Tropical extreme droughts drive long-term increase in atmospheric CO_2 growth rate variability

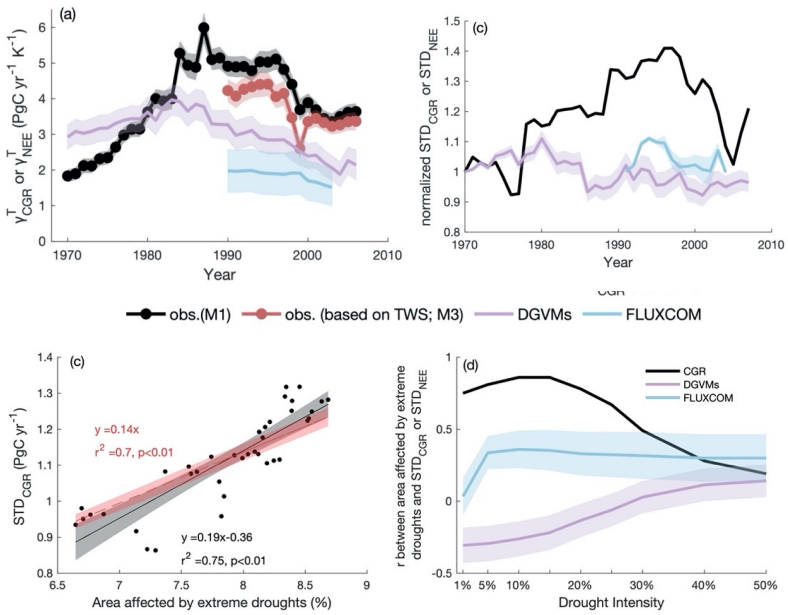

Figure. Long-term change in the temperature sensitivity of atmospheric CO_2 growth rate (γ^{T}_{CGR}) emerges from the long-term change in variability of CGR (STD_{CGR}), which is further explained by tropical extreme droughts, while terrestrial biosphere models fail to capture these long-term changes and the drought impact.

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Scientific Achievement

- We link the observed long-term changes in the variability of atmospheric CO_2 growth rate (STD_{CGR}) to tropic extreme droughts, highlighting the influence of tropical droughts on the modulating the climate sensitivities of the global carbon cycle.
- The historical changes in STD_{CGR} were dominated by extreme drought-affected areas in tropical Africa and Asia, and semi-arid ecosystems.

Significance and Impact

- We provide novel insight into the terrestrial carbon-water relation over long-term timescales.
- Our results show that terrestrial biosphere models misrepresent the long-term impact of Amazonian droughts, calling into question their utility for diagnosing the climate sensitivities of the global carbon cycle.

Research Details

This analysis combines atmospheric observations, multiple global vegetation models and machine learning products to analyze the cause of the sensitivity change.

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