

cavitation algorithm

$$1. \dot{m} \propto (p^* - p^{\text{liquid}})$$

\downarrow
 saturation pressure

2. update $\gamma \equiv$ mass fraction

3. modify the pressure projection equation:

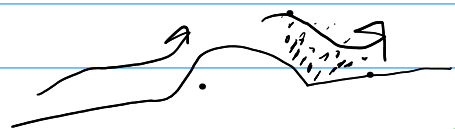
$$\nabla \cdot (\vec{u} = \vec{u}^* - \frac{\nabla p}{\rho})$$

$$\nabla \cdot \vec{u} = \nabla \cdot \vec{u}^* - \nabla \cdot \left(\frac{\nabla p}{\rho} \right) = k \dot{m}$$

$$-\nabla \cdot \frac{\nabla p}{\rho} = -\nabla \cdot \vec{u}^* + k \dot{m}$$

alternate approach

compressible fluids



$$\rho_t + \nabla \cdot (\rho \vec{u}) = 0$$

$$(\rho E)_t + \nabla \cdot (\rho \vec{u} E + p \vec{u}) = \nabla \cdot (\rho \vec{u} \cdot \vec{\tau}) + \nabla \cdot (k \nabla T)$$

$$(\rho \vec{u})_t + \nabla \cdot (\rho \vec{u} \vec{u}) = -\nabla p + \nabla \cdot (\rho \vec{\tau})$$

$$(\rho \gamma)_t + \nabla \cdot (\rho \gamma \vec{u}) = \nabla \cdot (\rho D \nabla \gamma)$$

$$p = p(\rho, E, \gamma)$$

1. find
in $\alpha (P_{\text{sat}} - P)$

2. update Y

3. use an equation of state
that depends on Y .

$$\frac{P^{n+1} - P(\rho^{n+1}, Y^{n+1})}{\rho^2 \Delta t^2} = - \left(\frac{\nabla \cdot U^*}{\Delta t} - \nabla \cdot \left(\frac{\nabla P}{\rho} \right)^{n+1} \right)$$

$$U^{n+1} = U^* - \nabla \cdot \left(\frac{\nabla P}{\rho} \right) \Delta t$$

No in in pressure equation.

P depends on ρ^{n+1} & Y^{n+1} .

Wardlaw?