2nd law

$$\frac{\partial T}{\partial t} = \left(\begin{array}{c} \text{vert.} \\ \text{adv} \end{array} + \begin{array}{c} \text{adiabatic} \\ \text{compression} \end{array} \right) + \text{Vertical motion term} + \cdots$$

$$= \underline{W\left(\Gamma - \Gamma_d\right)} \Leftarrow \text{HW5}$$

$$= -W\frac{\partial s}{\partial z}\left(\frac{1}{c_p}\right) = -\omega\frac{\partial s}{\partial p}\cdot\left(\frac{1}{c_p}\right) \qquad s = c_p T + gz$$

dry static energy

$$= -W\frac{\partial \theta}{\partial z}\cdot\left(\frac{T}{\theta}\right) = -\omega\frac{\partial \theta}{\partial p}\cdot\left(\frac{T}{\theta}\right) \qquad \theta = T\left(\frac{p_0}{p}\right)^{R/c_p}$$