Are Oceanic and Terrestrial Sinks of CO_2 Not Able to Keep Up with Emissions?

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The CO_2 emitted by our society into the atmosphere is shared between the oceans, terrestrial biosphere, and atmosphere. Over the last several years an impression has been generated in the scientific literature that the capacity of the oceans and terrestrial biosphere to take up continuing emissions of CO_2 shows signs of weakening. We make a mass balance for the entire record of direct atmospheric measurements of CO_2 in the atmosphere, and published estimates of emissions from fossil fuel burning and land use change. It shows that total global sinks continue to increase, roughly in proportion to the increasing rate of emissions. An airborne fraction has been defined as the rate of atmospheric CO_2 increase divided by the rate of either fossil fuel emissions alone or emissions from fossil fuel burning combined with land use change. A careful statistical analysis reveals that, with the first definition, the airborne fraction has decreased somewhat over time (relatively more uptake), and with the second definition it has no measurable trend.

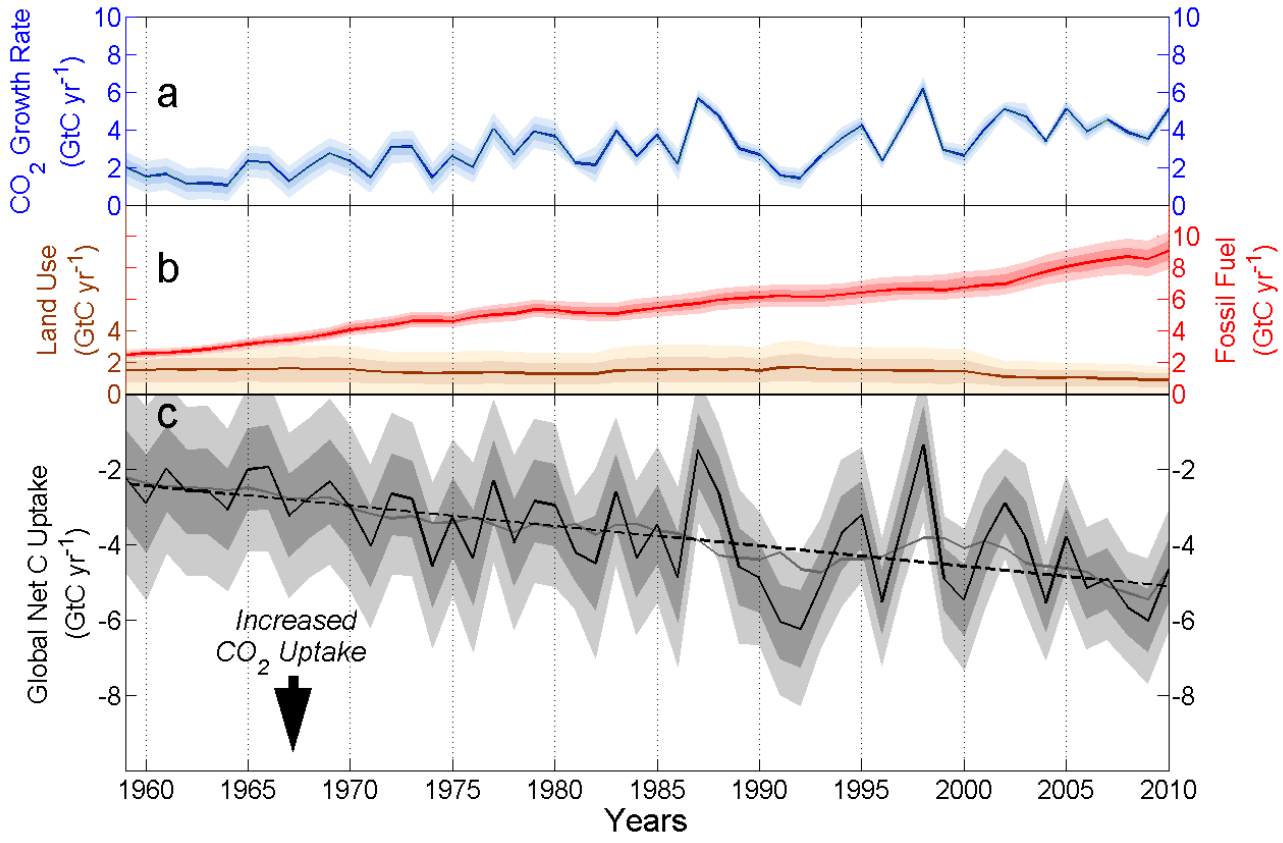

Figure 1. Panel a) observed annual mean growth rate of atmospheric CO_2; b) annual estimated emissions from fossil burning (red) and land use change (brown); c) observed growth rate minus total emissions. The outer lightly shaded bands represent 2-sigma uncertainty, the inner darker shade represents 1-sigma uncertainty.