Adjustment towards RCE.

Let's consider the thermodynamic eqn. in pressure coords, vertically-integrated

$$C_p \frac{\partial \langle T \rangle}{\partial t} = \underbrace{L_v(1+r)P}_{\text{cloud heating}} + \underbrace{\langle Q_{ro} \rangle}_{\text{clean sky cooling}}$$

For $\langle Q_{ro} \rangle$ let's assume it obeys Newton's law of cooling:

$$\langle Q_{ro} \rangle = -C_p \langle T \rangle / \tau_r$$

↑ rad. adj. timescale

For convection, it warms the atmosphere so long as $T < T_c$ ← temp. of convection "T that comes from T_m"

$$\frac{\partial \langle T \rangle}{\partial t} = \frac{\langle T \rangle - \langle T_c \rangle}{\tau_c} - \frac{\langle T \rangle}{\tau_r}$$

↑ conv. adj. timescale

Diabatic heating from conv. >> radiative cooling

$$\therefore \frac{\partial \langle T \rangle}{\partial t} \approx \frac{\langle T \rangle - \langle T_c \rangle}{\tau_c}$$

Has a solution of the form:

$$\langle T \rangle (t) = \langle T_c \rangle \left(1 - \underbrace{\Delta T}_{\text{initial condition}} e^{-\frac{t}{\tau_c}}\right)$$

At $t \to \infty$ the exponential becomes 0

$$\langle T \rangle (t \to \infty) = \langle T_c \rangle$$