Disturbance suppresses the aboveground carbon sink in North American boreal forests

Wang, J.A. et al., *Nature Climate Change.* (2021). https://doi.org/10.1038/s41558-021-01027-4

Science Question

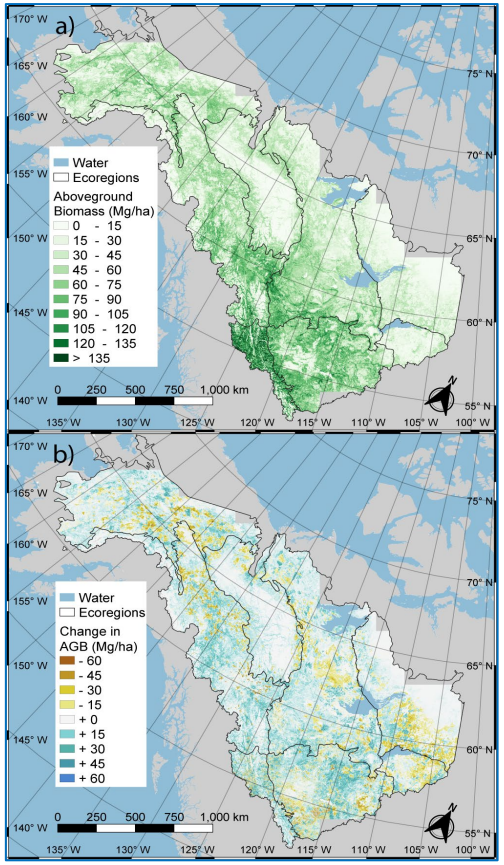
- Climate change is altering boreal vegetation and disturbance dynamics, but the aggregate impact of these changes on boreal carbon budgets is not well understood. We examined how disturbances have altered aboveground biomass carbon budgets in boreal forests.

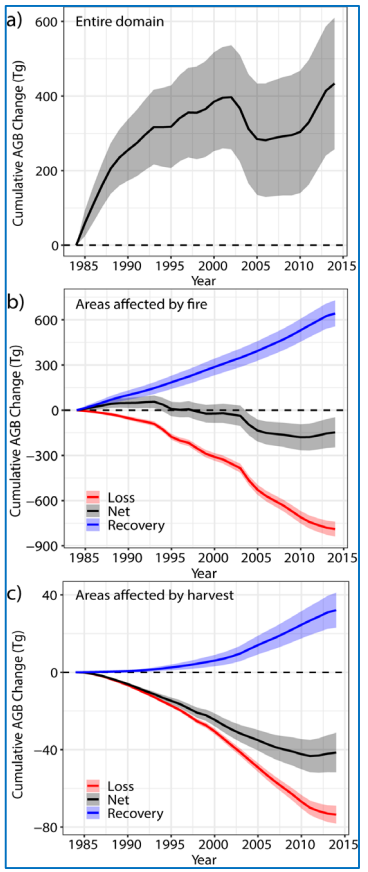
Analysis

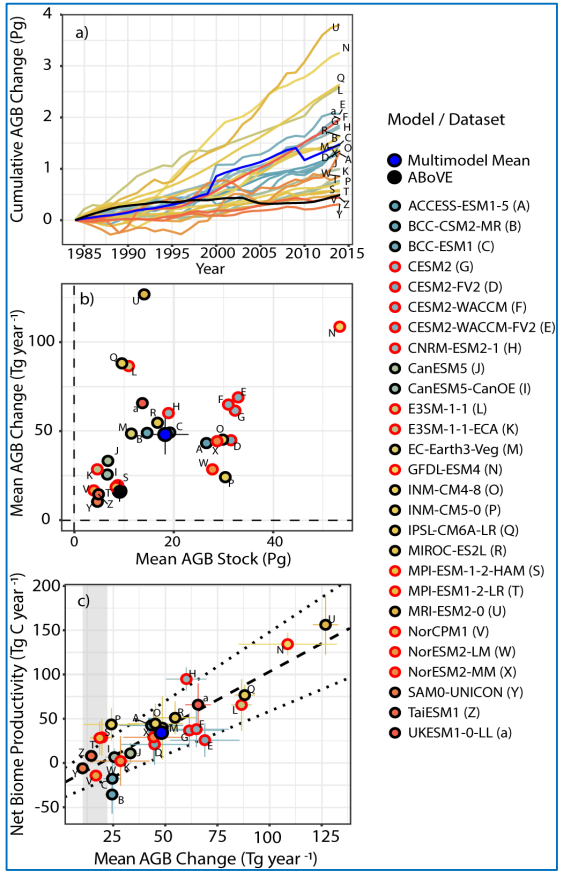
- The Landsat archive was used with ICESat LiDAR to annual map changes in aboveground woody biomass (AGB) from 1984 – 2014 for the ABoVE study region.

Results

- Net gain of AGB (+434 ± 176 Tg), including reductions due to fire (-176 ± 99 Tg) and harvest (-42 ± 10 Tg).
- AGB dynamics are increasingly being driven by disturbance and recovery, rather than climate or other global change (e.g., CO_2 fertilization).
- CMIP6 Earth system models overestimate AGB carbon gain by a factor of three, due to poor representation of fire disturbance.







Significance

- Boreal forests comprise the largest forest biome on the planet and are vulnerable to climate change. Understanding and modeling the response of boreal forests is critical for projecting future carbon budgets and climate change. The study also demonstrates the ability to map annual changes in AGB at 30 m spatial resolution.

Notes

Citation:

Wang, J.A., Baccini, A., Farina, M., Randerson, J.T. and M.A. Friedl. Disturbance suppresses the aboveground carbon sink in North American boreal forests. *Nature Climate Change.* (2021). https://doi.org/10.1038/s41558-021-01027-4.

Award Information:

This work was partially supported by grant no. 80NSSC18K0994 from NASA's Making Earth Science Data Records for Use in Research Environments (MEaSUREs) Program, ABoVE grant no. NNX15AU63A, NASA's Carbon Monitoring System (CMS) program grant no. NNX16AP24G, and funding to Jim Randerson from NASA's CMS and Interdisciplinary Science (IDS) research program.