# LEAC

## Learning About Cloud Brightening under Risk and Uncertainty: Whether, When and How to do Field Experiments


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## Background and Aim

No consensus has been achieved in science, society and politics even about the question whether in-depth research in the form of field experiments on Climate Engineering should be conducted. This projects aims at theoretical clarification of this question without actually doing experiments.

**Cloud seeding:**

- Climate Engineering by injection of aerosol which would serve as cloud condensation nuclei and thus increase cloud brightness
- May enable field experiments which are scalable in intensity as well as spatial and temporal extent.

**RESEARCHQUESTIONS**

- **How large are the physical uncertainties on cloud seeding?**
- **To which extent**

**could field experiments reduce these uncertainties, depending on intensity and spatial and temporal extent of the experiment?**

- **Which detrimental side effects would cloud seeding have? Which climate damages (e.g., precipitation patterns, ocean acidification) would not be mitigated?**
- **At which level of climate change would such a Climate Engineering be part of a economically optimal climate policy?**
- **Under which circumstances should a field experiment on cloud seeding be implemented? If implemented, how should it be done?**
- **How do these decisions depend on social risk- and time preferences?**

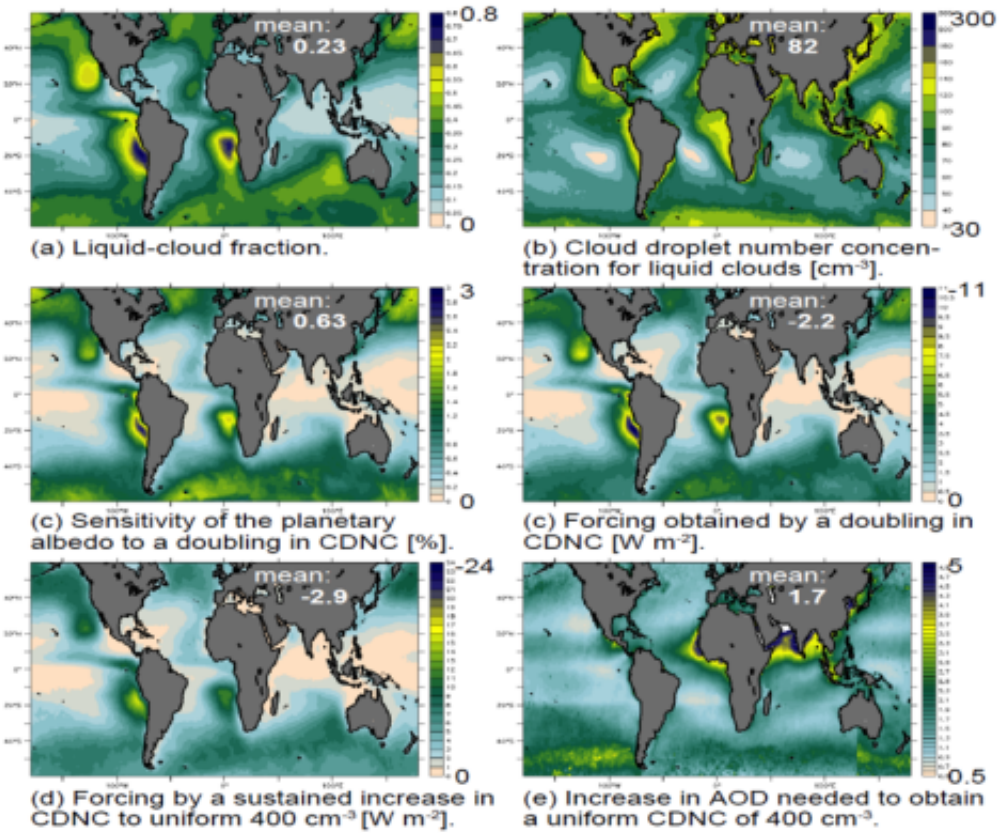
## Approach

1. Quantification of the uncertainty of the radiative forcing by cloud seeding.

2. Estimate how this uncertainty could be reduced depending on intensity as well as spatiotemporal extent of a possible field experiment.

3. Characterisation of an optimal climate policy for given uncertainties and different social risk- and time preferences.

4. Characterisation of the optimal learning by field experiments for different social risk- and time preferences.




_ Preliminary study on Climate Engineering by cloud seeding: Statistical analysis of satellite data.

## Methods

**The project will apply or develop**

- Satellite data
- A global aerosol-climate model (ECHAM6-HAM2)
- An integrated assessment model for climate system and economy (IAM), extended by

- Effectiveness and cost of Climate Engineering by cloud seeding
- Bayesian learning on probability distributions of Climate Engineering damages
- Hyperbolic time preferences