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Climate Tipping Points: Can they trigger a Global Cascade?

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Over the past 15 years climate tipping points have emerged as both an important research topic and source of public concern. Some articles have suggested that some tipping points could begin within the 1.5-2°C Paris climate target range, with many more potentially starting by the ~3-4°C of warming that current policy is projected to be committed to. Recent work has also proposed that these tipping points could interact and potentially ‘cascade’ – with the impacts of passing one tipping point being sufficient to trigger the next and so on – resulting in an emergent global tipping point for a long-term commitment to a ‘Hothouse Earth’ trajectory of 4+°C (Steffen et al., 2018). However, much of the recent discussion relies largely on a decade-old characterisation of climate tipping points, based on a literature review and expert elicitation exercise. An updated characterisation would fully utilise more recent results from coupled and offline models, model inter-comparisons, and palaeoclimate studies. The ‘tipping cascade’ hypothesis has also not yet been tested, with the suggestion of 2°C as the global tipping point remaining speculative. Furthermore, the definition of what counts as a climate tipping point is often inconsistent, with some purported tipping points represented more accurately as threshold-free positive feedbacks. Here we perform an updated systematic review of climate tipping points, cataloguing the current evidence for each suggested element with reference to rigorously-applied tipping point definitions. Based on this we test the potential for a global tipping cascade using a stylised model, from which we will present preliminary results.

References

Steffen, W., et al.: Trajectories of the Earth System in the Anthropocene, *Proc. Natl. Acad. Sci.*, 115(33), 8252–8259, doi:10.1073/pnas.1810141115, 2018.