Interactions between land use change & carbon cycle feedbacks

Objective:

Quantify the impact of human land use and land cover change (LULCC) on the terrestrial carbon budget to year 2300

Approach:

- Used an Earth system model (ESM) forced with Representative Concentration Pathway 8.5 (RCP8.5)
- Accounted for direct and quasi-direct LULCC CO_2 emissions as well as the influence of LULCC on reducing natural carbon sinks in the future

Results/Impacts:

- Conversion of land (e.g., from forest to croplands via deforestation) resulted in a model-estimated, cumulative carbon loss of 490 Pg C between 1850 and 2300
- About 40% of carbon loss associated with LULCC arose from direct human modification of land surface; remaining 60% was indirect consequence of loss of potential natural carbon sinks
- Most anthropogenic carbon uptake resulted from effect of rising atmospheric CO_2 on photosynthesis in trees, indicating model-projected carbon feedbacks were sensitive to deforestation

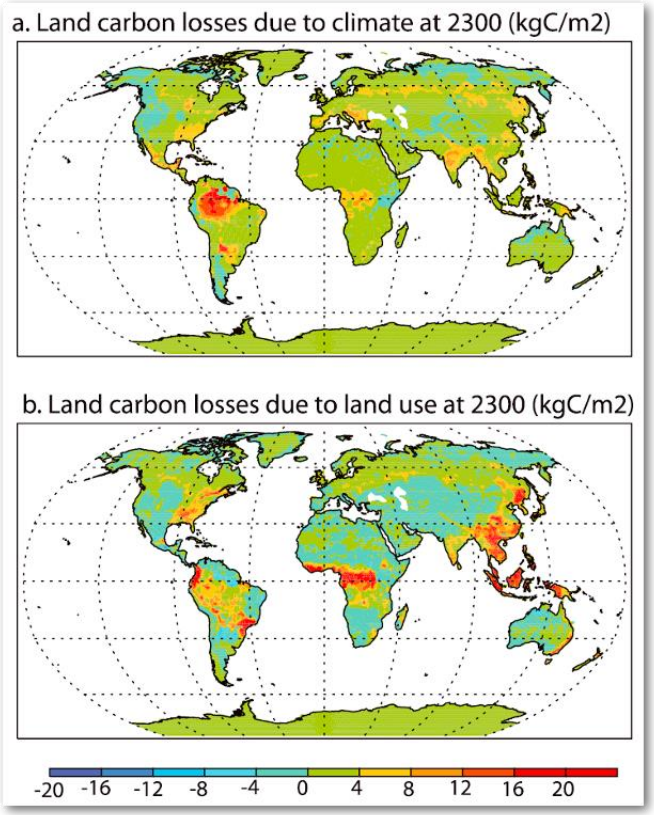

Figure: Change in land carbon at year 2300 caused by (a) climate change from CO_2 and other forcing agents, and (b) human land use and land cover change.

Mahowald, Natalie M., **James T. Randerson**, Keith Lindsay, Ernesto Muñoz, Scott C. Doney, Peter Lawrence, Sarah Schlunegger, Daniel S. Ward, **David M. Lawrence**, and **Forrest M. Hoffman** (2017), Interactions between land use change and carbon cycle feedbacks, *Global Biogeochem. Cycles*, 31(1):96–113, doi:10.1002/2016GB005374.