$

$$u^{n+1/2} = \left[\left(\frac{1}{2}+\gamma\right)\text{Hz}\ u^n + \left(\frac{1}{2}-\gamma\right)\text{Hz\_bak}\ u^{n-1} - (1-\gamma)\,\Delta t\ \text{ru}\right]/\text{Hz\_half}$$

$$u^n = u^n\ \text{Hz}$$

$$\text{CL sur } t^{n+1/2},\ u^{n+1/2}$$

$$\text{couplage : corriger } u^{n+1/2}\text{tel que } \sum_{n=1}^{N} \text{Hz}\ u^{n+1/2} = \frac{3}{2}\text{DU\_avg1}^n - \frac{1}{2}\text{DU\_avg1}^{n-1}$$

$$\eta = \eta\text{\_avg}^n$$

- **u3dmix**

- **step2d**

  - rubar = pressure gradient + advection horizontale + Coriolis + Diffusion + friction de fond
  - *au premier step2d predicteur :*

    $$\text{rufrc}^\star = \alpha(\text{rufrc}-\text{rubar})+\beta\text{rufrc\_bak}(n)+(1-\alpha-\gamma)\text{rufrc\_bak}(n-1)$$

    $$\text{rufrc\_bak}(\text{n}-1) = \text{rufrc\_bak}(\text{n}), \text{rufrc\_bak}(\text{n}) = \text{rufrc} - \text{rubar}$$

  - rubar = rubar + $\text{rufrc}^\star$
  - *au dernier predicteur step2d :*

    $$\text{Hz\_bak} = \text{Hz}, \text{Hz} = \text{Hz}(\eta\text{\_avg}^{n+1})$$

- **set_HUV2**

$$\text{corriger } u^{n+1/2}\text{tel que } \sum_{n=1}^{N} \text{Hz } u^{n+1/2} = \text{DU\_avg2}$$

$$\text{Huon} = \text{Hz } u^{n+1/2}$$

- **omega**

$$w^{n+1/2} = -\text{div Huon}$$

- **rho_eos**

$$\rho^{n+1/2} = \rho(T^{n+1/2}, S^{n+1/2})$$

- **prsgrd**

$$\text{ru} = \frac{\partial p}{\partial x}^{n+1/2}$$

- **rhs3d**

$$\text{ru} = \text{ru} + \text{rhs3d}(u^{n+1/2}), \qquad \text{rufrc} = \sum_{n=1}^{N} ru(k)$$

$$\text{rhs3d}(u^n) = \text{friction fond - surface, Coriolis, advection 3D}$$

- **step3d_uv1**

$$u^{n+1} = u^n + \Delta t \text{ ru}$$

- **step3d_uv2**

$$\text{diffusion verticale implicite + corriger } u^{n+1} \text{ tel que } \sum_{n=1}^{N} \text{Hz } u^{n+1} = \text{DU\_avg1}^{\text{n+1}}$$

$$\text{CL sur } u^{n+1}$$

$$\text{ubar} = \text{DU\_avg1}^{n+1}/\text{Htot(Hz)}$$

$$u^\star = \frac{1}{2}\left(u^n + u^{n+1}\right)$$

$$\text{corriger } u^\star \text{ tel que } \sum_{n=1}^{N} \text{Hz } u^\star = \text{DU\_avg2}^{\text{n+1}}$$

$$\text{Huon} = \text{Hz } u^\star$$

- **omega**

$$w^{n+1/2} = -\text{div Huon}$$

- **step3d_t**

$$t^{n+1} = t^n - \Delta t \text{ div } \left((\text{Huon}, w^{n+1/2})\, t^{n+1/2}\right)$$

$$\text{CL sur } t^{n+1}$$

- **ouf**