Achieving net zero greenhouse gas emissions critical to limit climate tipping risks

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Abstract

Under current emission trajectories, temporarily overshooting the Paris global warming limit of 1.5 °C is a distinct possibility. Permanently exceeding this limit would substantially increase the probability of triggering climate tipping elements. Here, we investigate the tipping risks associated with several policy-relevant future emission scenarios, using a stylized Earth system model of four interconnected climate tipping elements. We show that following current policies this century would commit to a 45% tipping risk by 2300 (median, 10–90% range: 23–71%), even if temperatures are brought back to below 1.5 °C. We find that tipping risk by 2300 increases with every additional 0.1 °C of overshoot above 1.5 °C and strongly accelerates for peak warming above 2.0 °C. Achieving and maintaining at least net zero greenhouse gas emissions by 2100 is paramount to minimize tipping risk in the long term. **Our results underscore that stringent emission reductions in the current decade are critical for planetary stability.**