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Inherent Uncertainty Disguises Attribution of Reduced Atmospheric CO2 Growth to Mitigation for up to a Decade

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On inter-annual time scales the growth rate of atmospheric CO_2 is largely driven by the response of the land and ocean carbon sinks to climate variability. Therefore, climate mitigation in terms of emission reductions can be disguised by internal variability.
However, the probability that emission reductions induced by a policy change caused reductions in atmospheric CO_2 growth trend is unclear.
We use 100 historical MPI-ESM simulations and interpret mitigation in 2020 as a policy shift from Representative Concentration Pathway 4.5 to 2.5 in a comprehensive causation attribution framework.
Here we show that five-year CO_2 trends are higher in 2021-2025 than over 2016-2020 in 30% of all realizations in the mitigation scenario, compared to 52% in the non-mitigation scenario. Therefore, mitigation is sufficient or necessary to cause these trends by 42% or 31%, respectively and therefore far from certain.
A stronger increase in atmospheric CO_2 trends despite emission reductions is possible when the global carbon cycle triggered by internal climate variability releases more CO_2 than mitigation saves. Such trends might occur for of up to ten years. Certainty that mitigation causes trend reductions is only reached after ten or fifteen years, respectively of the type of causation.
Our analysis showcases the inherent uncertainty of near-term CO_2 projections. Assessments of the efficacy of mitigation in the near term are incomplete without quantitatively considering internal variability.