Geophysical Research Abstracts
Vol. 12, EGU2010-12896, 2010
EGU General Assembly 2010
© Author(s) 2010

Trade-offs between solar radiation management, carbon dioxide removal, emissions mitigation and adaptation

Naomi Vaughan (1,2) and Timothy Lenton (1)

(1) University of East Anglia, School of Environmental Sciences, Norwich, United Kingdom (n.vaughan@uea.ac.uk), (2) Tyndall Centre for Climate Change Research

The possible use of solar radiation control strategies to counteract global warming is explored through a number scenarios of different anthropogenic CO2 emission reduction pathways and carbon dioxide removal interventions. Using a simple Earth system model, we illustrate the trade-offs between CO2 emission reduction, the use of carbon dioxide removal geoengineering interventions ('negative emissions') and solar radiation management (SRM). These relationships are illustrated over a multi-centennial timescale, allowing sufficient time for the carbon-cycle to respond to the anthropogenic perturbation. The anthropogenic CO2 emission scenarios (focussing on those from fossil fuel combustion) range from more to less stringent mitigation of emissions and includes the scenario assumed in our previous work on the maximum cooling potential of different geoengineering options. Results are presented in terms of transient atmospheric CO2 concentration and global mean temperature from year 1900 to year 2500. Implementation of solar radiation control strategies requires an understanding of the timing and effect of terminating such an intervention, a so called 'exit strategy'. The results illustrate a number of considerations regarding exit strategies, including the inherent commitment to either carbon dioxide removal interventions, or the length of time the solar radiation control mechanism must be maintained for. The impacts of the various trade-offs are also discussed in the context of adaptation and adaptive resilience. The results have a bearing on policy and long term planning by illustrating some of the important assumptions regarding implementation of solar radiation management. These include baseline assumptions about emission mitigation efforts, timescale of intervention maintenance and impacts on adaptation.