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Allowable emissions for CO₂ stabilisation are strongly determined by future carbon cycle changes

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The response of the global carbon cycle to increased atmospheric CO_2 and climate changes will have a direct effect on efforts to stabilise CO_2 concentrations in the atmosphere. If carbon sinks weaken due to climate change, emissions required to stabilise atmospheric CO_2 will have to be reduced in order to accommodate decreased land and ocean carbon uptake. Conversely, if carbon sinks strengthen in the future, emission targets for stabilisation can be set higher. In this study, I use an intermediate complexity coupled climate-carbon model to quantify the influence of future carbon cycle changes on emissions consistent with CO_2 stabilisation at 550 ppmv. A range of climate sensitivities is incorporated into the model simulations, as the amount of simulated warming strongly affects the extent of climate impacts on the carbon cycle. I find that reduced carbon sinks due to climate warming lead to substantial reductions in allowable emissions for CO_2 stabilisation, an effect that is amplified at higher climate sensitivities. I also reduce the effect of elevated atmospheric CO_2 on terrestrial carbon uptake, and find that a reduction in simulated land carbon sinks requires further reductions in allowable emissions for 550-stabilisation.