Warming induced increasing ratio between the carbon uptake and loss caused the enhanced atmospheric CO_2 amplitude in the boreal regions.

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The atmosphere CO_2 concentration ($[CO_2]$) go up with the annual vegetation Senescence and down with the recurrent of the terrestrial plants. The amplitude of $[CO_2]$ was illustrated highly respond to the seasonal vegetation growth. However, we are unclear whether the temporal changes of net ecosystem exchanges are related with the changes in the $[CO_2]$ amplitude and how they caused. Here we use the *in-situ* $[CO_2]$ measurements in Brrow (BRW), eddy-covariances net ecosystem exchanges (NEE), MODIS GPP products and the respiration outputs from TRENDY models to detect the trends of the ratio between carbon uptake and carbon loss in the northern high latitudes (>45°N) during the past three decades. The results show that the increasing trends of the ratio between carbon uptake and loss are coincident between the $[CO_2]$ data and the flux tower data. However, the reasons for the increasing ratio of carbon uptake and carbon loss are disparate for different biomes. The high respiration caused delayed carbon uptake date and the warming induced growing peak net ecosystem productivity (NEP) are the main reasons for tundra. While the early carbon uptake date and the early peak time the NEP are the main reasons for the boreal forests. These results provide a new insight to linking the seasonal cycle of atmospheric $[CO_2]$ with the terrestrial carbon exchange and provide new evidences to support the carbon sink of the northern ecosystems under current global warming.