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Climate Impacts of the Paris Agreement

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The UN agreement signed during the recent COP21 meeting in Paris defines policies which supposed to be implemented by different countries to reduce their anthropogenic greenhouse gas (GHG) emissions. Those agreed policies, however, only cover the period up to 2030 and they do not specify actions after 2030. As a result, projections of the long-term climate impact of the Paris agreement produced by different research groups differ significantly because they make different assumptions about the policies after 2030. In this study we estimate possible impacts using the MIT Integrated Global System Model, which consists of the human activity model, Economic Projection and Policy Analysis (EPPA) model, and a climate model of intermediate complexity, the MIT Earth System Model (MESM).
In addition to the "no climate policy" scenario, we consider a scenario that incorporates the emissions targets proposed by the international community to address the challenges of climate change based on the submissions to the COP21 process. For the post-2030 period we create several variations: a) no additional climate policy after 2030, but the proposed cuts are extended to 2100; b) reductions in emissions and emission intensities after 2030 at the same rate as in the 2020-2030 period; 3) in addition to the conditions in the previous no country increases its GHG emissions after 2050.
Based on the emission scenarios, we simulate possible future climate changes. Our analysis shows that, for the climate parameters corresponding to the median strength of the climate system response to anthropogenic forcing, the Paris Agreement can reduce the global mean surface air temperature (SAT) in 2100 between 0.63 and 1.07oC relative to "no climate policy" case. At the same time, due to a large inertia of climate system, in 2050 the SAT reduced only by about 0.12oC under all three scenarios. Under all three variants of an extension of the Paris Agreement an increase in the SAT relative to an 1861-1880 average exceeds 2oC in 2053 and in 2100 it reaches 3.5, 3.2 and 3.0oC, respectively. We contrast these results with the results from an emission scenario that leads to the 2oC stabilization.