IMPLEMENTING A TERRESTRIAL NITROGEN AND PHOSPHORUS CYCLE IN THE UVIC ESCM: Validation and first results

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WHY SHOULD WE ADD NUTRIENTS?

- Terrestrial system are nutrient limited.
- N and P are the main limiting nutrients.
- Overestimation of atmospheric carbon fix by vegetation.

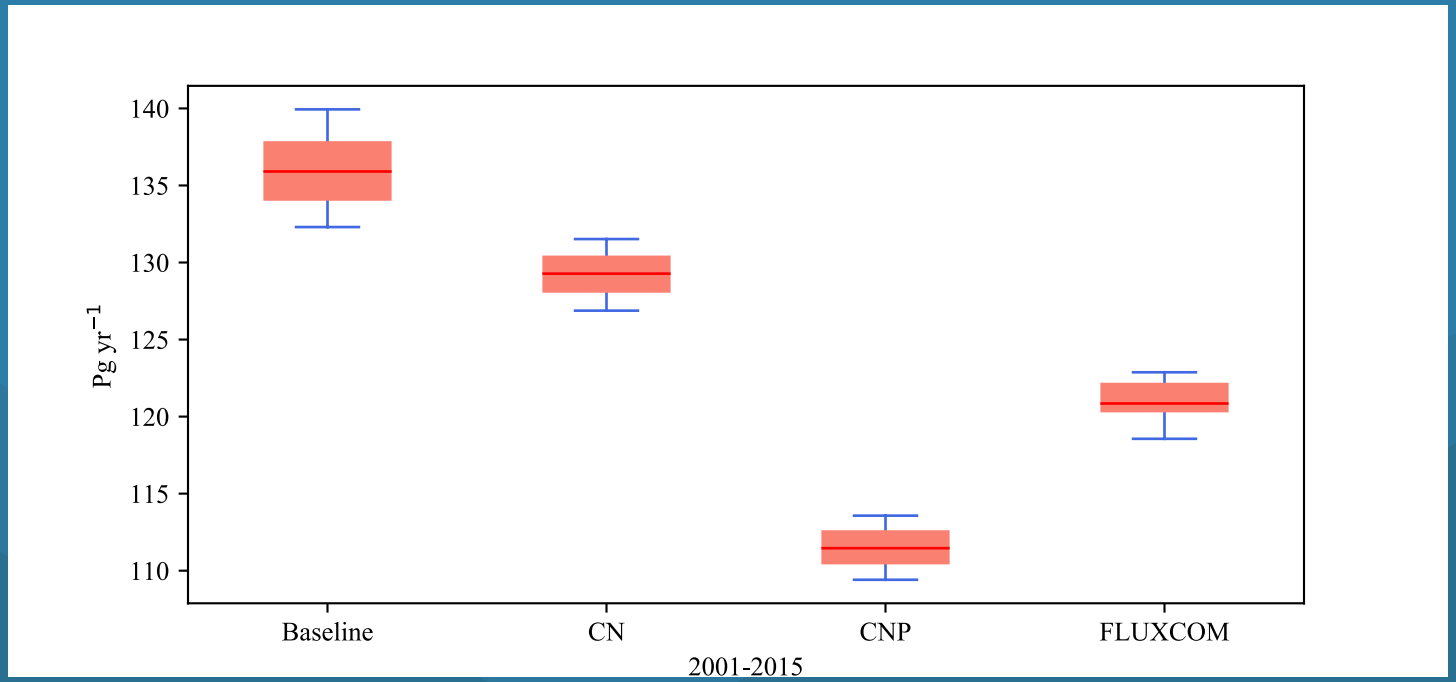
OBJECTIVES

IMPROVE NITROGEN MODEL

DEVELOP PHOSPHORUS MODEL

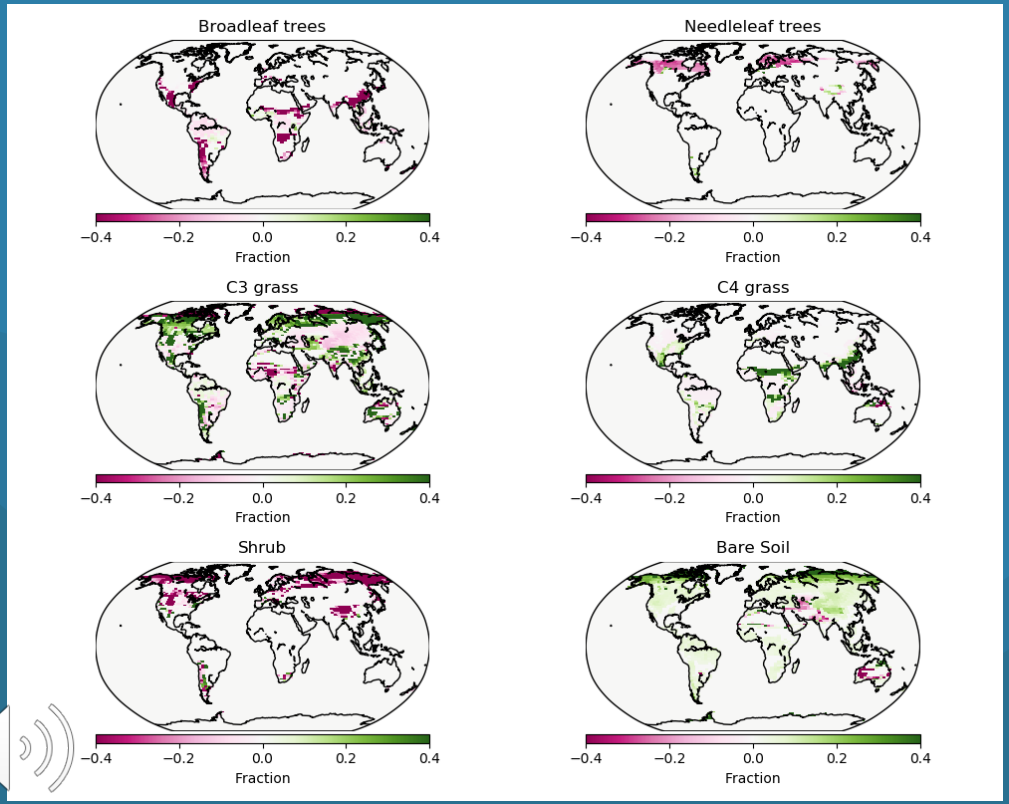
COUPLE C:N:P

GROSS PRIMARY PRODUCTIVITY



PFTs FRACTION DIFFERENCES

PFTs fraction, **CNP** Minus **Baseline**



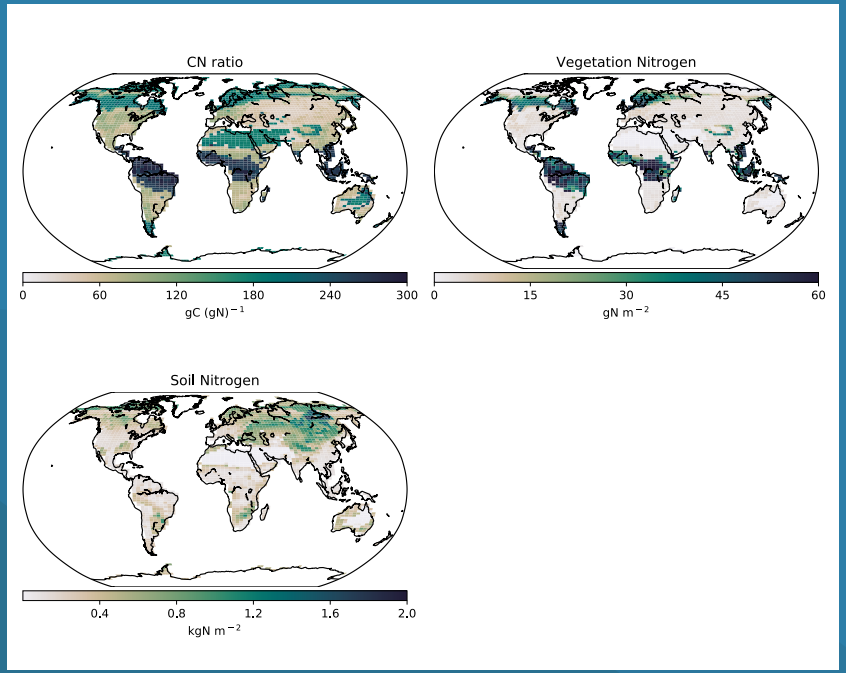
Vegetation carbon biomass

Baseline: 594 Pg

CNP: 456 Pg

Wania et al. 2012 N cycle vs current

N distribution

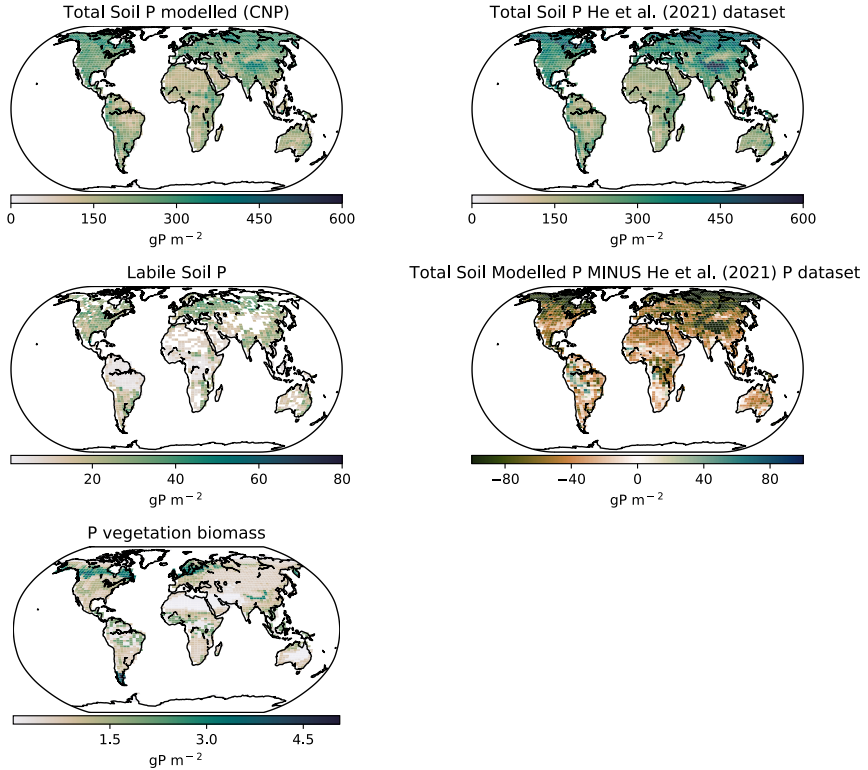


- Mass balance changes.

- Denitrification.

- Vegetation N reduction:
2.94 PgN- First 2012 model
2.12 PgN – Our model

Phosphorus cycle distribution



Phosphorus cycle General values

Variables	Value (Pg P)	References (Pg P)
Total inorganic P	20.8	35-40 (Smil, 2000)
		36(Mackenzie et al. 2002)
		26.5 (Wang et al. 2010)
Total organic P	3.5	5-10 (Smill, 2000)
		5(Mackenzie et al. 2002)
		5.7 (Wang et al. 2010)
		8.6 (Yang et al.2013)
Labile P	1.4	1.5 (Wang et al. 2010)
		3.6 (Yang et al.2013)
Sorbed P	1.1	1.7 (Wang et al. 2010)
Strongly sorbed P	12	7.6 (Wang et al. 2010)
Occluded	6.3	9.0 (Wang et al. 2010)
Vegetation P	0.2	0.4 (Wang et al. 2010)
		0.5 (Smil, 2010)
P Litter	0.01	0.04 (Wang et al. 2010)

SUMMARY

- The nutrient limitation has reduced the carbon fixing capacity of terrestrial vegetation.
- N has mainly limited high latitudes while P limits tropical regions, but co-limitation has been seen in tropical regions.
- Both nutrient have reduced the terrestrial vegetation biomass.
- The primary productivity and atmospheric carbon representation has improved with nutrient limitation.

THANK YOU