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Would Solar Geoengineering Devalue Research on Climate Response?

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Although solar geoengineering (SG) can reduce anthropogenic global warming quickly and inexpensively (compared to traditional greenhouse gas emissions mitigation), its deployment may lead to some potential unintended negative side-affects and risks such as precipitation pattern changes. Such risks and costs can be quantified with an economic approach in order to provide a framework for decision making under climate response uncertainty. Here a cost-risk analysis is applied, which is a target-based decision analytic framework that makes a trade-off between climate policy costs and climate risks of exceeding a climate target, and incorporates future learning about the true value of climate sensitivity (CS). Considering probabilistic information about CS and perfect correlation between CS and transient climate response, this investigation focuses on estimating the expected value of information in near- and long-term compared to a no-learning case. The main contribution of this investigation is to understand whether an inexpensive climate policy such as SG can reduce the incentive toward enhancing climate response knowledge. Considering precipitation change, as a SG side-effect, alongside temperature change in both globally-aggregated and regionally-disaggregated analyses, results show the near- and long-term policy outcomes of learning about the true value of CS. In each case, three optimization analyses are conducted: business-a-usual (BAU, no climate policy), mitigation-only, and joint-mitigation-SG. In the joint-mitigation-SG analysis, social welfare is optimized in three scenarios using a convex combination of climatic risks: temperature-risk-only, precipitation-risk-only, and equally weighted both-risks scenarios. Results indicate that for a 2°C-target in combination with a 66% compliance level, the value of research and receiving better information about climate response can be higher in a joint mitigation-SG analysis compared to a mitigation-only analysis when either regional precipitation risks or both globally-averaged temperature and precipitation risks are considered in decision optimization. In the joint-mitigation-SG case, near-term policies will stay almost unchanged when globally-aggregated climate risks are investigated. Current climate policy investments, however, can be reduced until better information arrives if regional precipitation risks are considered.