

LEAC-II

LEarning About Cloud modification under risk and uncertainty: Investigation of feasibility, traceability, Incentives and decentralised governance of limited-area climate engineering

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Summary

Climate engineering (CE) has been proposed as a means of last resort to combat dangerous global change. However, numerous concerns arise when considering a possible implementation, or even a large field experiment. Yet, CE is not an either-or decision, and the transition from a field experiment to the application of CE is blurred. A realistic assessment of the potential future implementation of CE measures needs to seriously consider the possibility of limited-area CE. The modification of clouds exerts a radiative forcing that is localised to the region of spraying. This is a necessary, but not sufficient condition for a localised response of climate parameters such as near-surface temperature. A first question is, what could be the incentives and possibilities for countries or clubs of countries to utilise limited-area CE. To this end, we will estimate how strongly the economic preferences with respect to climate-related variables are correlated in space. Depending on the feasibility of a local manipulation of relevant climate variables, and given the preferences of the regions of the world with respect to these variables, a next question is to what extent countries or clubs of countries might make use of limited-area CE, and to what extent this would influence greenhouse gas mitigation efforts, in the absence of global cooperation on climate policy. The scope for regulation of limited-area CE depends on the possibility to attribute intended outcomes to CE measures and to exclude damages outside the targeted area. We will study this building on the experience with detection and attribution studies, making use of novel approaches exploiting ensemble climate forecasts at short timescales. In LEAC-II we finally aim at exploring the potential to draft an international regulation mechanism based on the theory of non-point source pollution control that would lead to a Pareto-improvement compared to the uncoordinated outcome.

KEY OBJECTIVES

- **Feasibility:**

To which extent is it possible to generate a localised climate response to a localised forcing?

- **Incentives:**

What is the spatial correlation of economic preferences with respect to climate variables?

- **Economic implications**

:

What are possible welfare implications of limited-area CE when countries implement limited-area CE and mitigate greenhouse gas emissions in an uncoordinated way?

- **Traceability**

:

What does it take to detect and attribute a localised effect of a CE measure, and to reject the hypothesis that climat

e
events
outside
the targeted
area
are affected
by the
CE measure?
-Based
on ensemble
modelling,
this
will provide
probability
distributions
for the
socio-
economic
assessment.

- **Governance**
:

How
to regulate
limited-
area
CE
most
efficiently,
given
the
uncertainties
in
predictability
and
traceability?



Role of the project within the SPP

LEAC-II contributes in particular to the cross-cutting themes "Metrics in view of decision under uncertainty" and "Liability, detection and attribution". Collaborations are particularly intense with the projects CELARIT, CEMICS2, ComparCE-2 and AWICIT.