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Enhanced terrestrial carbon uptake: global drivers and implications for the growth rate of atmospheric CO_2.

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In this presentation we will focus on using decadal changes in the global carbon cycle to better understand how ecosystems respond to changes in CO_2 concentration, temperature, and water and nutrient availability. Using global carbon budget estimates, ground, atmospheric and satellite observations, and multiple process-based global vegetation models, we examine the causes and consequences of the long-term changes in the terrestrial carbon sink. We show that over the past century the sink has been greatly enhanced, largely due to the effect of elevated CO_2 on photosynthesis dominating over warming induced increases in respiration. We also examine the relative roles of greening, water and nutrients, along with individual events such as El Nino. We show that a slowdown in the rate of warming over land since the start of the 21st century likely led to a large increase in the sink, and that this increase was sufficient to lead to a pause in the growth rate of atmospheric CO_2. We also show that the recent El Nino resulted in the highest growth rate of atmospheric CO_2 ever recorded. Our results provide evidence of the relative roles of CO_2 fertilization and warming induced respiration in the global carbon cycle, along with an examination of the impact of climate extremes.