



Is there a more ideal idealized climate model experiment for evaluating carbon cycle feedbacks to climate change?

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Idealized climate change experiments are used as benchmark experiments to facilitate the comparison of ensembles of climate models. In the Fifth Assessment Report of the IPCC the 1% per yearly compounded change in atmospheric CO₂ concentration experiment was used to compare climate models with full representations of the global carbon cycle (Earth System Models, ESMs). However this “1% experiment” was never intended for such a purpose and implies a rise in atmospheric CO₂ concentration at double the rate of the instrumental record. Here we critically examine this choice by comparing the 1% experiment to an idealized CO₂ pathway derived from a Gaussian function. Our results suggest that during the emission rate deceleration phase of the pathway the ocean sink strengthens and comes to dominate the global carbon cycle. An affect that cannot be studied with the 1% experiment, as CO₂ the emission rate monotonically increase in that experiment. Additionally, the Gaussian pathway smoothly transitions to zero emissions allowing for easier examination of zero emissions commitment and net negative CO₂ emissions. Using a Gaussian or similar pathway for intercomparing ESMs has some cost but overall would allow for a more a comprehensive examination of the possible behaviour of the carbon cycle.