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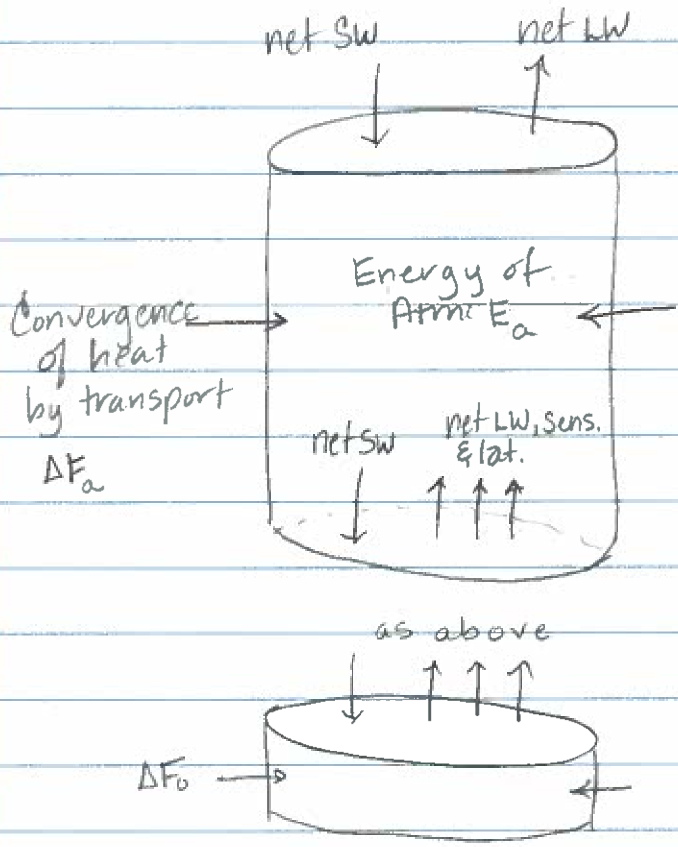
Consider of Column of the model with a slab ocean (perhaps at the pole, but ignore sea ice for now)



F_{TOA} = net SW − net LW (positive down)

Atmosphere

F_s = net SW − net LW − sens − lat (positive down)

Slab ocean

For Atmosphere

$$\int_{Area}\int \frac{dE_a(z)}{dt}\, dz\, dA = F_{TOA} - F_s + \Delta F_a$$

$$E_a(z) = c_p T(z) + gz + Lq(z)$$

For ocean

$$\int_{Area}\int \frac{dE_o(z)}{dt}\, dz\, dA = F_s + \Delta F_o$$

note that $\Delta F_{a,o}$ are total heat entering side divided by Area to give a flux per unit area - artificial in a way because it is not spread uniformly over ~~horizontal area~~ at all

done to match other vertical flux norm.

For a Slab ocean $E_o = \rho C_p h T_s$

$h = 50m$ (usually)

For Our experiments $\Delta F_o = 0$

IF we assume equilibrium (aka steady state) a good assumption for Tidally-locked Case (erroneously called asynch)

$$\frac{dE_a}{dt} = \frac{dE_o}{dt} = 0$$

Equil. Energy balance of Slab ocean requires

$F_s = 0$!

Thus Equil Energy balance of Atm requires

$$F_{TOA} = -\Delta F_a$$

net incoming Flux at TOA = Flux of heat leaving sides