

H.20: Modeling Complex Effects of Multiple Environmental Stresses on Carbon Dynamics of Mid-Atlantic Temperate Forests

Yude Pan, USDA Forest Service, Northern Global Change Program, ypan@fs.fed.us (Presenting)

Richard Birdsey, USDA Forest Service, Northern Global Change Program, rbirdsey@fs.fed.us

John Hom, USDA Forest Service, Northern Global Change Program, jhom@fs.fed.us

Kevin McGullough, USDA Forest Service, Northern Global Change Program, kmcgullough@fs.fed.us

We used our GIS variant of the PnET-CN model to investigate changes of forest carbon stocks and fluxes in Mid-Atlantic temperate forests over the last century (1900-2000). Forests in this region are affected by multiple environmental changes including climate, atmospheric CO₂ concentration, N deposition and tropospheric ozone, and extensive land disturbances. Our objectives are to gain mechanistic understanding of the complex interactive effects of changing environmental factors on forest carbon dynamics, and to partition the forest carbon responses to different causes. Our results indicate that, for the whole forest area in the Mid-Atlantic, net primary productivity (NPP) increased by 25% over the

last century due to chronic changes in climate and atmospheric chemistry. Among these factors, change in climate increased NPP by 4%; interannual climate variability caused 7% lower NPP; and changes in atmospheric chemistry had the dominant impact of increasing NPP by 34%, while 5% of this impact was further reduced by the interaction with interannual climate variability. With consideration of land disturbances, NPP may end up increasing more due to a greater response to N deposition which may compensate for N loss in disturbed soil pools. Annual net ecosystem productivity (NEP) fluctuated annually and was affected primarily by climate variability. This research shows that changes in atmospheric chemistry could be important driving variables that affect net carbon change in regions where air pollution is a significant factor.