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Beyond the Peak: What we know and don't know about temperature overshoot

Carl-Friedrich Schleussner[1,2,3]
[1]Humboldt University, Berlin, Germany (carl.schleussner@climateanalytics.org)
[2]Climate Analytics, Berlin, Germany
[3]International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria

Global emission reduction efforts continue to be insufficient to meet the temperature goal of the Paris Agreement. This makes the systematic exploration of so-called overshoot pathways that draw temperatures back down to safer levels in the long term a priority for science and policy.

I will present major insights from the Horizon 2020 PROVIDE project on overshoot pathways. We find that global and regional climate change in a post-overshoot world would be substantially different from a world that avoided overshoot, bearing profound implications for adaptation needs. Irrespective of the peak warming, we find that achieving declining global temperature remains critical for limiting long-term climate risks including sea-level rise and cryosphere changes. Reversal of warming by deploying carbon dioxide removal (CDR) at scale, however, is not guaranteed. In addition to uncertain technical and sustainability limitations of CDR, we find that a preventive CDR capacity of several hundred gigatonnes might be desirable to hedge against strong Earth system feedbacks that amplify warming. Aiming for temperature decline is thus not a robust strategy to achieve a climate objective, but rather one part of a broader approach towards managing long-term climate risks. It is no replacement for stringent near-term emission reductions to limit risks at peak warming in the first place.