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Cost-risk trade-off of solar radiation management and mitigation-considering regional disparities under long-tailed climate sensitivity probability density distributions

Elnaz Roshan, Mohammad Mohammadi Khabbazan and **Hermann Held**
University of Hamburg, Germany

Solar radiation management (SRM) might be able to alleviate the anthropogenic global mean temperature rise but unable to do so for other climate variables such as precipitation, particularly with respect to regional disparities. Here we evaluate the optimal trade-off between SRM and mitigation by applying cost-risk analysis (CRA) with the probabilistic knowledge about climate sensitivity density distribution. CRA trades off the expected welfare-loss from climate policies costs against the climate risks from overshooting an environmental target. Using the spatial resolution of 'Giorgi regions', we generalize CRA in order to represent the regional precipitation risks as a prominent side-effect of SRM. We introduce three scenarios, considering alternative relative weights of risks: temperature-risk-only, precipitation-risk-only, and equally weighted both-risks scenarios. Our results suggest that, by considering regional precipitation risks in optimization, SRM in conjunction with mitigation would only save about a half of welfare-loss (in terms of BGE) compared to mitigation-only analysis. In temperature-risk-only scenario, perfect compliance with 2°C-temperature target is achieved while a very high precipitation risk in half of the regions is demonstrated. In precipitation-risk-only and both-risks scenarios, temperature is complied with its threshold for about 95% of all numerical representative climate sensitivities in 2100. However, expected regional precipitation risk would increase at least in four regions compared to mitigation- only portfolio.

Biography

Elnaz Roshan is a Doctoral candidate in Economics at University of Hamburg and at International Max Planck Research School in Earth System Modeling. She started her PhD in August 2014 and this work is a part of her Doctoral research.

elnaz.roshan@uni-hamburg.de

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