Regional Carbon Budgets by Fusion of Multiple NASA Data Products

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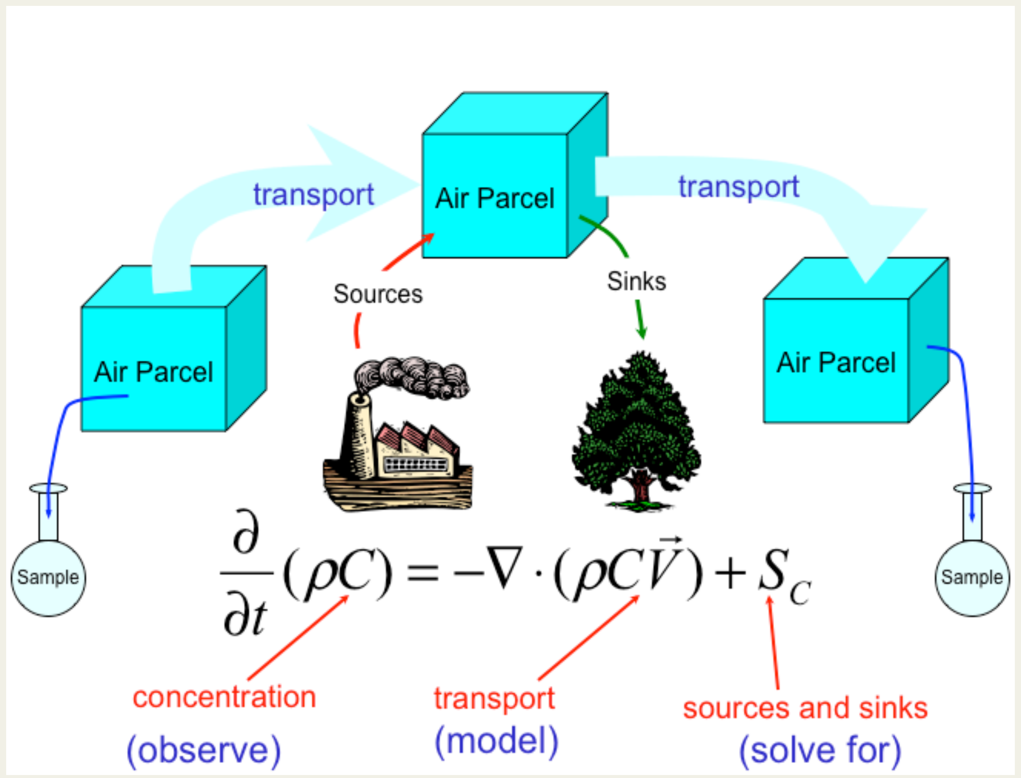
"Inverse Modeling" of Atmospheric CO_2

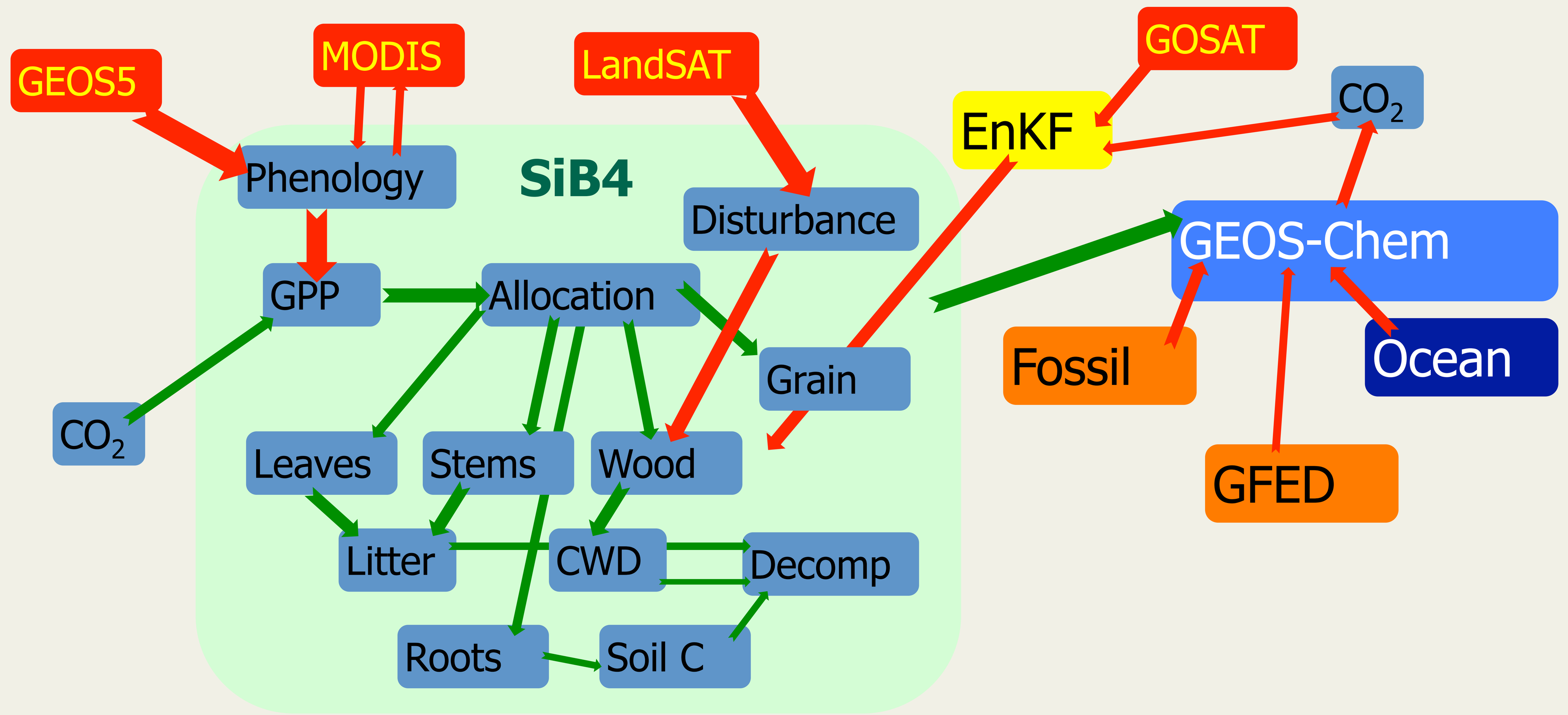


Seems simple enough, but:

- CO_2 "flux" is really just a tiny difference (NEE) between two much larger fluxes (GPP & Resp)
- Component fluxes are governed by different BGC processes, so will respond differently to future change
- NEE has no "memory:" knowing its value at one time is no help in estimating it later
- Direct estimation of NEE is therefore poorly constrained, even by satellite CO_2 observations

We seek improved constraint by instead estimating long-lived state variables that control GPP and Resp

Forward Modeling and Data Assimilation



Preliminary Test Optimizations

$$F_T(x,y,t) = (1+\beta_{FF}(x,y))FF(x,y,t) + (1+\beta_{Fire}(x,y))Fire(x,y,t)$$
$$+(1+\beta_{RESP}(x,y))RESP(x,y,t) - (1+\beta_{GPP}(x,y))GPP(x,y,t)$$
$$+(1+\beta_{Ocean}(x,y))Ocean(x,y,t)$$

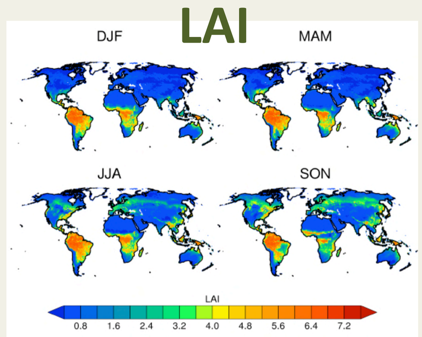
Prototype of Future Optimization

GPP estimation from photosynthetic capacity
(fPAR * fractional coverage * Vmax)

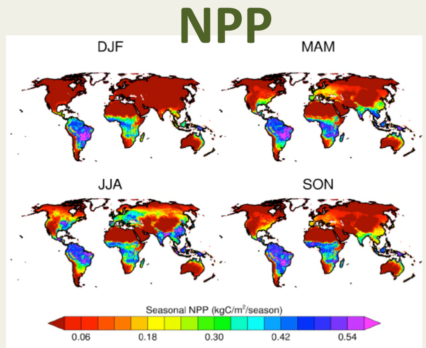
Resp estimation from decomposing biomass (litter + intermediate soil carbon + CWD)

SiB4: phenology, biomass, & fluorescence

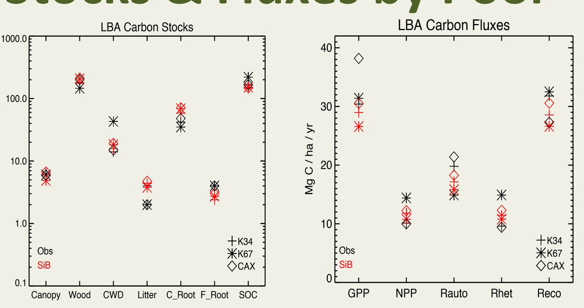
LAI



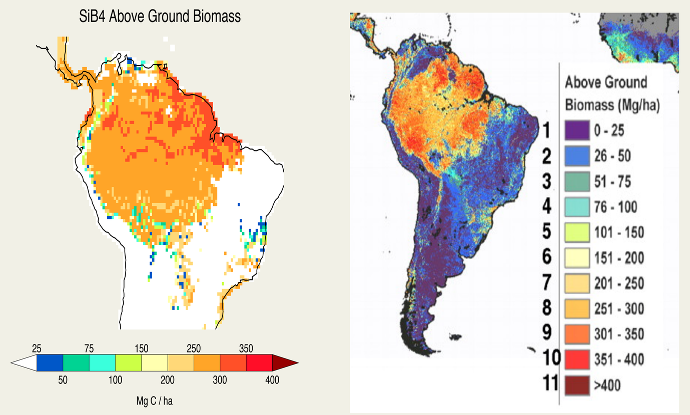
NPP



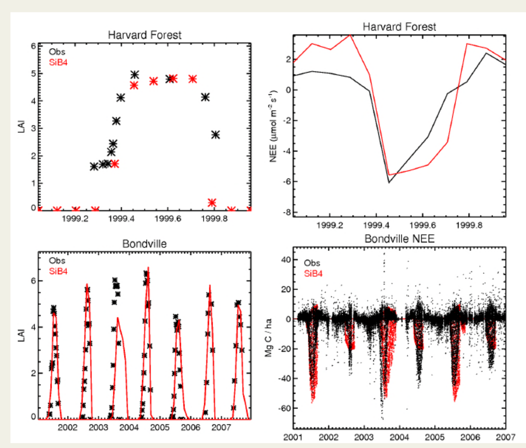
Stocks & Fluxes by Pool



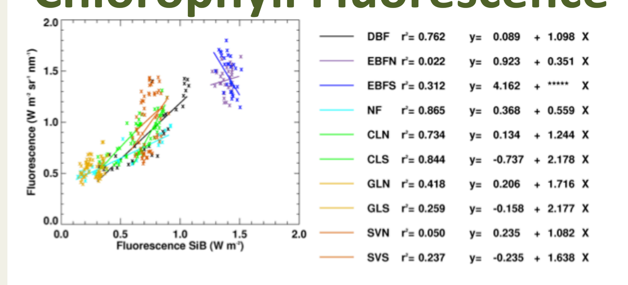
Simulated & Observed Biomass



Phenology & Fluxes

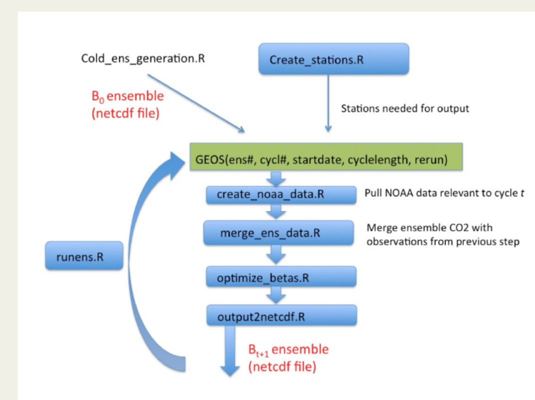


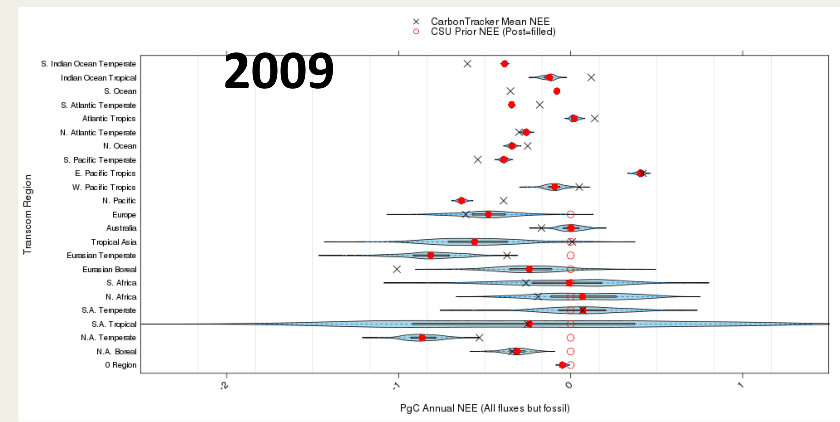
Chlorophyll Fluorescence

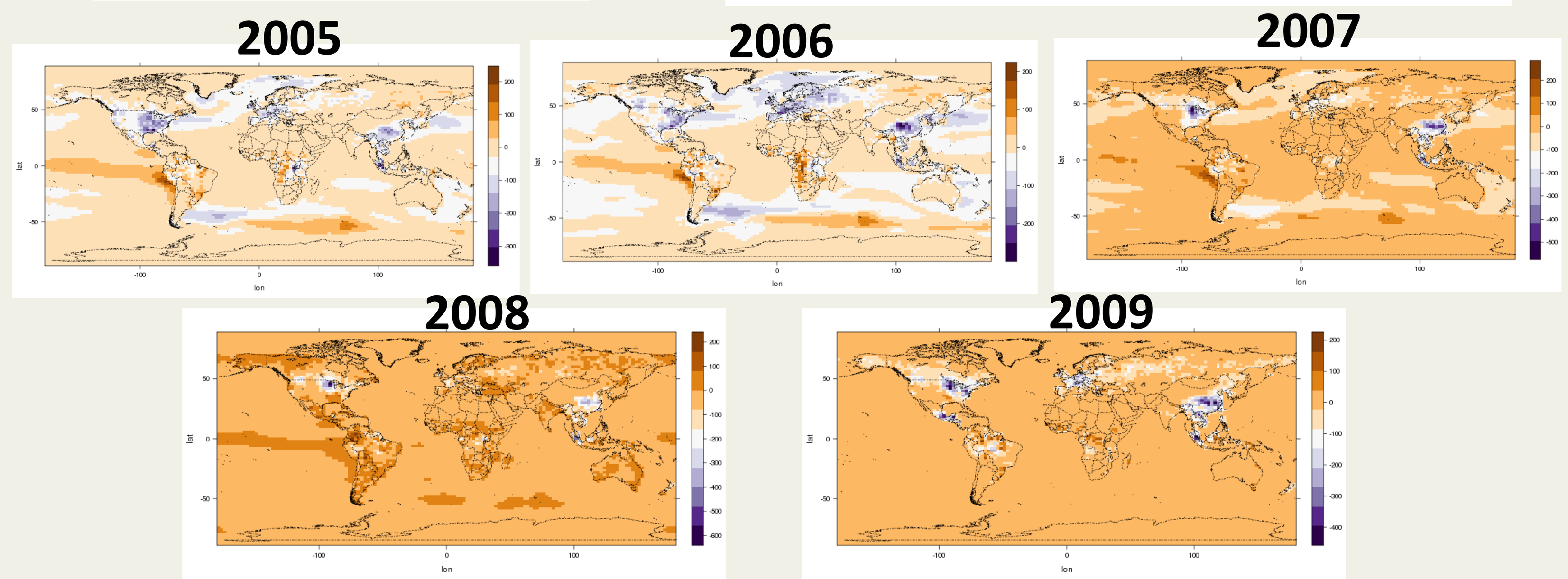


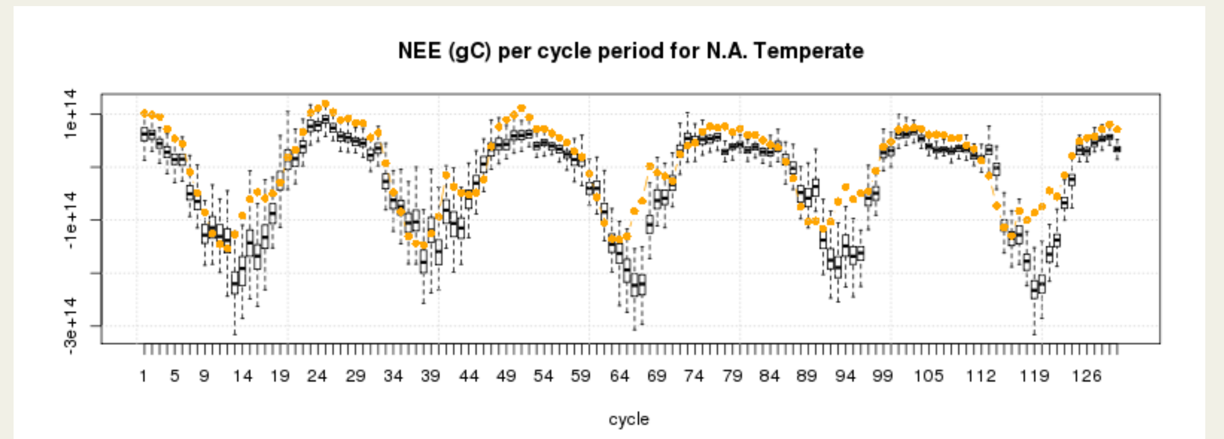
Preliminary Optimization from Atmospheric CO_2

Using NOAA in-situ data









Using GOSAT Data