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Climate response uncertainty and crop productivity changes at 1.5°C and 2°C

Carl-Friedrich Schleussner (1,2,3), Delphine Deryng (1,4), Christoph Müller (2), Joshua Elliot (4,5), Christian Folberth (6), Wenfeng Liu (7), Xuhui Wang (8,9), Thomas A. M. Pugh (10,11), Wim Thiery (12,13), Sonia I. Seneviratne (12), and Joeri Rogelj (5)

(1) Climate Analytics, Berlin, Germany (carl.schleussner@climateanalytics.org), (2) Potsdam Institute for Climate Impact Research, Potsdam, Germany, (3) Integrative Research Institute on Transformations of Human-Environment Systems (IRI THESys), Humboldt University ,Berlin, (4) Columbia University Center for Climate Systems Research, New York, NY 10025, USA, (5) University of Chicago and ANL Computation Institute, Chicago, IL 60637, USA , (6) International Institute for Applied Systems Analysis, Ecosystem Services and Management Program, 2361 Laxenburg, Austria, (7) Eawag, Swiss Federal Institute of Aquatic Science and Technology, 8600 Duebendorf, Switzerland, (8) Laboratoire des Sciences du Climat et de l'Environnement. CEA CNRS UVSQ Orme des Merisiers, (9) Sino-French Institute of Earth System Sciences, Peking University, 100871 Beijing, China, (10) School of Geography, Earth & Environmental Sciences and Birmingham Institute of Forest Research, (11) Karlsruhe Institute of Technology, IMK-IFU, 82467 Garmisch-Partenkirchen, Germany, (12) ETH Zurich, 8092 Zürich, Switzerland, (13) Vrije Universiteit Brussel, 1050 Brussels, Belgium

Studying changes in global and regional crop production is central for assessing potential benefits of capping anthropogenic CO_2 emissions in order to limit global average temperature increase to below $1.5°C$ above pre-industrial levels. However, future crop yields will be affected by increasing atmospheric CO_2 concentrations not only through changes in the climate system, but also through direct CO_2 effects. The strength of both processes, the climate system response to increases in CO_2 concentrations as well as the CO_2 fertilization effect, is not well constrained. We will explore the resulting uncertainty in crop productivity changes for four major staple crops using an ensemble of global gridded crop models from the Global Gridded Crop Model Intercomparison Project (GGCMI) for four major staple crops using climate forcing data from the Half a degree Additional warming, Prognosis and Projected Impacts (HAPPI) project. We will present results of a sensitivity study of future crop yield projections at $1.5°C$ and $2°C$ warming above pre-industrial levels, as well as at different CO_2 levels determined by similar probabilities to lead to a warming of $1.5°C$ and $2°C$. The unique multi-ensemble setup also allows to identify changes in 1-in-10-year extreme yield losses.