

ComparCE

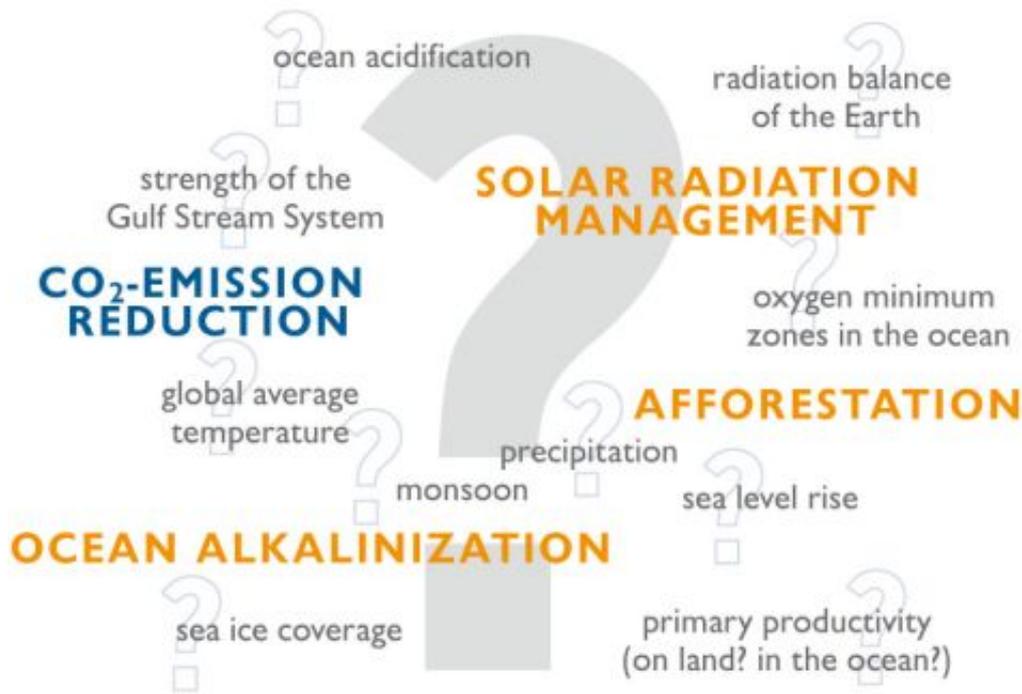
Comparative Assessment of Potential Impacts, Side-Effects and Uncertainties of CE Measures and Emission-Reduction Efforts

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Project Goal

The key goal of the project is an objective and comprehensive assessment of potential effects, side-effects, and uncertainties of different Climate Engineering (CE) methods and emission reduction measures. This will be done using simulations with Earth system models.

Different CE methods (e.g., afforestation, radiation management, ocean alkalinity enhancement) will be simulated under various CO₂ emission scenarios. Effects and side-effects will be compared by using different metrics (Fig. 1).



_ Fig. 1: Exemplary set of societally relevant target variables, which could enter an assessment of CE methods and emission reduction measures.

CORE QUESTIONS

- How can different CE methods and CO₂ emission reduction measures be assessed comparatively by using model simulations?
- How large are the effects of uncertainties in Earth system models and what is their role in the comparative assessment?
- How can economic and ethical conceptions of

**public benefit
and welfare be
considered?**

- **How could
optimal
strategies of
emission
avoidance and
Climate
Engineering
look like?**

Methods

A relatively simple, computationally fast Earth system model (UVic) will be established as an emulator of a complex but computationally costly model (MPI-ESM). Thus, a multitude of model simulations with different CE methods, model parameters, and emission pathways can be performed. This will allow for a better characterization of uncertainties in the model results.

Legend:

ECHAM6 - European Centre for Medium-Range Weather Forecasts Hamburg Version 6

JSBACH - Jena Scheme for Biosphere-Atmosphere Coupling in Hamburg

MPIOM - Max-Planck-Institute Ocean General Circulation Model

HAMOCC - Hamburg Ocean Carbon Cycle

EMBM - Energy Moisture Balance Model

MOSES - Met Office Surface Exchange Scheme

TRIFID - Top-down Representation of Interactive Foliage and Flora Including Dynamics

MOM2 - Modular Ocean Model (<http://climate.uvic.ca/model/common/manual2.2.ps>)

Role in the Priority Programme

1. Model simulations of different CE methods are performed and provided.
2. Metrics for the assessment of CE effects are developed in close cooperation with other subprojects and are checked for their validity in model calculations.
3. Uncertainties in the model results are calculated and provided.

