

$n-1$ n $n+1$

model time step

ssh equation

$$\eta^{n-1*} \rightarrow \frac{1}{2} \left[q_w^{n-1/2} + q_w^{n+1/2} \right] - \nabla_{\mathbf{h}} \cdot \left((H + \eta^n) \overline{\mathbf{U}_{\mathbf{h}}^n} \right) \rightarrow \eta^{n+1}$$

$$h^{n-1*} \rightarrow \text{Update vertical coordinate} \rightarrow h^{n+1}$$

continuity equation

$$h^{n+1} = h^{n-1*} - 2\Delta t [\nabla_{\mathbf{h}} \cdot (h^n \mathbf{U}_{\mathbf{h}}^n) + h^n \partial_z w^n] + \Delta t \left[q_w^{n-1/2} + q_w^{n+1/2} \right]$$

 w^n

$$\Gamma^{n+1/2} = \Gamma \left(\frac{1}{2} (h^n + h^{n+1}) \right)$$

tracer equation

$$h^{n-1*} T^{n-1*} \rightarrow \frac{1}{2} \left(F_T^{n-1/2} + F_T^{n+1/2} \right) - \nabla_{\mathbf{h}} \cdot (h^n T^n \mathbf{U}_{\mathbf{h}}^n) + h^n \partial_z (T^n w^n) + D_T^n \rightarrow h^{n+1} T^{n+1}$$

 T^{n-1*} T^n T^{n+1}

semi implicit hydrostatic pressure gradient

momentum equation

$$h^{n-1*} \mathbf{U}_{\mathbf{h}}^{n-1*} \rightarrow \frac{1}{2} \left(\mathbf{F}_{\mathbf{u}}^{n-1/2} + \mathbf{F}_{\mathbf{u}}^{n+1/2} \right) - \frac{1}{\rho_0} [\nabla_{\mathbf{h}} p_h^n + \nabla_{\mathbf{h}} p_s^n] - \frac{1}{2} \nabla_{\mathbf{h}} \mathbf{U}_{\mathbf{h}}^{n2} - [\nabla_{\mathbf{h}} \times \mathbf{U}_{\mathbf{h}}^n + f\mathbf{k}] \times \mathbf{U}_{\mathbf{h}}^n + \mathbf{D}_{\mathbf{u}}^n \rightarrow h^{n+1} \mathbf{U}_{\mathbf{h}}^{n+1}$$

 η^{n-1*}, h^{n-1*}
 $T^{n-1*}, \mathbf{U}_{\mathbf{h}}^{n-1*}$
 η^n, h^n
 $T^n, \mathbf{U}_{\mathbf{h}}^n$
 η^{n+1}, h^{n+1}
 $T^{n+1}, \mathbf{U}_{\mathbf{h}}^{n+1}$

time filter

 η^{n*}, h^{n*}
 $T^{n*}, \mathbf{U}_{\mathbf{h}}^{n*}$

model operations