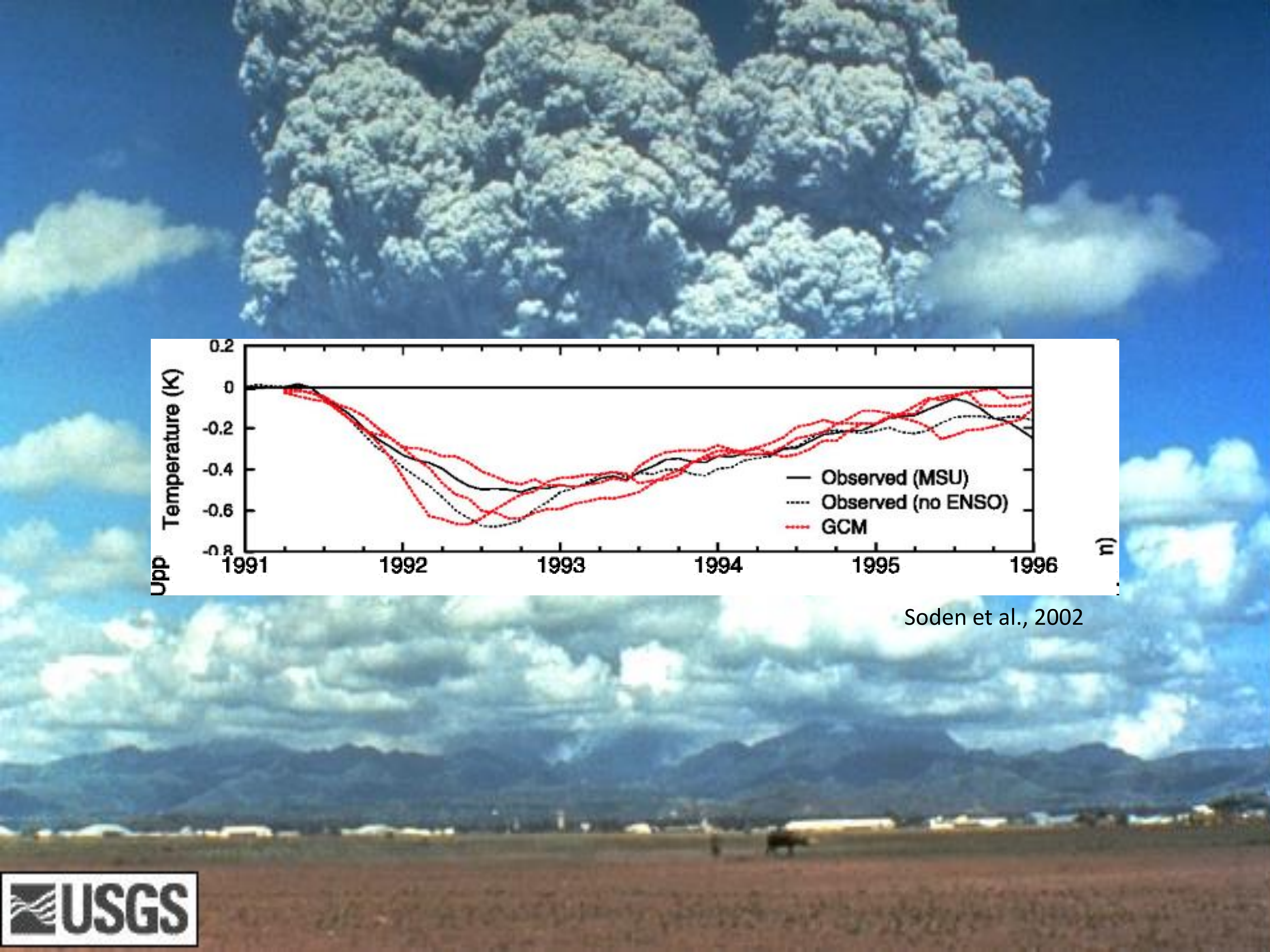
Solar Radiation Management Governance Initiative

SRM geoengineering

Gobeshona conference
11 January 2018

Andy Parker
Project Director – SRMGI



Soden et al., 2002

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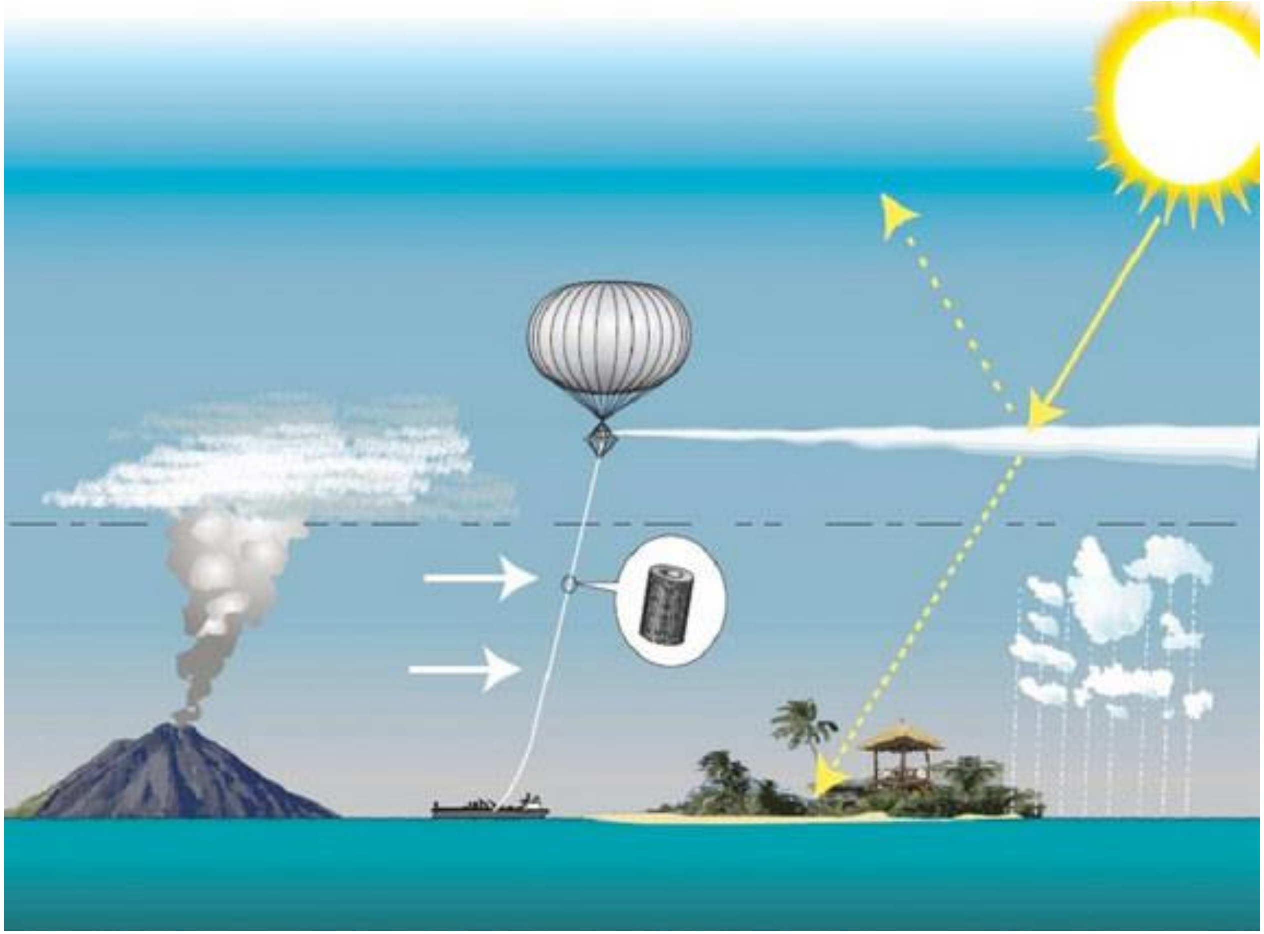
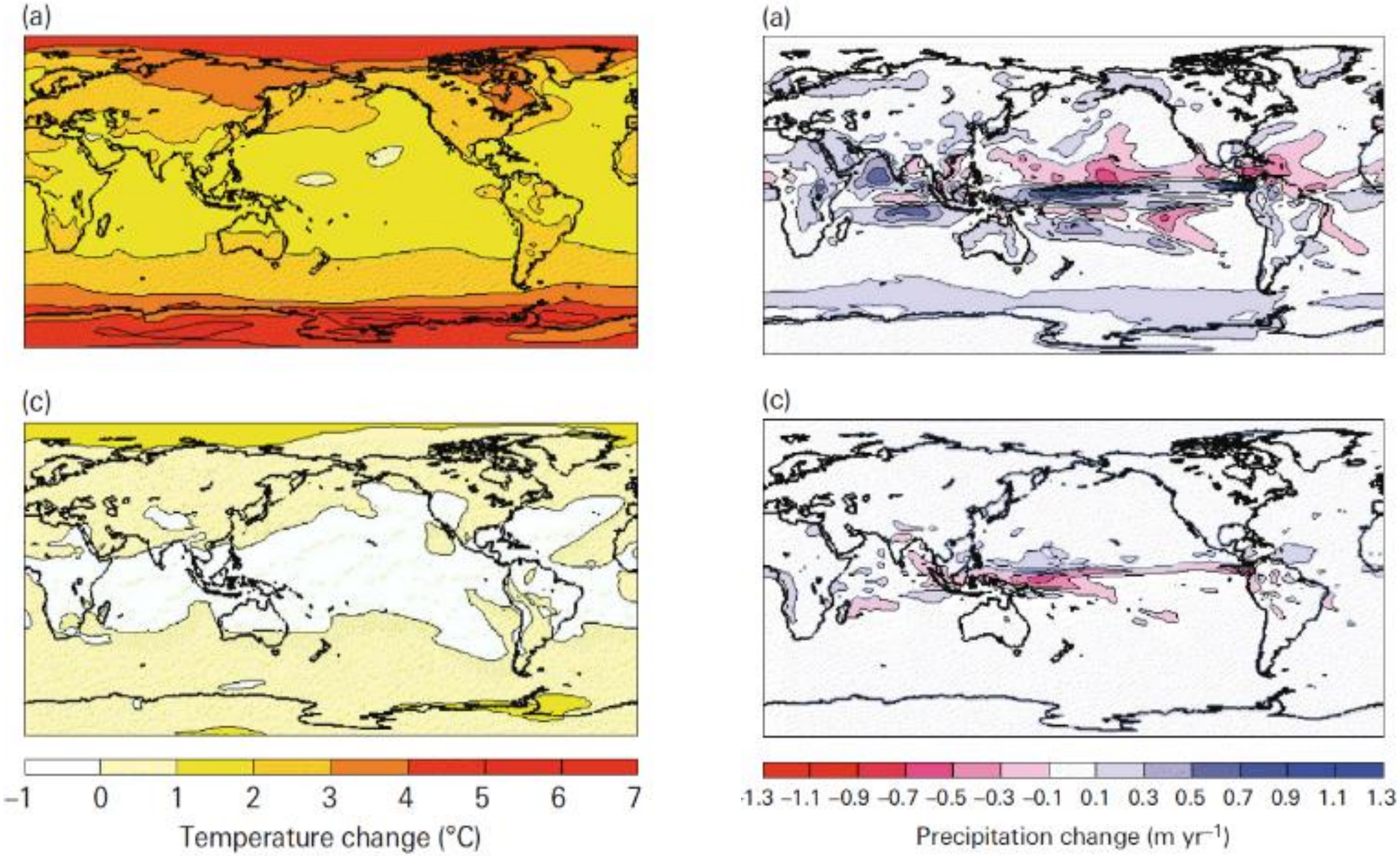
SRM – using stratospheric aerosols



Modelled effects: temp and precip



From Caldeira and Wood (2008)

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Sea level rise

Projected that SRM could significantly slow (but not stop) rising sea levels

PNAS

Efficacy of geoengineering to limit 21st century sea-level rise

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Edited by Robert E. Dickinson, University of Texas, Austin, TX, and approved July 15, 2010 (received for review June 12, 2010)

Geoengineering has been proposed as a feasible way of mitigating anthropogenic climate change, especially increasing global temperatures in the 21st century. The two main geoengineering

and financially reasonable—in so far as any geoengineering project may be thought of as feasible. Here we present simulations of 21st century global sea level resulting from both geoengineered

Storm intensity

Complicated to model, but studies indicate that SRM use could ameliorate cyclones due to reduction in SST

PNAS

Atlantic hurricane surge response to geoengineering

John C. Moore[a,b,1], Aslak Grinsted[a,c], Xiaoran Guo[a], Xiaoyong Yu[a], Svetlana Jevrejeva[a,d], Annette Rinke[a,e], Xuefeng Cui[a], Ben Kravitz[f], Andrew Lenton[g], Shingo Watanabe[h], and Duoying Ji[a,1]

[a]Joint Center for Global Change Studies, College of Global Change and Earth System Science, Beijing Normal University, Beijing 100875, China; [b]Arctic Centre, University of Lapland, Rovaniemi 96101, Finland; [c]Centre for Ice and Climate, Niels Bohr Institute, University of Copenhagen, 2100 Copenhagen Ø, Denmark; [d]National Oceanography Centre, Liverpool L3 5DA, United Kingdom; [e]Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Potsdam 14473, Germany; [f]Atmospheric Sciences and Global Change Division, Pacific Northwest National Laboratory, Richland, WA 99352; [g]Commonwealth Scientific and Industrial Research Organisation, Oceans and Atmosphere Flagship, Hobart, Tasmania, TAS 7004, Australia; and [h]Japan Agency for Marine-Earth Science and Technology, Yokohama 237-0061, Japan

Edited by Kerry A. Emanuel, Massachusetts Institute of Technology, Cambridge, MA, and approved September 29, 2015 (received for review June 12, 2015)

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Effects on plant life and agriculture

Many factors, many variables, much more research necessary

nature climate change

LETTERS

PUBLISHED ONLINE: 22 JANUARY 2012 | DOI: 10.1038/NCLIMATE1373

Crop yields in a geoengineered climate

J. Pongratz[1]*, D. B. Lobell[2], L. Cao[1] and K. Caldeira[1]

AGU PUBLICATIONS

JGR

Journal of Geophysical Research: Atmospheres

RESEARCH ARTICLE

10.1002/2013JD020630

Special Section:
The Geoengineering Model Intercomparison Project (GeoMIP)

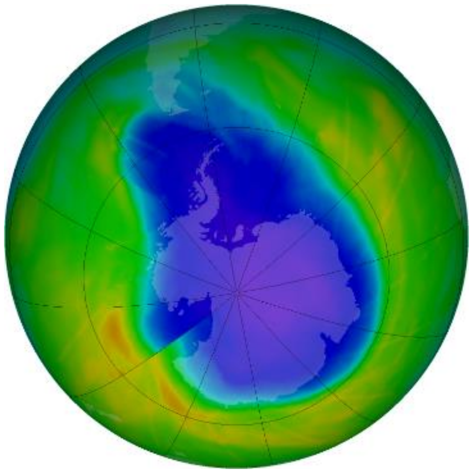
Solar radiation management impacts on agriculture in China: A case study in the Geoengineering Model Intercomparison Project (GeoMIP)

Lili Xia[1], Alan Robock[1], Jason Cole[2], Charles L. Curry[3], Duoying Ji[4], Andy Jones[5], Ben Kravitz[6], John C. Moore[4], Helene Muri[7], Ulrike Niemeier[8], Balwinder Singh[6], Simone Tilmes[9], Shingo Watanabe[10], and Jin-Ho Yoon[6]

Modelled effects: summary

"Models consistently suggest that SRM would generally reduce climate differences compared to a world with elevated GHG concentrations and no SRM; however, there would also be residual regional differences in climate (e.g., temperature and rainfall) when compared to a climate without elevated GHGs."
IPCC AR5, Working Group I, Chapter 7

Side effects?



Effects on the ozone layer?

Acid rain?

Health effects?

Unknown unknowns?

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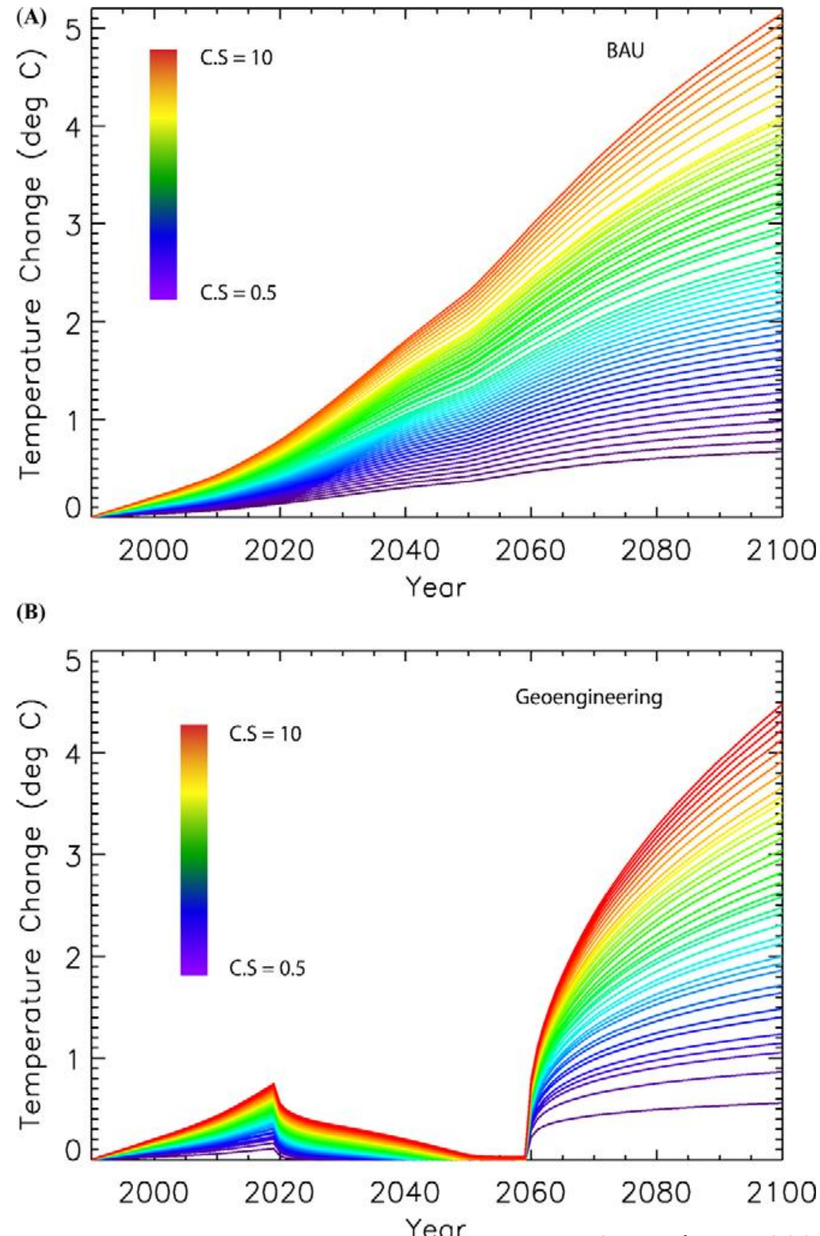
Termination shock

- Termination of (lots of) SRM would lead to a rapid warming
- The rate of warming would be much greater than without SRM
- More rapid warming means less time for adaptation, which means more damaging impacts on ecosystems



Ross & Matthews, 2009

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Socio-political concerns

Moral hazard response

Research creates a slippery slope towards use of SRM?

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Politics

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Why consider SRM at all???

There are some risks that mitigation just cannot treat

- Long lifetime of CO_2 leads to committed warming
- What happens if Earth heads to 3C or worse?

Some say that whatever the impacts, people can just adapt

- Is this realistic?

Speed of action is what makes SRM a potentially unique tool

- Might therefore be able to reduce some climate impacts that mitigation and adaptation cannot

The SRM Governance Initiative

Building developing country capacity to participate in SRM discussion and research

The DECIMALS fund

Developing Country Impact Modelling Analysis for SRM

- Research grants for 2-3 years
- Local SRM impact analysis
- S-N scientists pairings
- Planning workshop for all grantees and collaborators
- Support for publication, conference attendance and final stakeholder workshop

Call for proposals to be circulated next month!

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Five main messages

1. The world needs to be aggressive and optimistic with mitigation – **SRM is not an alternative**
2. But it is the only known way to quickly stop temperatures rising
3. Modelling consistently suggests that moderate use of SRM would significantly reduce climate risks, but the benefits would not be universal
4. The world doesn't behave exactly as models say it will, and there are many large uncertainties
5. Social and political dimensions could prove much tougher than the physical ones

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Thank you!

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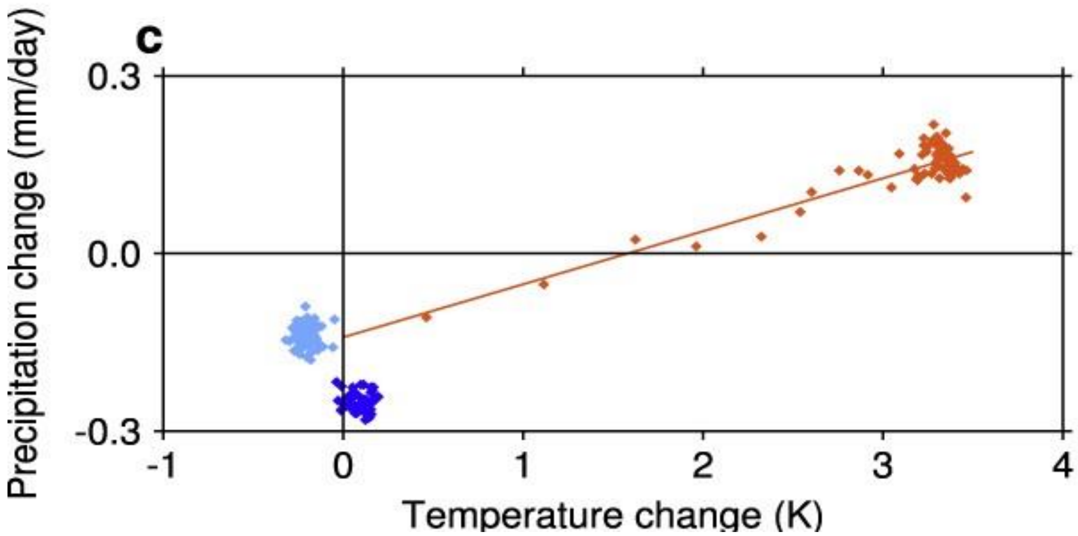
Poor country scientists to get help to study geoengineering impacts

Published on 19/10/2017, 1:02pm

With most geoengineering research happening in wealthy countries, fund aims to help developing nations understand how hacking the climate could affect them

Effects on hydrology



From Ferraro et al, 2013

1. Not possible to *entirely* cancel both temperature & precipitation changes, but both can be improved simultaneously
2. Therefore effects on global average precipitation are a choice

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Extremes of heat and precipitation

Effective at reducing temperatures in general and therefore extreme heat events

AGU PUBLICATIONS

JGR

Journal of Geophysical Research: Atmospheres

RESEARCH ARTICLE

10.1002/2013JD020648

Special Section:
The Geoengineering Model Intercomparison Project (GeoMIP)

A multimodel examination of climate extremes in an idealized geoengineering experiment

Charles L. Curry[1], Jana Sillmann[1,2], David Bronaugh[3], Kari Alterskjaer[2], Jason N. S. Cole[4], Duoying Ji[5], Ben Kravitz[6], Jón Egill Kristjánsson[2], John C. Moore[5], Helene Muri[2], Ulrike Niemeier[7], Alan Robock[8], Simone Tilmes[9], and Shuting Yang[10]