



Stabilizing climate requires near-zero emissions

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Current international climate mitigation efforts aim to stabilize levels of greenhouse gases in the atmosphere. However, human-induced climate warming will continue for many centuries, even after atmospheric CO₂ levels are stabilized. In this paper, we assess the CO₂ emissions requirements for global temperature stabilization within the next several centuries, using an Earth system model of intermediate complexity. We show first that a single pulse of carbon released into the atmosphere increases globally averaged surface temperature by an amount that remains approximately constant for several centuries, even in the absence of additional emissions. We then show that to hold climate constant at a given global temperature requires near-zero future carbon emissions. Our results suggest that future anthropogenic emissions would need to be eliminated in order to stabilize global-mean temperatures. As a consequence, any future anthropogenic emissions will commit the climate system to warming that is essentially irreversible on centennial timescales.