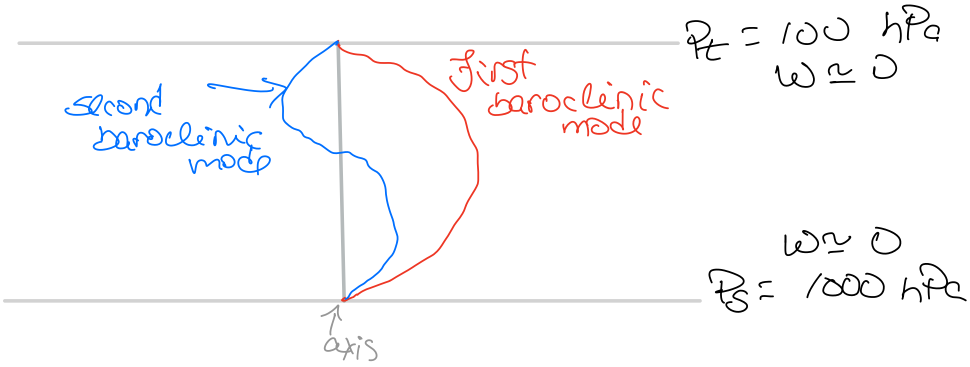
Vertical Velocity, moisture, and buoyancy.

Balance equation: $\frac{\partial^4 \omega}{\partial p^4} = \frac{1}{\mu_c^x} \nabla_h^2 \alpha'$ $\alpha = \frac{R_d T'}{p}$

non hyd pert.



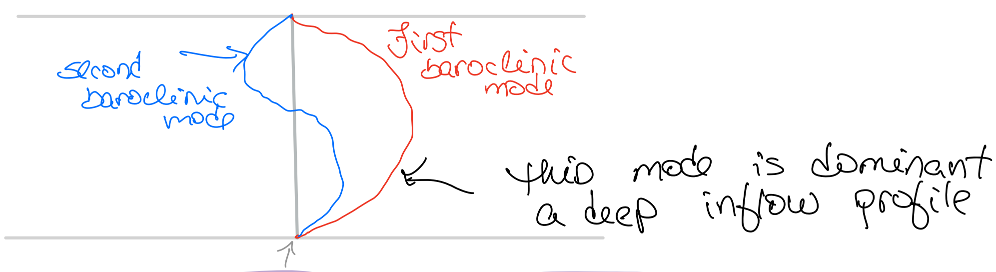
Let's assume a wave solution for ω

$$\omega = \hat{\omega} e^{imp}$$

$$\frac{\partial^4 \omega}{\partial p^4} = m^4 \omega$$

Now we have $m^4 \omega = \frac{1}{\mu_c} \nabla_h^2 \alpha' \rightarrow \omega = \frac{\nabla_h^2 \alpha'}{m^4 \mu_c}$

m increases with vertical modes, implying that lower baroclinic modes respond more strongly to a given buoyancy



Regardless of B, the eqn. states that first baroclinic is the dominant mode of ω.

Let's integrate our balance equation

$$\langle \omega \rangle = \frac{1}{g}\int_{p_t}^{p_s} \omega \, dp$$ we get:

$$\langle \omega \rangle = \frac{\nabla_h^2 \langle \alpha \rangle}{\mu_c m^4} \quad (1)$$

Let's invoke WTG

$$\omega \frac{\partial DSE}{\partial p} = Q_1$$

$$S_p = -\frac{\partial DSE}{\partial p}$$ = positive constant

$$-\langle \omega \rangle S_p = L_v P + \langle Q_r \rangle \quad (2)$$

$$-\frac{S_p \nabla_h^2 \langle \alpha \rangle}{\mu_c m^4} = L_v P + \langle Q_r \rangle$$