$A \sim \alpha(x\,y)\left(\frac{z}{\ell}\right)^a \longrightarrow A = xy\,\Phi\left(\frac{z}{\ell}\right)$

$A \sim \alpha_1 xy\left(\frac{z}{\ell}\right)^{a_1} + \alpha_2 xy\left(\frac{z}{\ell}\right)^{a_2} + \cdots \qquad \frac{A}{xy} \sim \left(\frac{z}{\ell}\right)^a$

$A \sim \alpha_1 xy\left(\pi_1\right)^{a_1}\left(\pi_2\right)^{b_1} + \alpha_2 xy\left(\pi_1\right)^{a_2}\left(\pi_2\right)^{b_2} + \cdots$

$A = xy\,\underbrace{\Phi(\pi_1, \pi_2)}_{f(x,y)}$

$v : LT^{-1} \quad g : LT^{-2} \quad \frac{\rho_b}{\rho_f}$: unitless

$R : L \quad \nu : L^2T^{-1}$

$LT^{-1} = L^a\left(LT^{-2}\right)^b\left(L^2T^{-1}\right)^c$

$a+b+2c=1$

$-2b-c=-1$

$a = \frac{1-3c}{2}$

$b = \frac{1-c}{2}$

$V \sim R^{\frac{1}{2}-\frac{3}{2}c}\, g^{\frac{1}{2}-\frac{1}{2}c}\, \nu^c\, \Phi\left(\frac{\rho_b}{\rho_f}\right)$

$\sim \sqrt{Rg}\left(\frac{\nu}{R\sqrt{Rg}}\right)^c \Phi_1\left(\frac{\rho_b}{\rho_f}\right)$

Φ_2

$2gR^2\left(\rho_b - \rho_f\right)/9\nu\rho_f = \frac{gR^2}{\nu}\left(\frac{2}{9}\right)\left(\frac{\rho_b-\rho_f}{\rho_f}\right) \rightarrow \left(\frac{\rho_b}{\rho_f} - 1\right)$