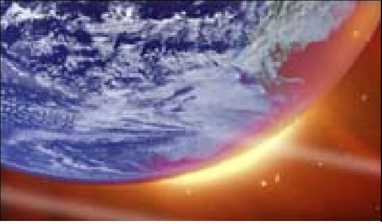


National Priorities
Climate Change Science & Technology

Climate Science and Technology Management Structure

Office of the President
Climate Change Policy and
Program Review by NSC, DPC, NEC

Committee on Climate Change Science and Technology Integration
Chair: Secretary of Commerce* Vice Chair: Secretary of Energy*
Executive Director: OSTP Director

Secretary of State
Secretary of Agriculture
EPA Administrator
OMB Director
NEC Director
NASA Administrator
Secretary of the Interior
Secretary of HHS
Secretary of Transportation
Secretary of Defense
CEQ Chairman
NSF Director

International Activities
(Including Task Force on International Energy Cooperation)

DOS, DOE, USAID and Other Agencies

Interagency Working Group on Climate Change Science and Technology
Chair: Deputy/Under Secretary of Energy*
Vice Chair: Deputy/Under Secretary of Commerce*
Secretary: OSTP Associate Director for Science
Members DS/US Level:
CEQ, DOD, DOI, DOS, DOT, EPA, HHS, NASA, NEC, NSF, OMB, USDA

Climate Change Science Program
Director: Assistant Secretary of Commerce for Oceans and Atmosphere
Members: DOC, DOD, DOE, DOI, DOS, DOT, EPA, HHS, NASA, NSF, OMB, OSTP, Smithsonian, USAID, USDA

Climate Change Technology Program
Director: Assistant Secretary of Energy for Energy Efficiency and Renewable Energy
Members: DOC, DOD, DOE, DOI, DOS, DOT, EPA, HHS, NASA, NSF, OMB, OSTP, USAID, USDA

*Chair and Vice Chair of Committee and Working Group rotate annually

November 2002

CCSP Deliverables

CCSP Goal 1 *Improve knowledge of the EarthÕs past and present climate and environment, including its natural variability, and improve understanding of the causes of observed variability and change*
CCSP Goal 2 *Improve quantification of the forces bringing about changes in the EarthÕs climate and related systems*
CCSP Goal 3 *Reduce uncertainty in projections of how the EarthÕs climate and environmental systems may change in the future*
CCSP Goal 4 *Understand the sensitivity and adaptability of different natural and managed ecosystems and human systems to climate and related global changes*
CCSP Goal 5 *Explore the uses and identify the limits of evolving knowledge to manage risks and opportunities related to climate variability and change*

GOAL 2

Improve quantification of the forces bringing about changes in the Earth's climate and related systems.

TOPICS FOR PRIORITY CCSP SYNTHESIS PRODUCTS	SIGNIFICANCE	COMPLETION
Updating scenarios of greenhouse gas emissions and concentrations, in collaboration with the CCTP. Review of integrated scenario development and application.	Sound, comprehensive emissions scenarios are essential for comparative analysis of how climate may change in the future, as well as for analyses of mitigation and adaptation options.	within 2 years
North American carbon budget and implications for the global carbon cycle.	The buildup of CO_2 and methane in the atmosphere and the fraction of carbon being taken up by North America's ecosystems and coastal oceans are key factors in estimating future climate change.	within 2 years
Aerosol properties and their impacts on climate.	There is a high level of uncertainty about how climate may be affected by different types of aerosols, both warming and cooling, and thus how climate change might be affected by their control.	2-4 years
Trends in emissions of ozone-depleting substances, ozone layer recovery, and implications for ultraviolet radiation exposure and climate change.	This information is key to ensuring that international agreements to phase out production of ozone-depleting substances are having the expected outcome (recovery of the protective ozone layer).	2-4 years

Approach For Synthesis and Assessment Product

•Phase I: CCSP-Stimulated Major Reviews of Aerosol Š Climate Science

- A few *explicit and focused* scientific *reviews* in the near term
- Stand-alone CCSP-facilitated accomplishments
- Useful input to subsequent, community-wide assessments like the IPCC.

Aerosol Direct Radiative Effects over the Northwest Atlantic, Northwest Pacific, and North Indian Oceans: Estimates Based on in-situ Chemical and Optical Measurements and Chemical Transport Modeling

T.S. Bates, T.L. Anderson, T. Baynard, T. Bond, O. Boucher, G. Carmichael, A. Clarke, C. Erlick, H. Guo, L. Horowitz, S. Howell, S. Kulkarni, H. Maring, A. McComiskey, A. Middlebrook, K. Noone, C.D. OÕDowd, J.A. Ogren, J. Penner, P.K. Quinn, A.R. Ravishankara, D.L. Savoie, S.E. Schwartz, Y. Shinozuka, Y. Tang, R.J. Weber and Y. Wu

Manuscript published in *Atmospheric Chemistry and Physics*

http://www.copernicus.org/EGU/acp/acpd/recent_papers.html

Atmos. Chem. Phys. Discuss., 5, 1–122, 2005
www.atmos-chem-phys.org/acpd/5/1/
SRef-ID: 1680-7375/acpd/2005-5-1
European Geosciences Union

Atmospheric Chemistry and Physics Discussions

A review of measurement-based assessment of aerosol direct radiative effect and forcing

H. Yu[1,2], Y. J. Kaufman[1], M. Chin[1], G. Feingold[3], L. A. Remer[1], T. L. Anderson[4], Y. Balkanski[5], N. Bellouin[6], O. Boucher[6,12], S. Christopher[7], P. DeCola[8], R. Kahn[9], D. Koch[10], N. Loeb[11], M. S. Reddy[12,13], M. Schulz[5], T. Takemura[14], and M. Zhou[15]

- **Assess the global aerosol distribution and direct radiative effect using satellites supplemented by chemical transport models.**

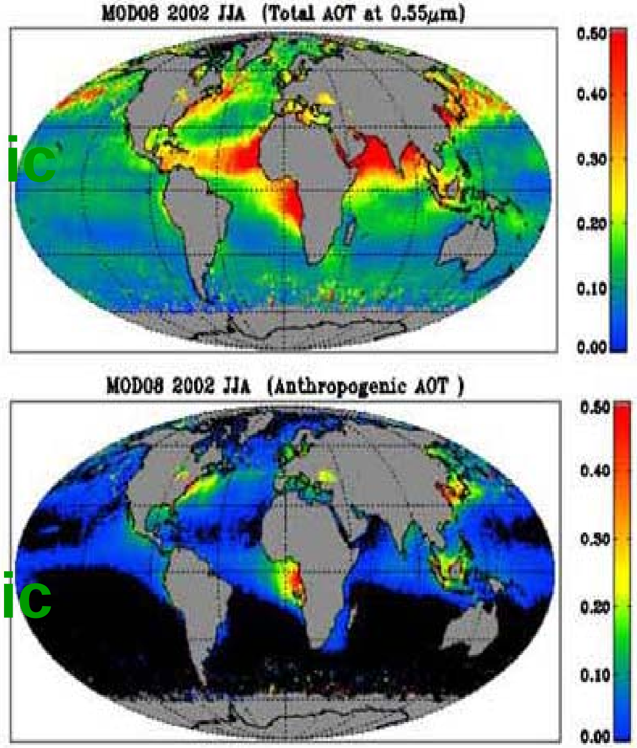
- **Assess the anthropogenic component, using satellite data and models.**

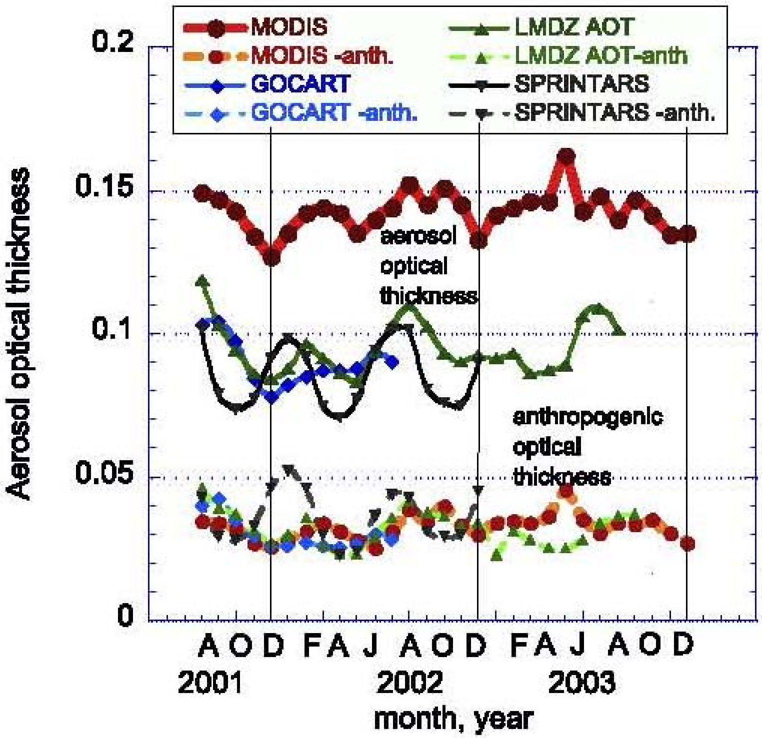
- **Evaluate these assessments against surface network data and field experiments and compare them to model estimates.**

MODIS measured aerosol size parameters can be used to distinguish anthropogenic aerosols from natural aerosols

Natural + Anthropogenic

Anthropogenic





Over ocean, the anthropogenic contribution to MODIS AOT is about 21%. MODIS and models are consistent in anthropogenic AOT. ***(Kaufman et al., JGR, 2005)***

The clear-sky aerosol direct forcing at the top of the atmosphere is -1.4 ± 0.4 W/m2 over ocean.

Model Intercomparison for Indirect Effects

Atmos. Chem. Phys., 6, 3391–3405, 2006
www.atmos-chem-phys.net/6/3391/2006/

Atmospheric Chemistry and Physics

Model intercomparison of indirect aerosol effects

J. E. Penner[1], J. Quaas[2,*], T. Storelvmo[3], T. Takemura[4], O. Boucher[5,**], H. Guo[1], A. Kirkevåg[3], J. E. Kristjánsson[3], and Ø. Seland[3]

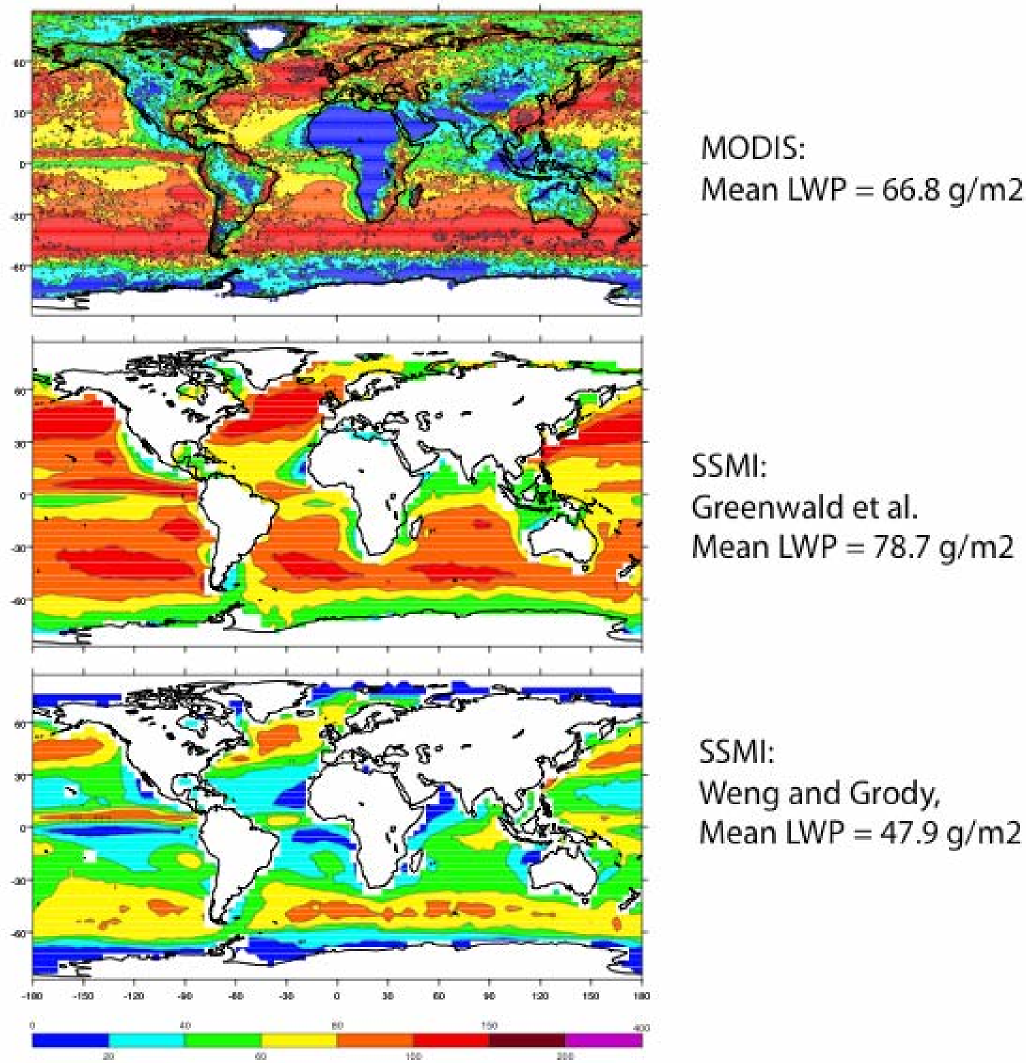
[1]University of Michigan, Department of Atmospheric, Oceanic and Space Sciences, Ann Arbor, USA
[2]Laboratoire de Météorologie Dynamique, CNRS/Institut Pierre Simon Laplace, 4, place Jussieu, 75005 Paris, France
[3]University of Oslo, Department of Geosciences, Oslo, Norway
[4]Research Institute for Applied Mechanics, Kyushu University, Fukuoka, Japan
[5]Laboratoire d'Optique Atmosphérique, CNRS/Universite de Lille I, 59655 Villeneuve d'Ascq Cedex, France
[*]now at: Max Planck Institute for Meteorology, Bundesstraße 53, Hamburg, Germany
[**]now at: Hadley Centre, Met Office, FitzRoy Road, Exeter EX1 3PB, UK

Received: 21 November 2005 – Published in Atmos. Chem. Phys. Discuss.: 28 February 2006
Revised: 23 June 2006 – Accepted: 27 June 2006 – Published: 21 August 2006

Why is the aerosol/cloud problem difficult?
Satellite observations are not accurate enough to constrain clouds in climate models:

Observed cloud liquid water path (g/m^2) is poorly known so it is difficult to improve the models.

Clouds reflect 54 W/m^2, so a small change from aerosols can have a large forcing impact



Approach For Synthesis and Assessment Product

Phase II: CCSP-Stimulated Aerosol Š Climate Decision-Support Synthesis Assessment Product

❖Produce assessment-synthesis product at the end of 2007

- World communityÕs IPCC will be close to their last draft.
- NRC Radiative Forcing review completed.
- Three review papers: two are accepted for publication, one in review

❖Use broader-community-assessment information to craft *explicit* CCSP decision-support information and tools.

❖Have explicit interagency/stakeholder CCSP process to scope out the appropriate themes and information needs in the aerosol-climate decision-support product. Have community involvement in drafting, reviewing, and publication.

Motivation for Phase II Decision Support Products

1) Need for specification of the aerosols and short-lived gases:
As long as different models are allowed to use different aerosol forcing (in particular), then models with different sensitivities will be able to reproduce the past climate, but future projections will vary for both sensitivity and forcing reasons.

2) To produce regional 'forecasts' up to 2030 (however far off that sounds), one would need to have gridded emissions (or abundance) data for the different aerosols. So far this is not available, and to make it happen will require some coordinated effort.

3) CCSP report could certainly be part of such an effort by highlighting the current lack-of-constraint, as well as suggesting improvements and things to take into account in producing better historical and future projections.

4) Have Integrated Assessment Modelers attempted to produce past aerosol emission calculations? Do they have intention of doing so? Has it been done by physical scientists? Encouraging the same people to produce the past aerosol emissions, as they are producing the future projections, could encourage merging the data sets and establishing consistency.

Possible Phase II Decision Support Products
FOCUS NEEDED

1) What have anthropogenic aerosols actually done to the climate over the past 100 years? [Requires using model simulations already done and published in a variety of locations - so this would be in some sense producing a consensus assessment]. It is a 'deliverable' because it is not shown in IPCC or included among the standard IPCC runs.

2) Equivalently, what is the anthropogenic aerosol impact likely to be in the future? [Again, from runs already done, with the same reasoning.]

3) The ultimate deliverable would be to assess the quality of the anthropogenic aerosol forcing, both that already produced and the forecast forcing, given additional information on aerosol radiative characteristics and what future emission plans are likely to be. That requires input from the more sophisticated aerosol modeling groups and inventory developers (bottom-up and top-down), and information about what was really used in the GCM runs already done (much of this information is available).

4) Look at the global impact of aerosol emission changes for specific regions. What would changes in US aerosol emissions resulting from PM 2.5 health regulations do to global and regional climate, or similar emission changes from technology/sectors/other regions?

a. Running an aerosol source/transport model (either off-line or in a GCM) to produce new aerosol distributions globally;
b. Using these global distributions in a GCM.
c. Questions include: what aerosols to include; what magnitude of reduction is likely or desirable for testing; what are the geographic distribution of the proposed source change?

5) Look at impact of long-range transport on input and output for North America.