

Nitrogen cycle in CLM5



**Will Wieder, Rosie Fisher, Dave Lawrence, Keith Oleson,
Charlie Koven, Erik Kluzek, & MANY, MANY more**

N Assumptions in

CLM 5

vs. **CLM4,4.5**

1. Leaf nitrogen content is static
dynamic & ~~un~~*related* to stomatal conductance

FlexCN



2. Photosynthetic capacity *does* ~~not~~ respond to the environment

LUNA

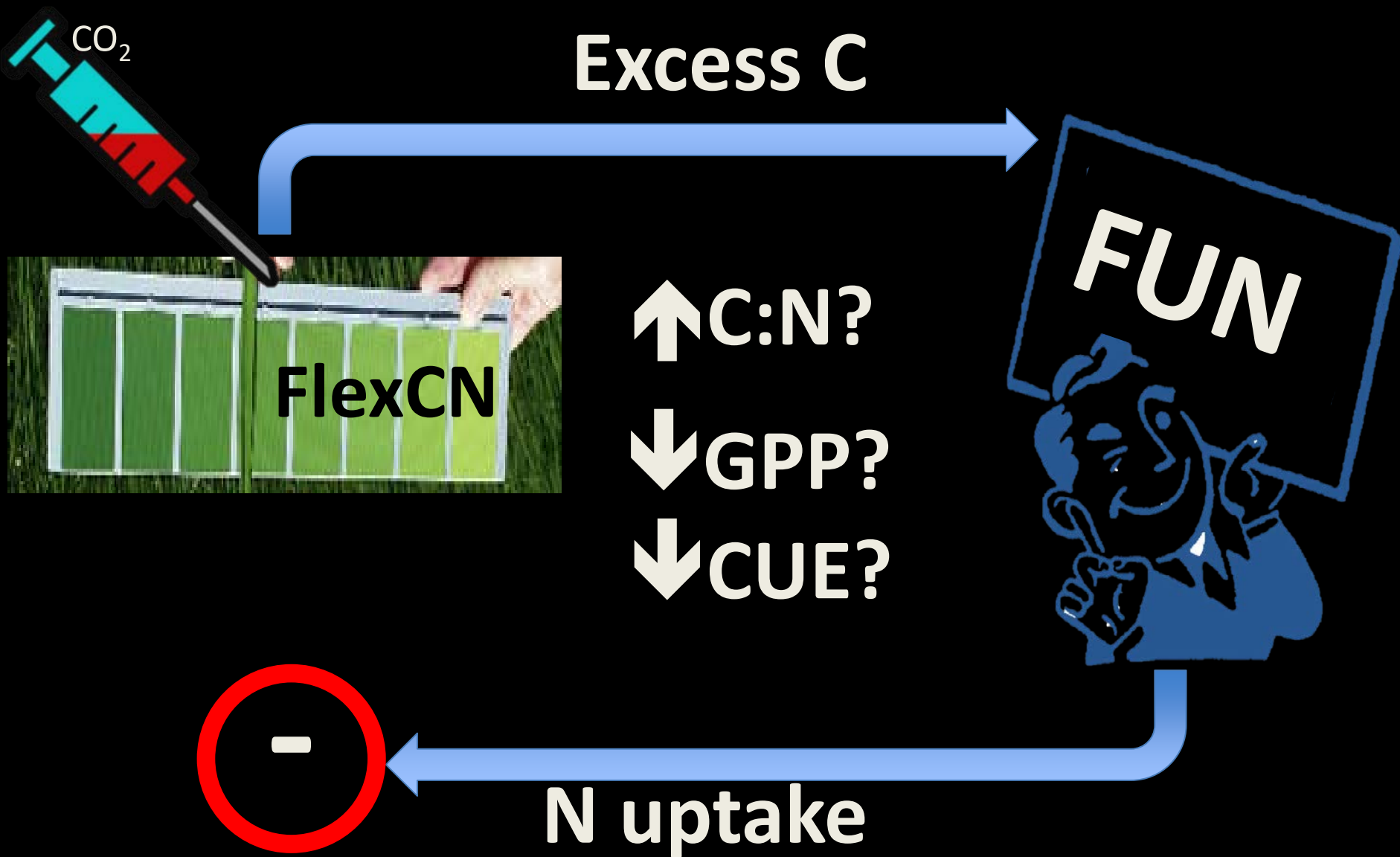


3. Plants *pay C to* get N for free

FUN



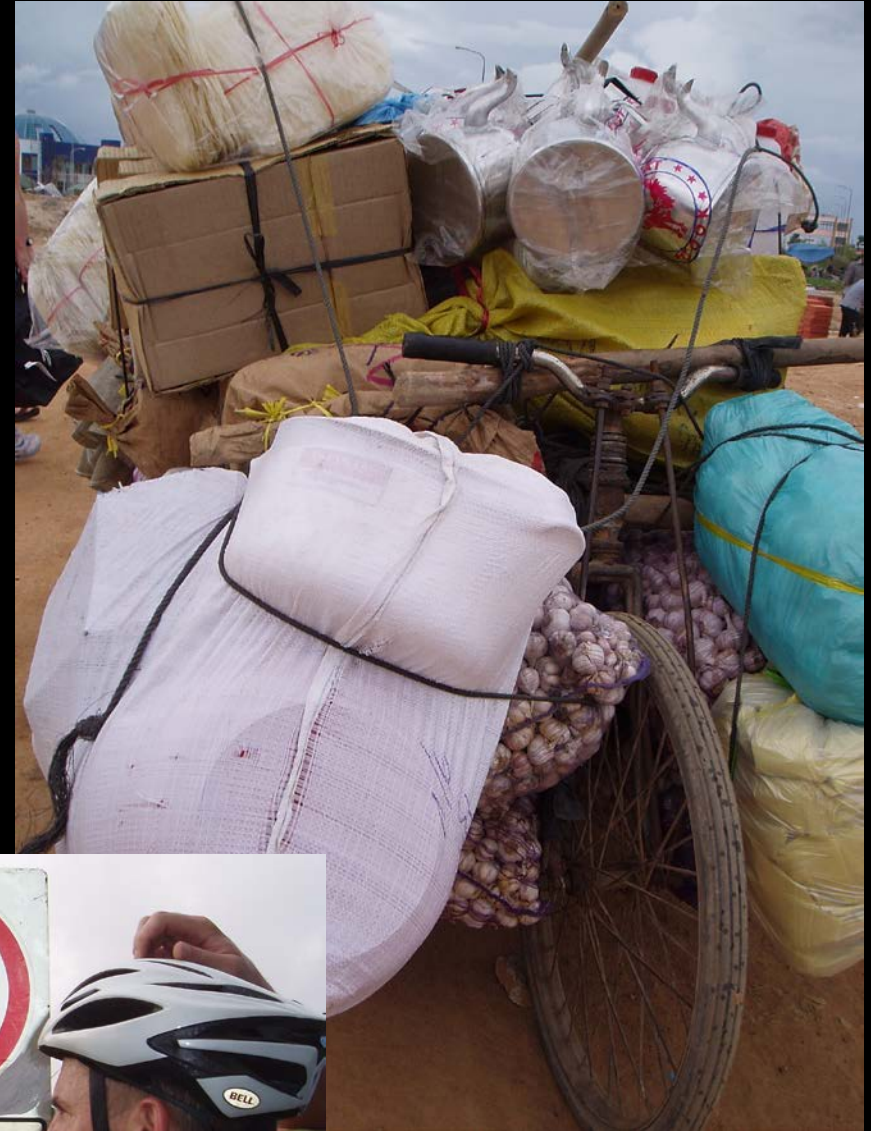
N Cycle in *CLM 5*



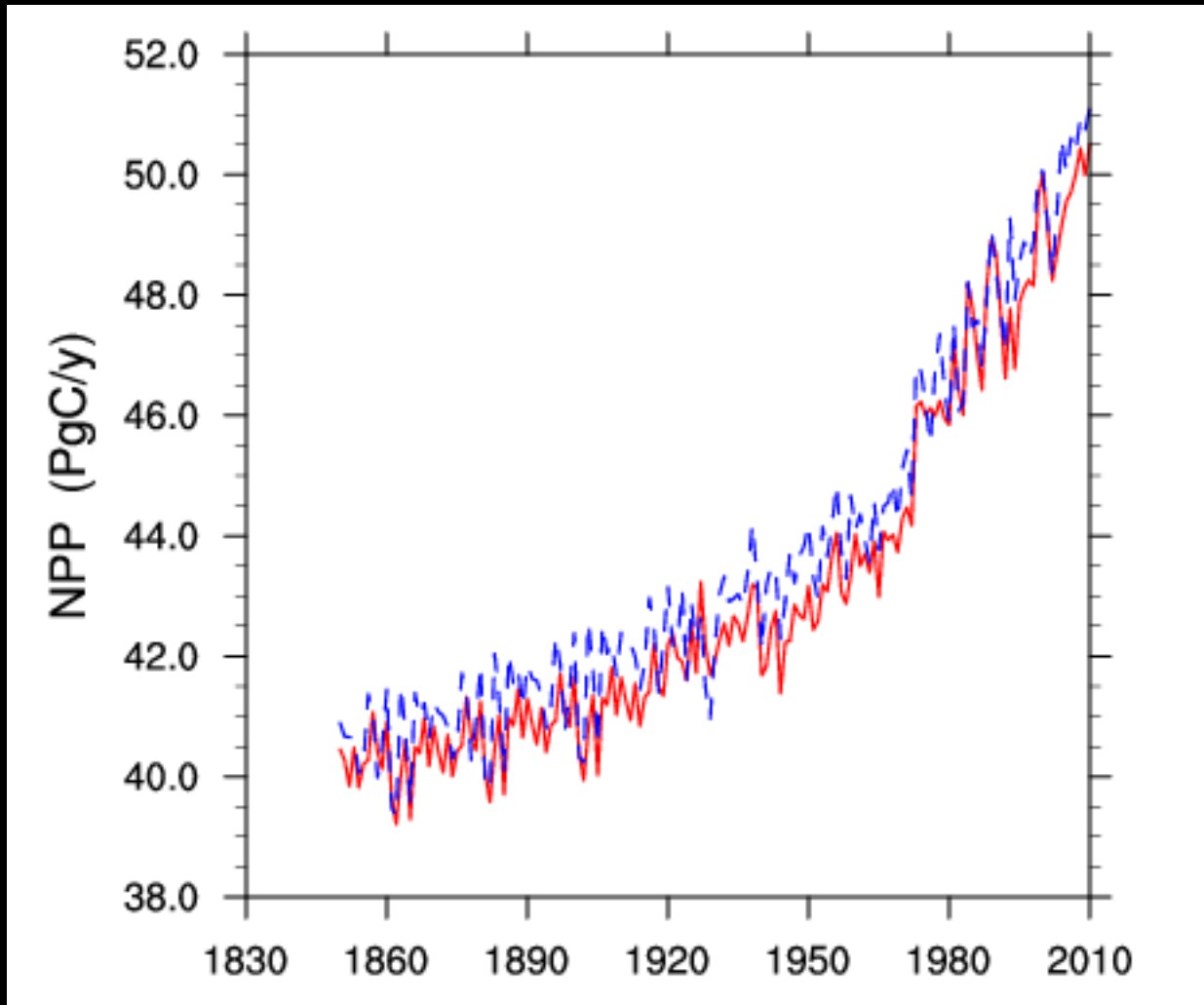
CLM4, 4.5



CLM 5

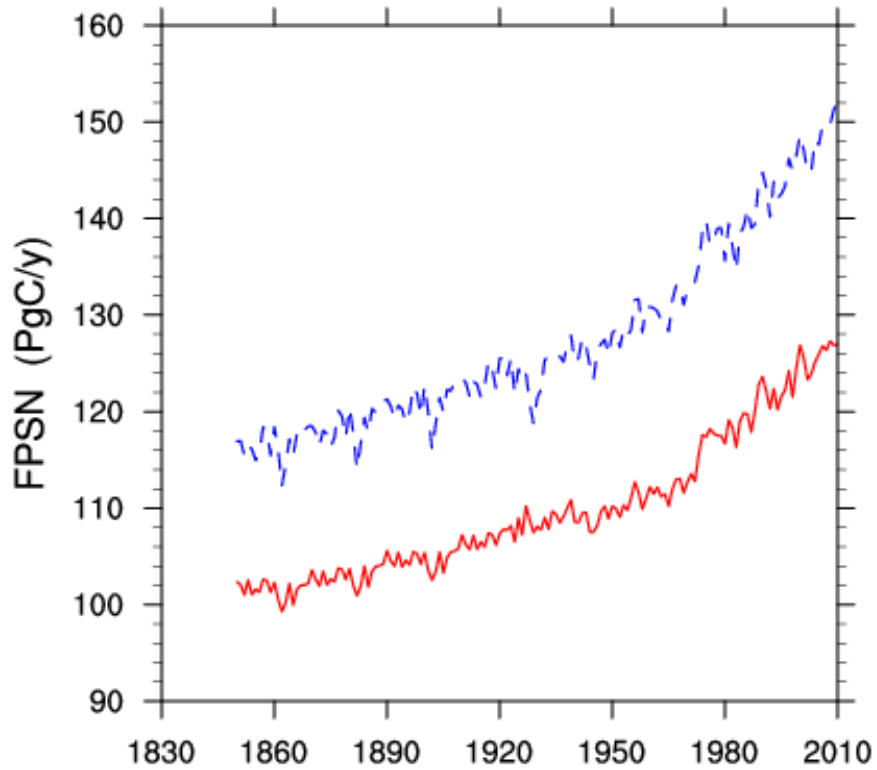


CLM4.5 vs. CLM5

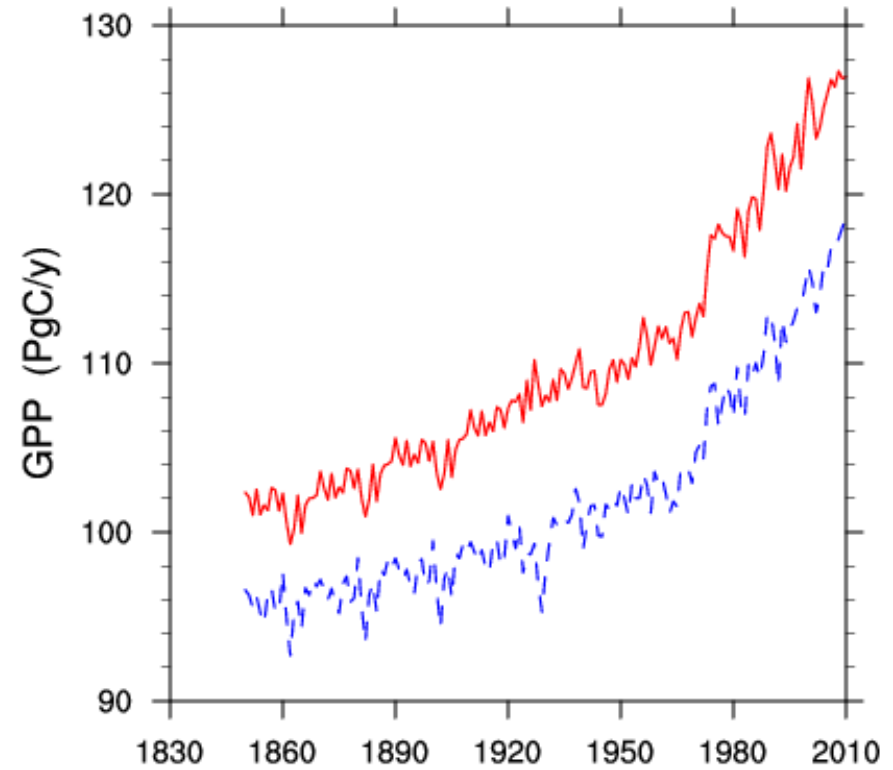


CLM4.5 vs. CLM5

photosynthesis



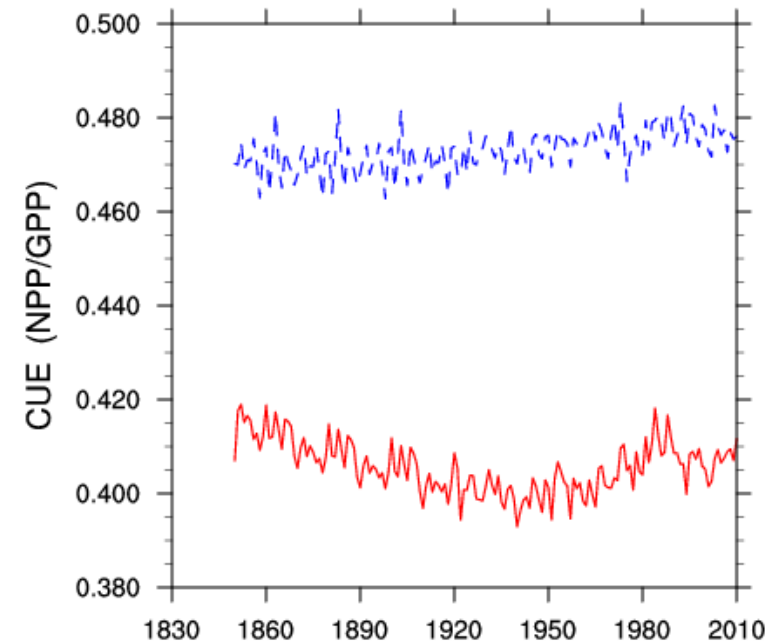
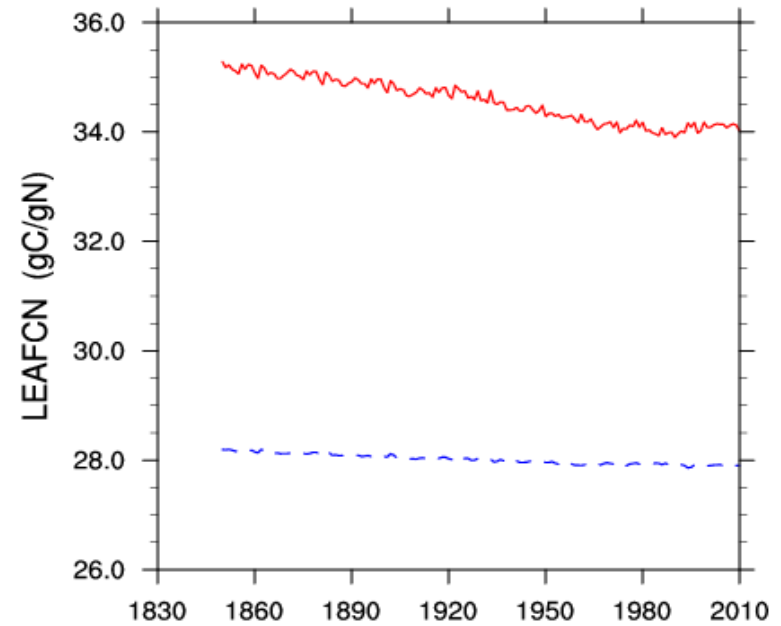
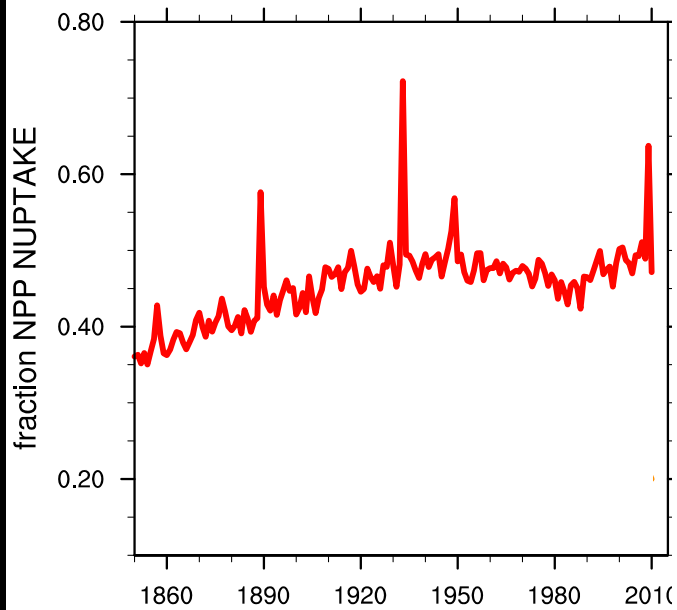
gross primary production



NO downregulation of GPP

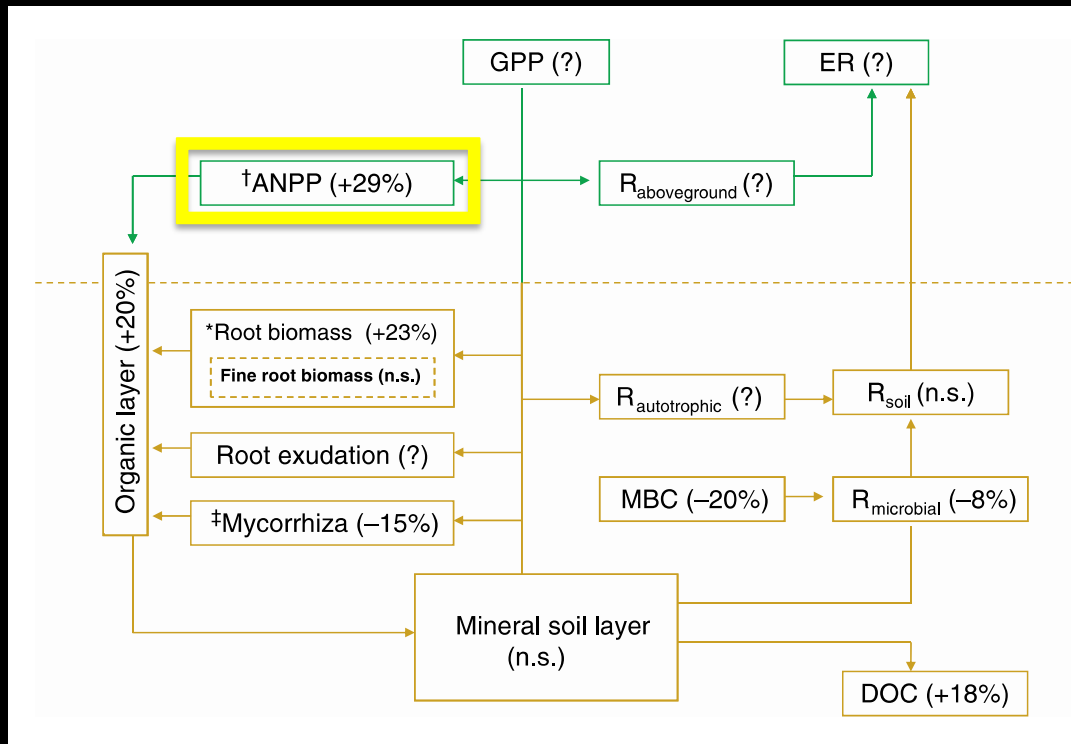
Now NPP depends on N availability (costs)

CLM4.5 vs. CLM5





Liu & Greaver 2010 *Eco Let*
 Janssens et al. 2010 *Nat Geo*
 Yue et al. 2016 *Sci Rep*



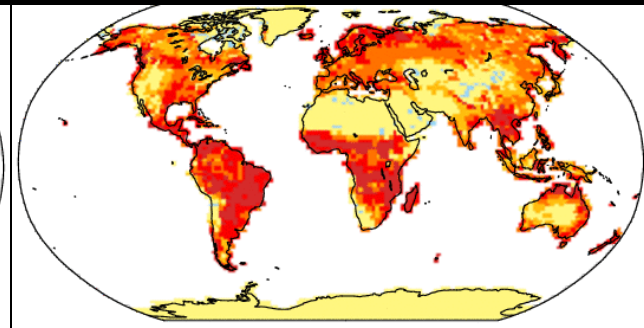
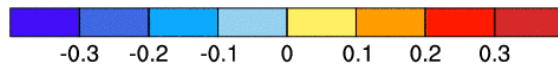
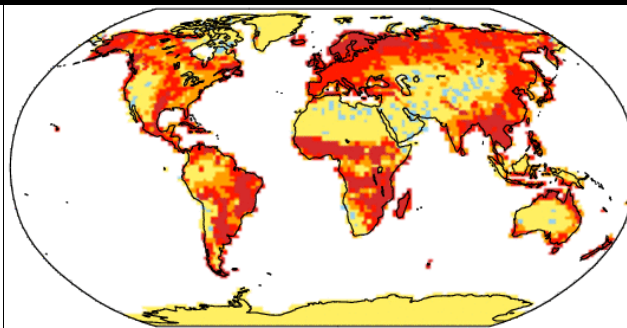
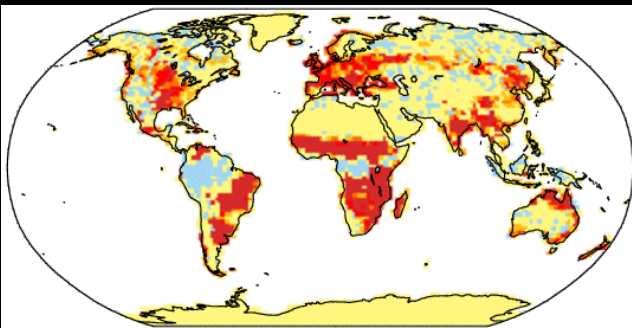
	CLM4.5 1850	CLM5 1850	CLM5 1990-2010	Obs*
GPP	+12%	+ 8%	+ 7%	?
LHEAT	+0.4 w/m ²	+0.9 w/m ²	+0.9 w/m ²	?
NPP	+18%	+22%	+22%	?
AGNPP	+11%	+13%	+18%	+29%
Litter C	<-1%	<-1%	+ 4%	+20%
NPP_NUPTAKE	NA	-35%	-35%	?

Δ NPP (g C m⁻² d⁻¹)

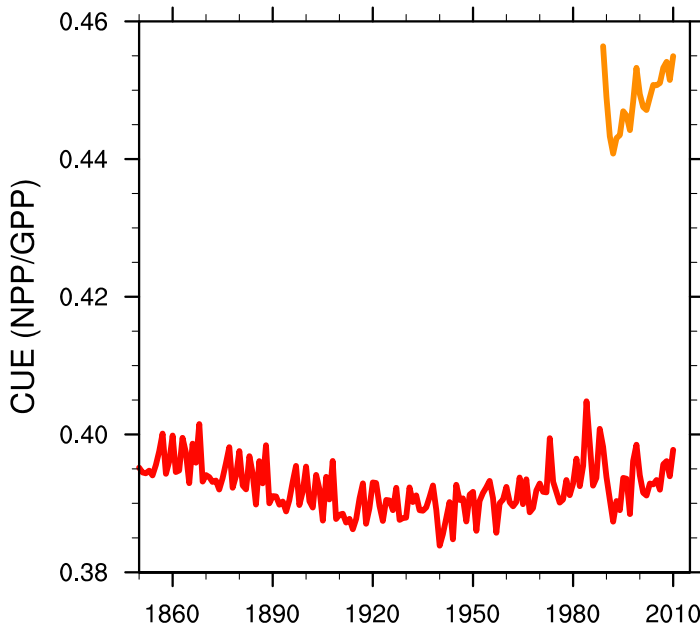
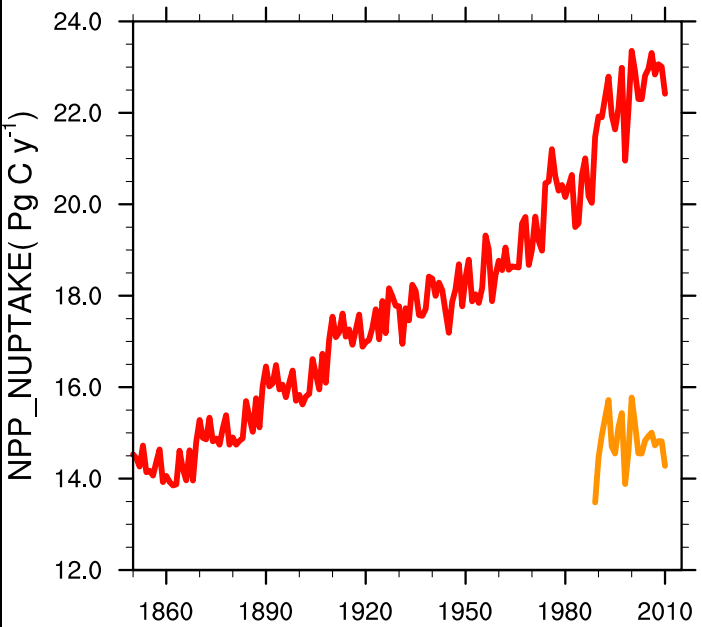
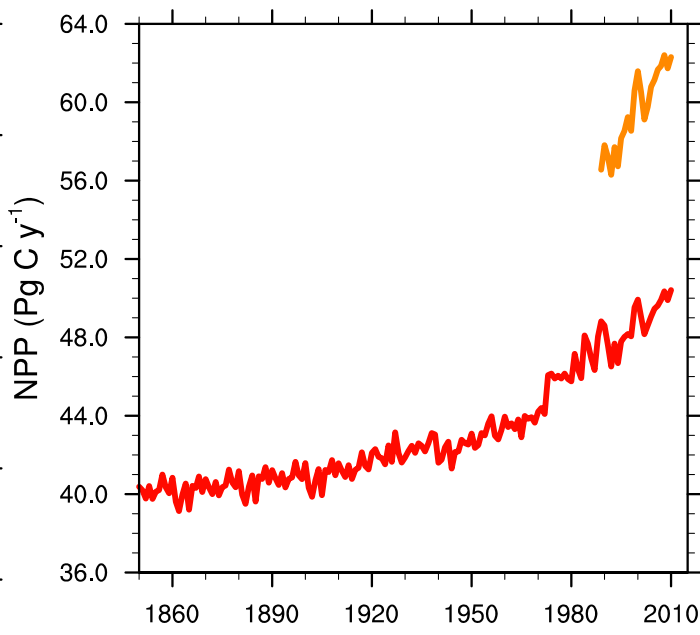
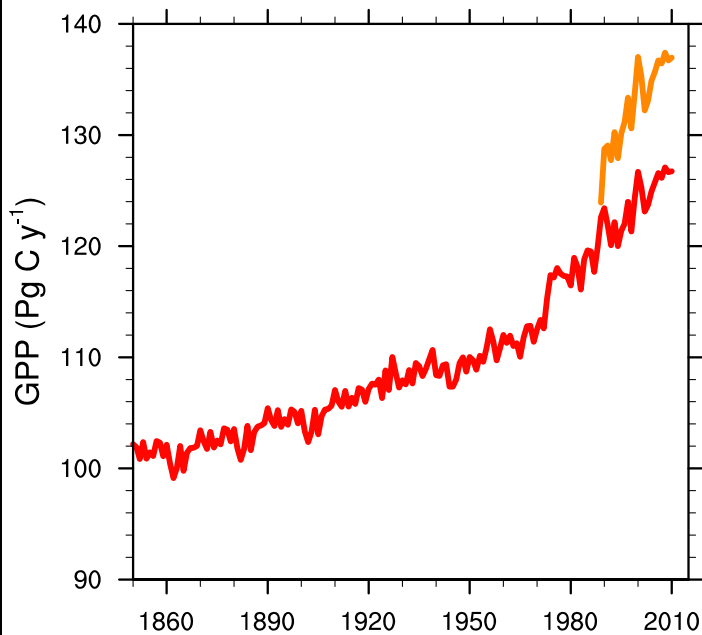
CLM4.5 (1850)

CLM5 (1850)

CLM5 (Hist.)

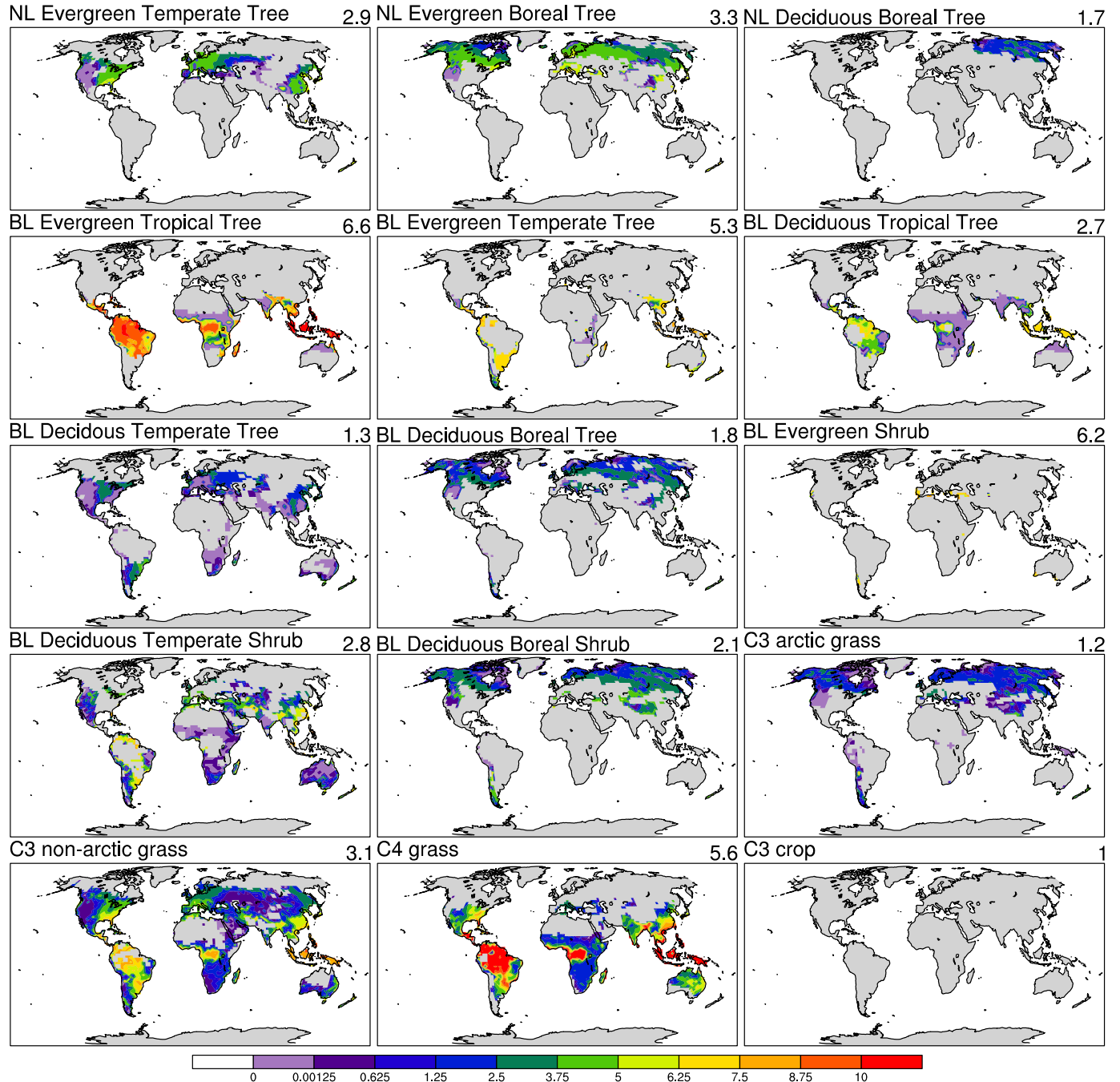


CLM5 5+FERT



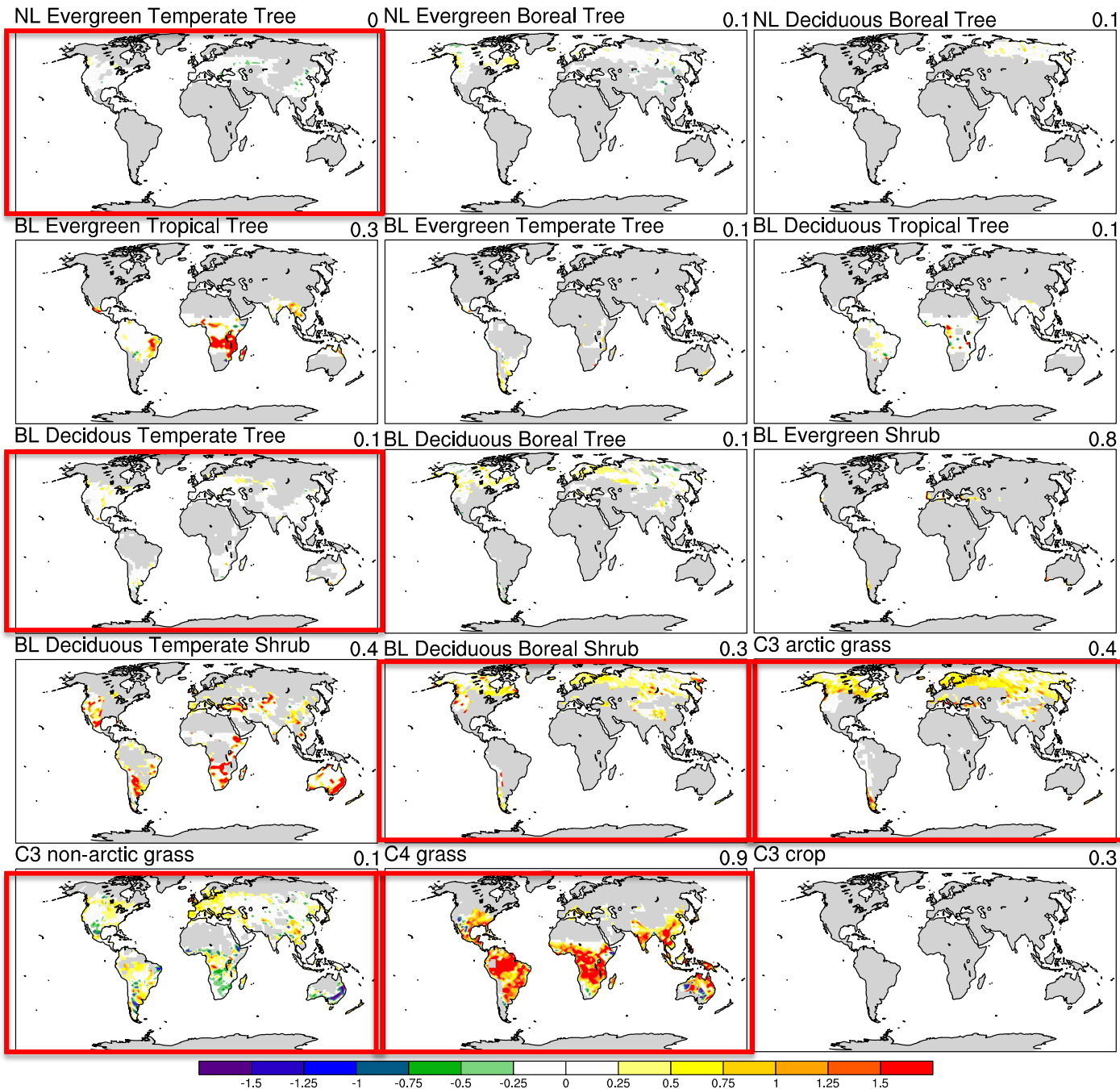
fclm50params_n12clm5r225_2deg_scspd_pkla_i_hist 2010: Daily Mean GPP $\text{gC m}^{-2} \text{d}^{-1}$

GPP
2010



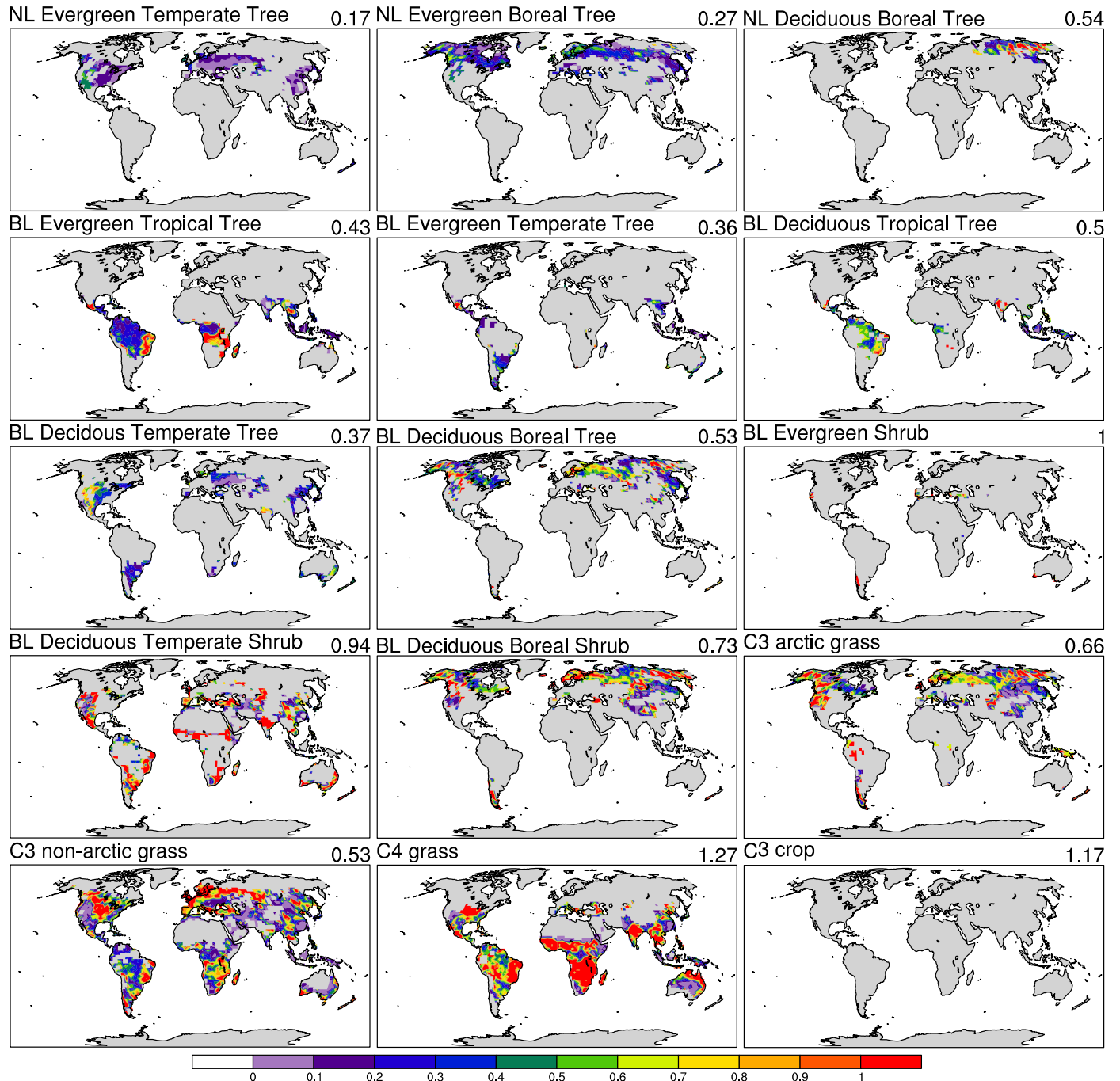
GPP 2010: Case A-B ANN mean difference

Δ GPP
Fert.



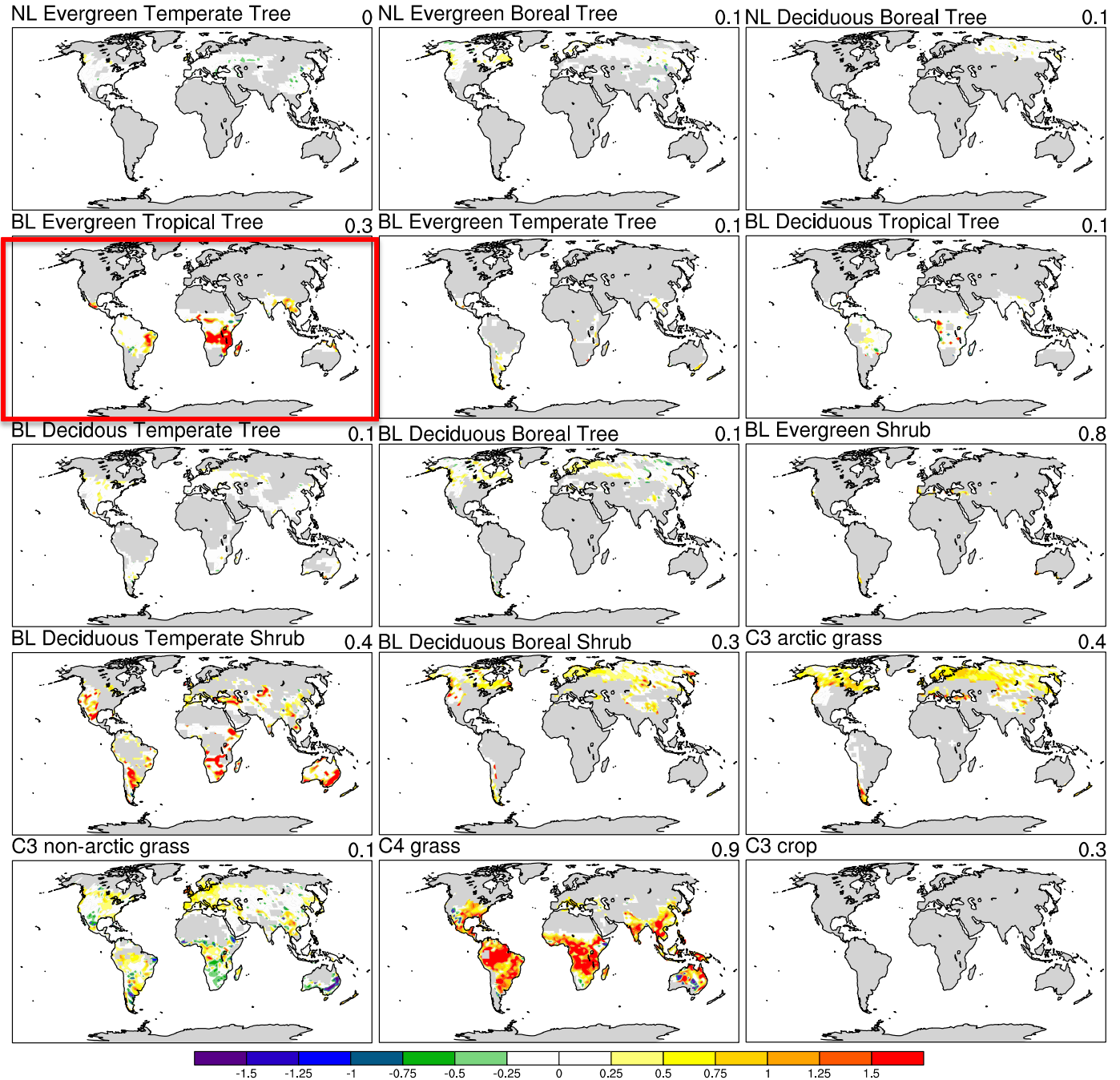
frac NPP_NUPTAKE (NPP_NUP/NPP)

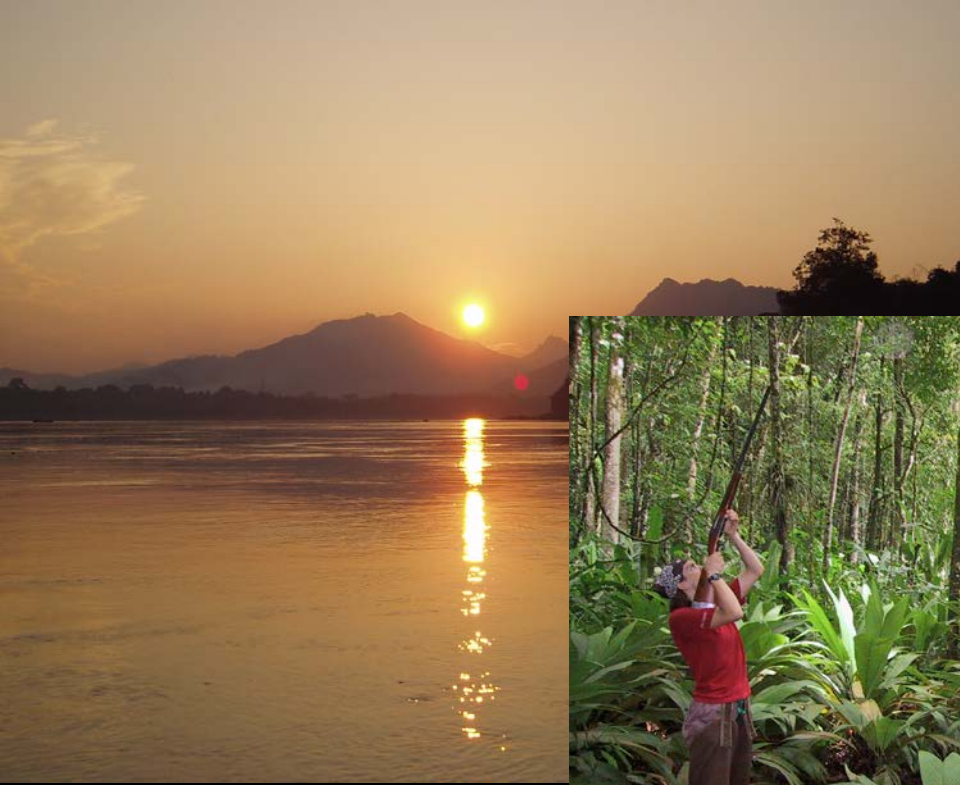
Fraction
NPP
N-uptake



GPP 2010: Case A-B ANN mean difference

Δ GPP
Fert.





N losses
N competition
C-N Dynamics
Management
Datasets & Funding



Metrics

N uptake: GPP

C:N uptake

Leaf C:N