Potential of land use and land management for mitigation of carbon emissions and local climate change

LUMIP
Land Use Change

David Lawrence (NCAR) and George Hurtt (University of Maryland) and ???

	Land-Use Scenario		
Main Scenario	**SSP1-2.6 Afforest**	**SSP3-7 Deforest**	**SSP5-8.5 Weak Deforest**
SSP1-2.6	**ScenarioMIP** Conc.-driven		
SSP3-7		**ScenarioMIP** Conc.-driven	
SSP5-8.5			**C4MIP** Emissions-driven

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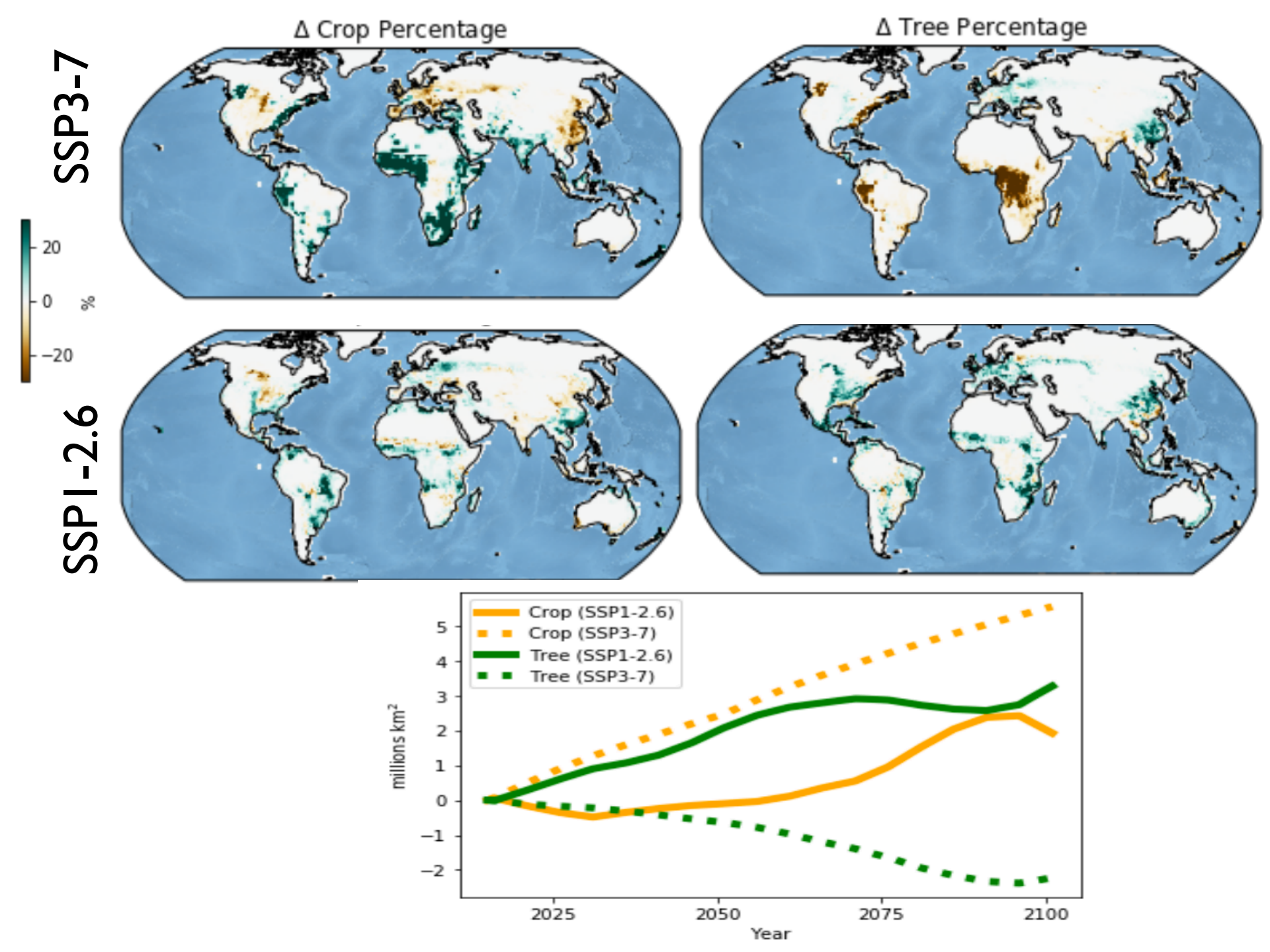
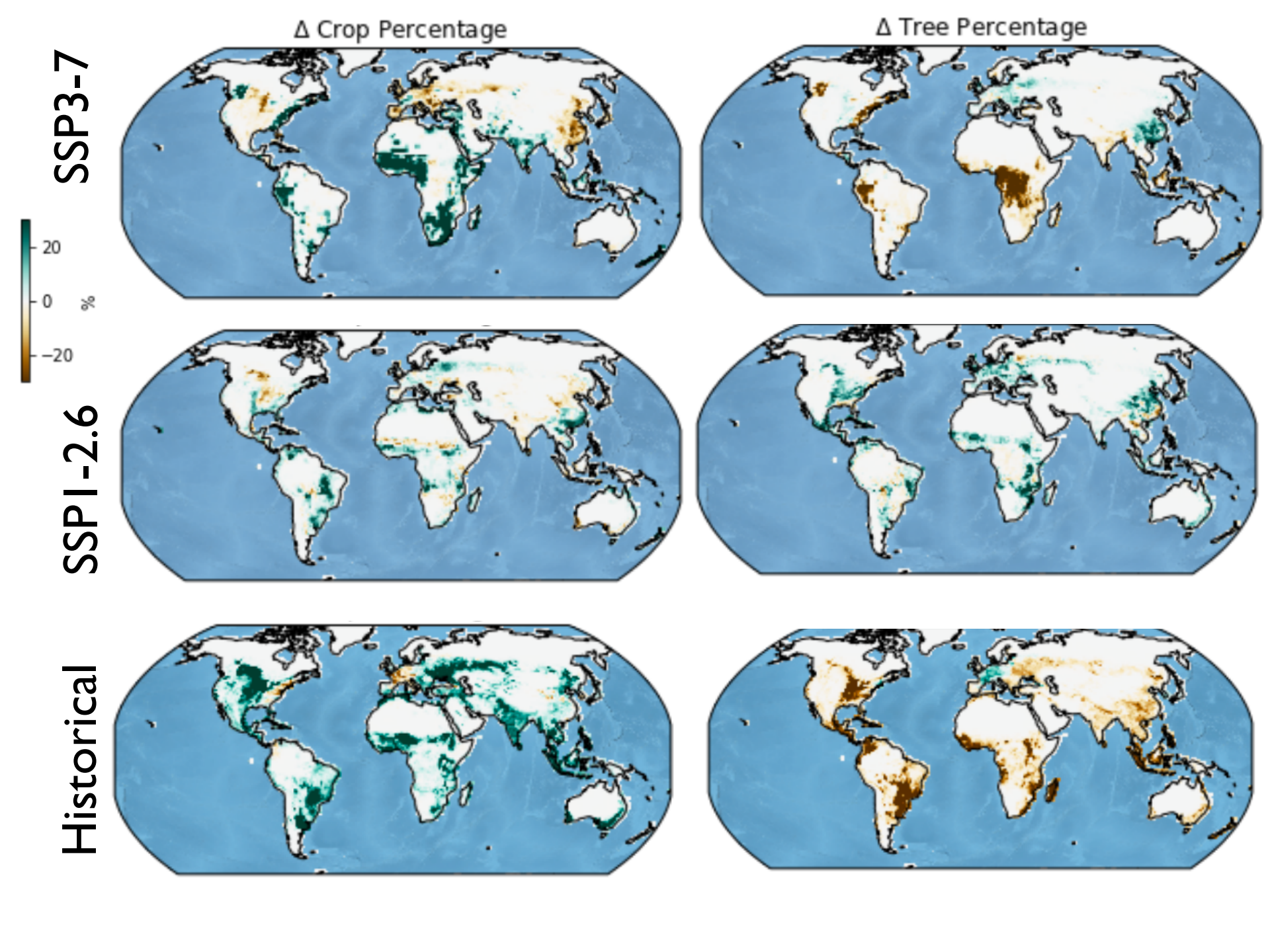
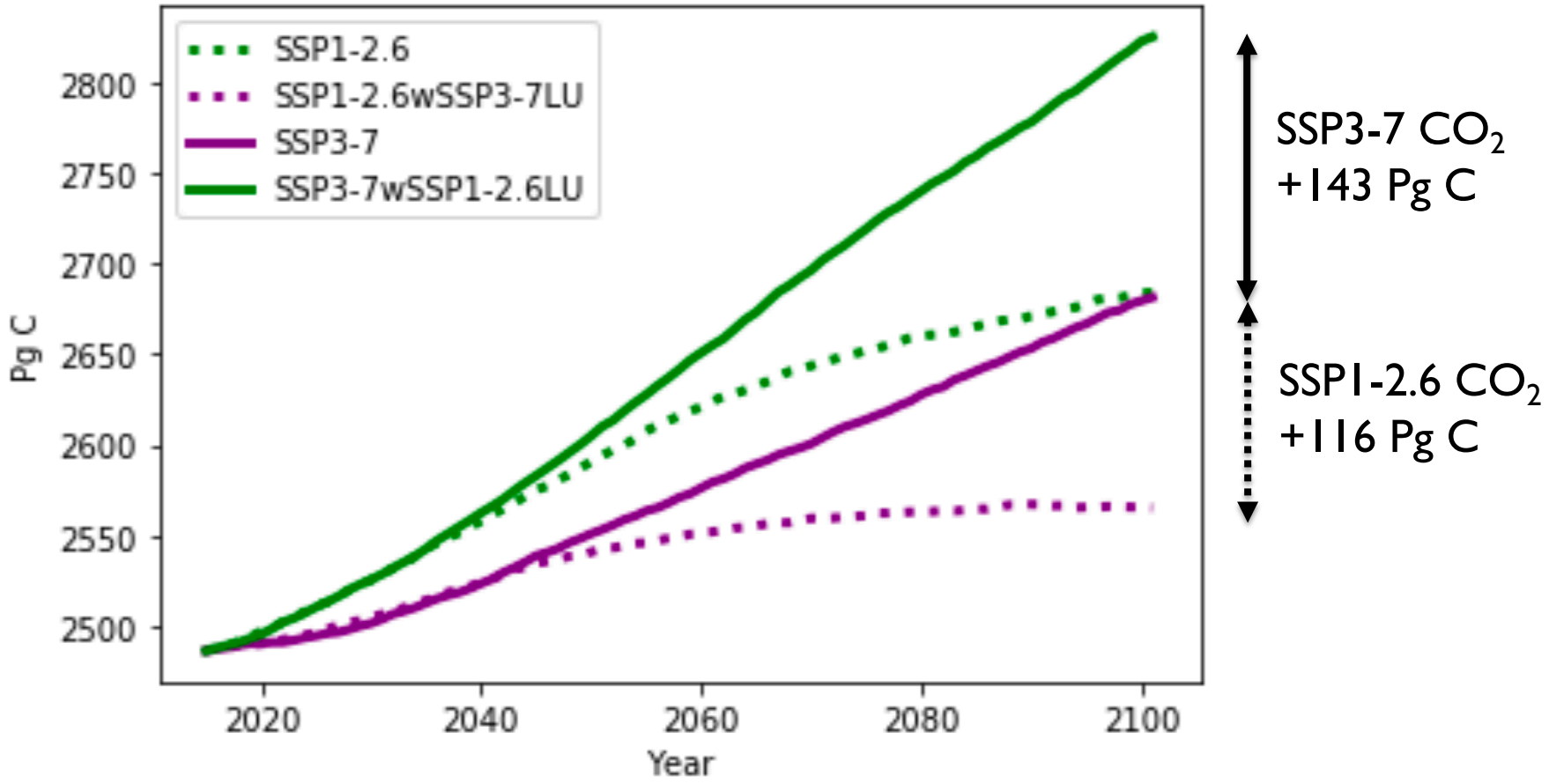
Biogeophysical climate impacts of LULCC; assess land management for regional climate mitigation

Assess how impact of LULCC differs at different climate change and CO_2 levels


Δ Crop Percentage
Δ Tree Percentage
SSP3-7
SSP1-2.6
20
0
−20
%
Crop (SSP1-2.6)
Crop (SSP3-7)
Tree (SSP1-2.6)
Tree (SSP3-7)
millions km²
5
4
3
2
1
0
−1
−2
2025
2050
2075
2100
Year


Δ Crop Percentage
Δ Tree Percentage
SSP3-7
SSP1-2.6
Historical
20
0
−20
%

Carbon gained due to re/afforestation differs at different CO_2 levels



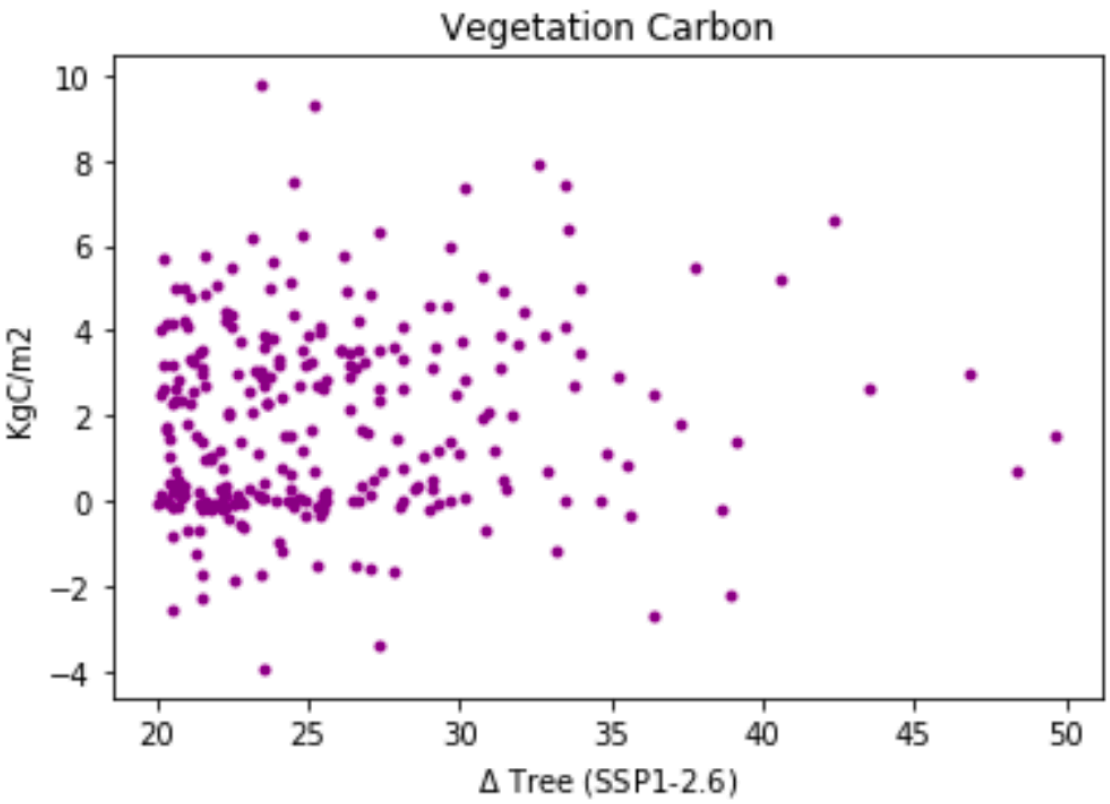
<u>IAM Projections of Accumulated Land C</u>

IMAGE SSP1-2.6 : +27 PgC

AIM SSP3-7: - 98 PgC

So, SSP1-2.6 Lu rather than SSP3-7Lu should result in +125 Pg C gain on land

How much carbon gained due to re/afforestation?



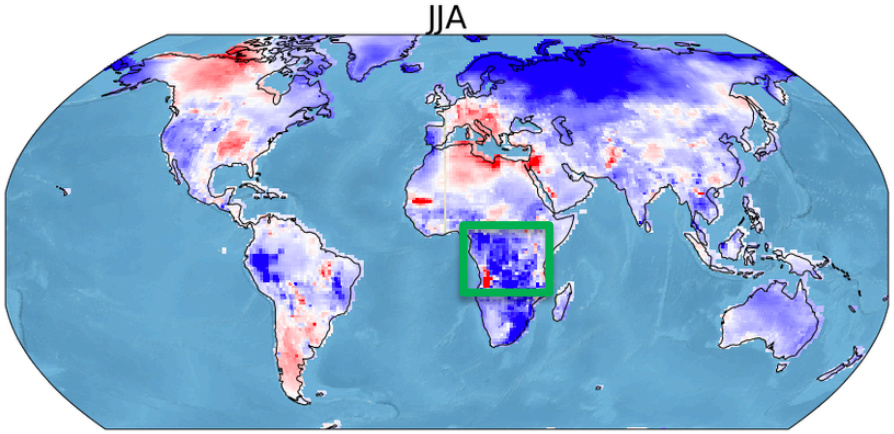
1. Select grid cells with >20% change in tree fraction (2060-2015) in SSP1-2.6
2. For these grid cells, evaluate grid cell carbon difference between SSP1-2.6 and SSP1-2.6wSSP3-7 Land use

Lots of grid cells show little or no C gain and some even show C losses? Why?

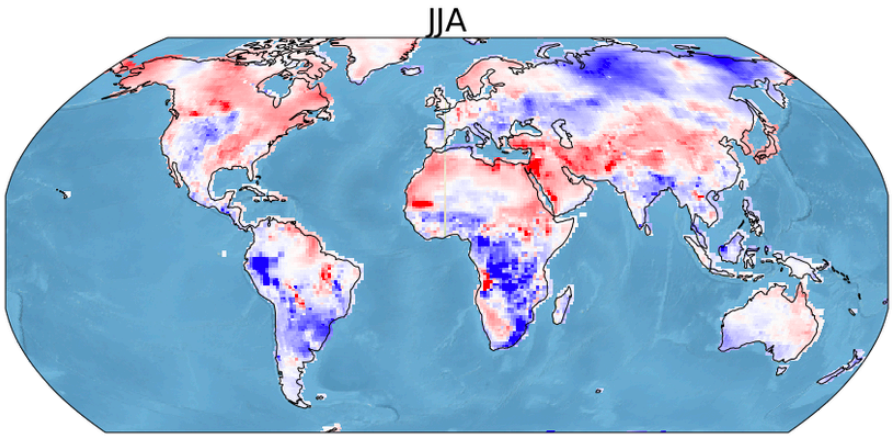
- Climate doesn't support tree growth?
- Trees 'lose' competition for water or nitrogen resources?

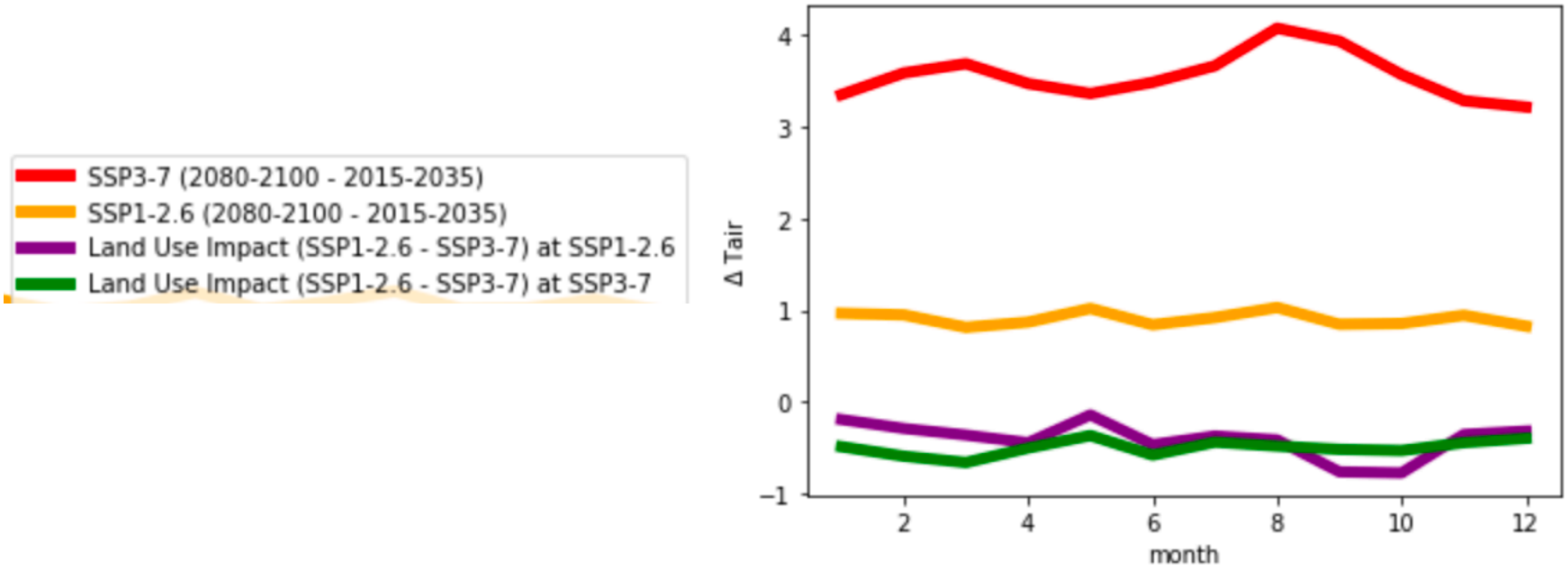
Delta T_{air} : SSP1-2.6 Land Use – SSP3-7 Land Use

SSP3-7



SSP1-2.6





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Biogeophysical climate impacts of LULCC; assess land management for regional climate mitigation

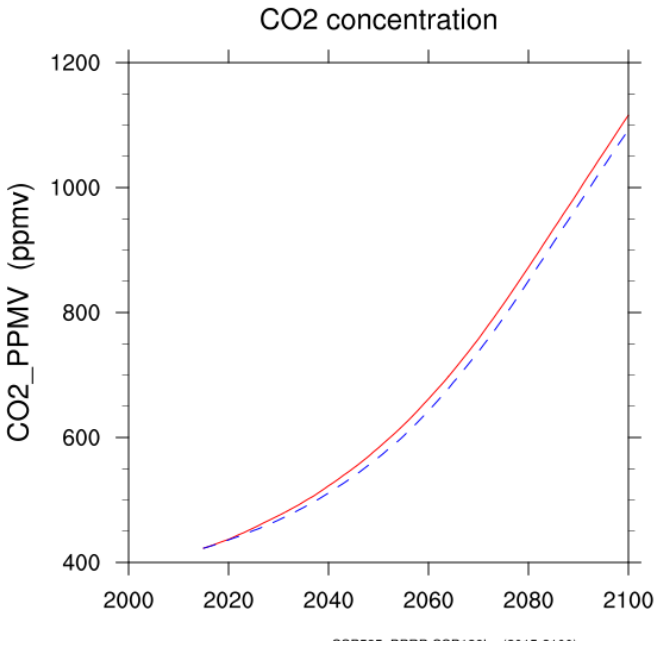
Assess how impact of LULCC differs at different climate change and CO_2 levels

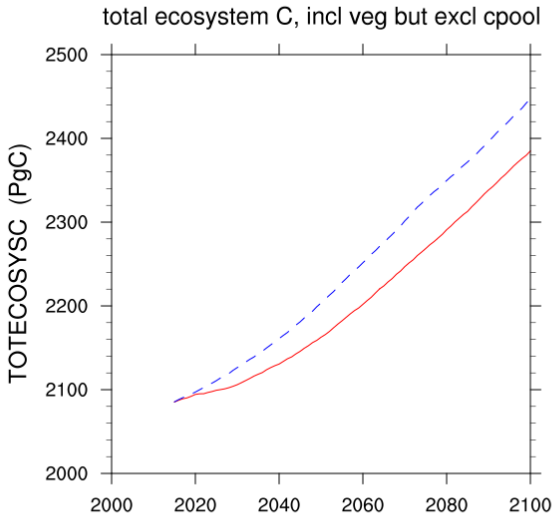
Full effects of LULCC through both biogeophys and biogeochem processes

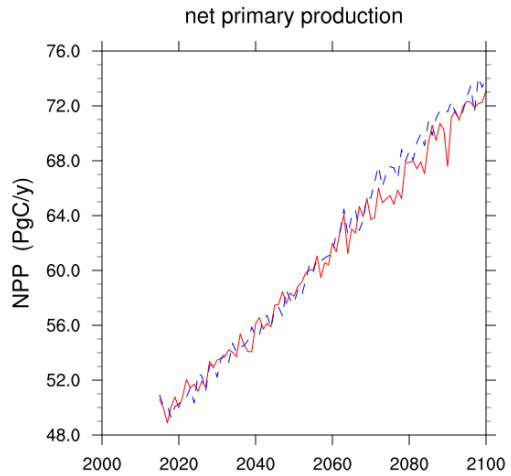
Emissions-driven: SSP5-8.5 vs SSP5-8.5 with SSP1-2.6 land use

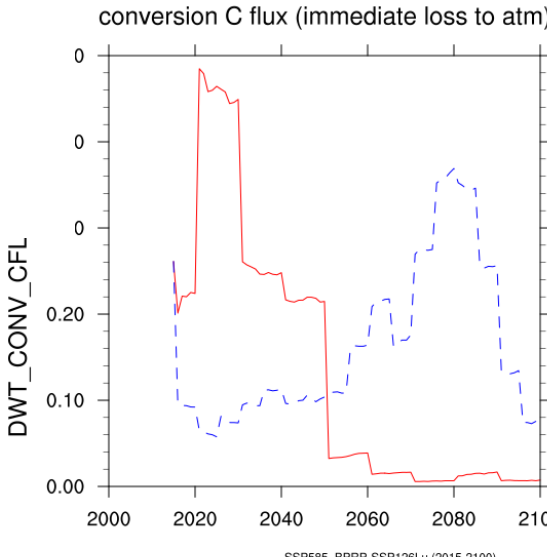
SSP5-8.5

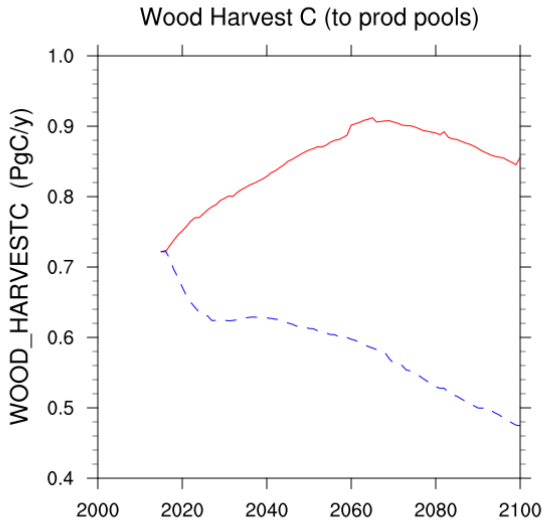
SSP5-8.5 w/ SSP1-2.6Lu











Emissions-driven: Impact of differing land use scenarios at SSP1-2.6?

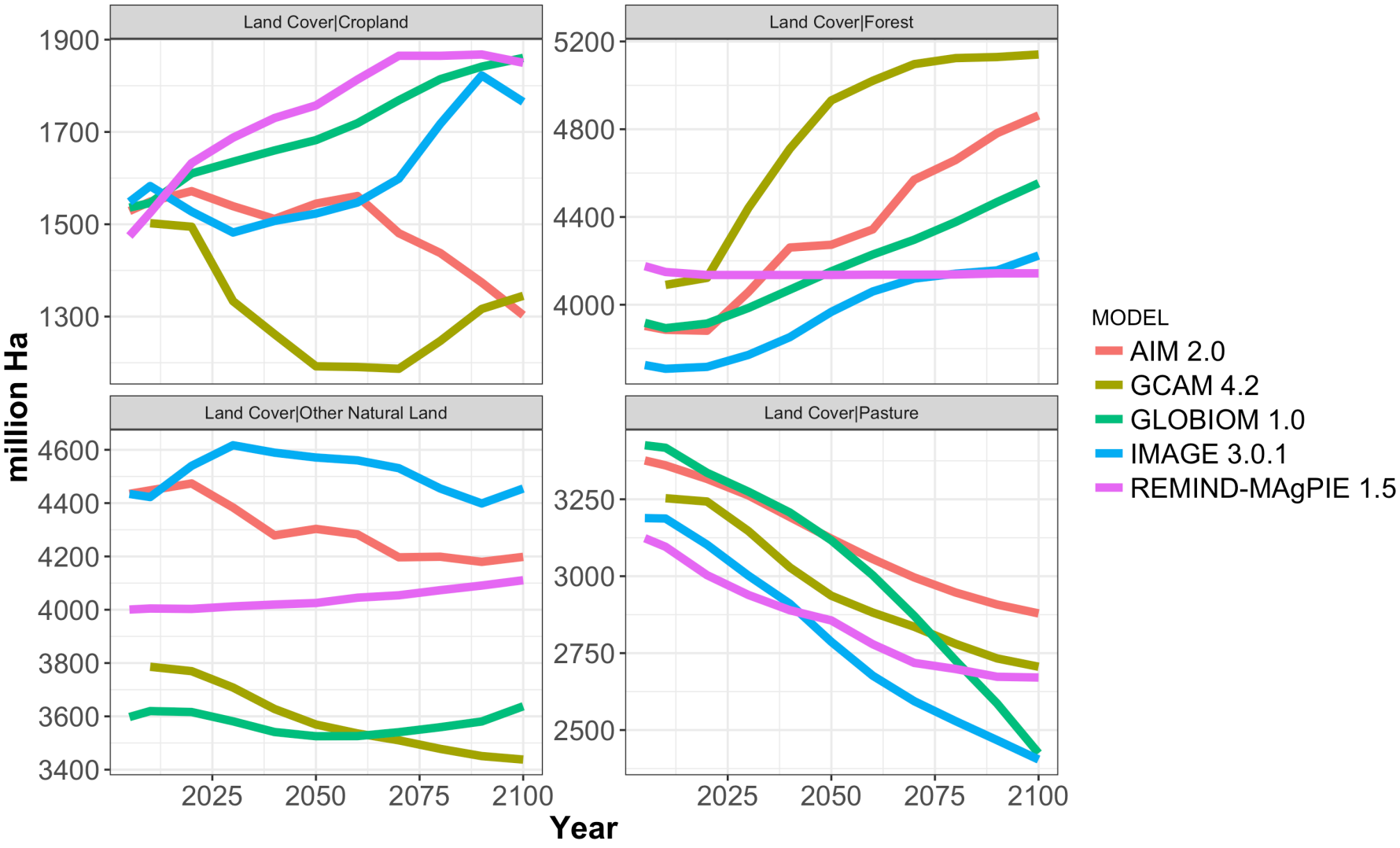


Figure from Kate Calvin