Mere budgets. Do they satisfy as "dynamics"?

$$\frac{\partial T}{\partial t} = \text{Hor. transport} + \text{Vertical term} + LW_{rad} + SW_{rad} + L(c-e) + F_{sfc} + \dots$$

Suppose we want an explanation for a hot time.

$$+ = - + - + - + \dots +$$

Biggest term!

most ~~ex~~ external term

better, maybe

need higher-level reasoning....

Example 1: climate change

CO_2 Forcing

high clouds

low clouds

$$\frac{\partial T}{\partial t} = \cancel{Hor} + \cancel{VER} + RAD\text{-}SW + RAD\text{-}LW + \cancel{COND\text{-}EVAP} + \ldots$$

part of this term

etc. etc.

also part of LW

Integrate over world, transport vanishes

$\Downarrow$

an ODE that rules the world

$$\frac{dT'}{dt} = F - \lambda T'$$

"forcing"

$T' = T - T_{PI}$ pre-industrial

(T is global annual avg T_{2m} air)

up stream, endogenous, external

$F \rightarrow$ System Energy $\rightarrow T$

"Feedbacks" λ

biggest is water vapor

Most uncertain: clouds

Example 2: T in afternoon in Florida ⇒ a/c energy demand

$$\frac{\partial T}{\partial t} = hor + ver + SW + LW + F_{sfc} + L(c-e)$$

"System" is now

- scale of Florida
- timescale of a day