cavitation algorithm

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

   p^{*}: saturation pressure

2. update $Y \equiv$ mass fraction

3. modify the pressure projection equation:

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

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

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

alternate approach

compressible fluids

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

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

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

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

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

1. find $\dot{m} \propto (P_{sat} - P_\infty)$

2. update Ψ

3. use an equation of state that depends only ρ.

$$\frac{p^{n+1} - p(\rho^{n+1}, \psi^{n+1})}{\rho c^2 \Delta\tau^2} = -\left(\frac{\nabla \cdot u^*}{\Delta\tau} - \nabla \cdot \left(\frac{\nabla p}{\rho}\right)^{n+1}\right)$$

$$u^{n+1} = u^* - \nabla\left(\frac{\nabla p}{\rho}\right)\Delta\tau$$

No $\dot{m}$ in pressure equation.

p depends on ρ^{n+1} & ψ^{n+1}.

Wardlaw?