Past, present and future directions of climate and global change science as reflected in landmark AGCI sessions

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U.S. DEPARTMENT OF ENERGY

Office of Science

Biological and Energy Research

Regional and Global Climate Modeling Program

NCAR

AGCI's roots: John Katzenberger and Rick Chappell (with an assist from John Denver)

(Rick not in this photo taken in the Windstar Biodome near Snowmass circa 1989)

It helps to have a celebrity launch a new Institute:

USA TODAY · FRIDAY, JULY 20, 1990 ·

CELEBRITY CORNER

Helping us understand our world

Ozone depletion. Global warming. Loss of rain forests. Few of us have a clear picture of the full scope of our planet's environmental problems or of the steps needed to solve those problems.

The newly created Aspen Institute on Global Change is a major step toward creating an understanding of these challenges.

In the weeks ahead, you will hear more about the institute, which will bring together some of the world's top scientists and educators to discuss what we know and don't know about our environment, and to help us move toward a consensus of understanding about the environment.

Operating under the auspices of the Windstar Foundation, the institute's partners include the United Nations Environment Programme and NASA, with funding from Amway Corp. as the founding corporate sponsor.

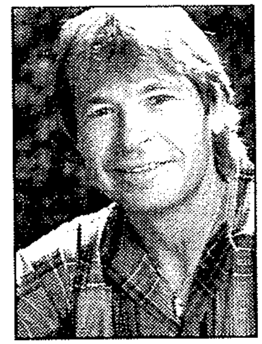
This blend of a non-profit foundation, a government agency and a major corporation reflects my philosophy that all sectors of our community must unite to find solutions to our environmental problems.

The first step in preserving our environment and quality of life is to determine what we know about our global environment. What's right? What's wrong? What are the causes of our environmental problems? What are the long-term risks to humanity and the environment? With this knowledge we can better maintain, protect or repair environmentally endangered areas.

The second step is education — to make people aware of the challenges our planet faces. This is the dual mission of the Aspen Institute on Global Change.

Every summer, top scientists and educators will convene in Aspen, Colo., to discuss global environmental issues and challenges. During the institute's first session, July 29 to Aug. 19, leading scientists will discuss topics such as the impact of global warming, deforestation, greenhouse gases and our planet's "global health."

Their findings will be used to develop educational materials such as textbooks, study guides, brochures and grass-roots public awareness programs to inform educators, students, opinion leaders and others as part of the Institute's educational mission.



John Denver is a recording artist and environmentalist.

JOHN DENVER

Another proposed education element is the Ground Truth project, which would involve people of all ages in local environmental tests and monitoring, such as measuring the temperature of soil, water and air, or the amount of plant cover. If approved, the Ground Truth project would work in conjunction with NASA's Mission to Planet Earth satellite series to provide "state of the planet" data on global environmental conditions.

I believe we all need to learn more about our environmental challenges. Only by becoming better educated and working together can we ensure the life and livelihood of our planet.

For more information, write the Aspen Institute on Global Change, 100 East Francis, Aspen, Colo., 81611.

The first science session of "AIGC" (soon to be AGCI) was 1990
--the same year the first IPCC Assessment was published
--arguably the start of the modern era of global change research

This session defined global change as an inherently interdisciplinary problem as reflected by the participants (a subset are pictured here)

Some others not pictured:

Amory Lovins
Pam Matson
Cherilynn Morrow
Richard Somerville
Karl Taylor

1992 was the year of the Earth Summit in Rio that marked the start of the interface between climate science and policy on the international scale

An update to the 1990 IPCC First Assessment had just been published earlier in 1992; there were then four global coupled climate models, and many more groups were developing new models around the world

An AGCI session was convened in the summer of 1992 to modestly chart the future course of earth system modeling

The *Eos* article that was a product of that AGCI session laid out the future directions of earth system modeling. The issues defined in this article are still highly relevant today:

SECTION NEWS

ATMOSPHERIC SCIENCES

Editor: Ronald Prinn, Massachusetts Institute of Technology, Department of Earth, Atmospheric, and Planetary Sciences, Room 54–1312, Cambridge, MA 02139; tel. 617-253-2452

The Coupled Climate System and Global Change

PAGES 2, 14

Current estimates of future global climate change rely on coupled models of the climate system. These models are both a measure of our level of understanding of coupled processes occurring in nature and of our ability to simulate the possible changes in these processes due to increased CO_2 and trace gases with computer models. Central to coupled models is air-sea interaction, but processes involving the cryosphere, biosphere, atmospheric chemistry/radiation, and land surface are also intimately involved. Monitoring and analysis of observations are critical for understanding and interpreting results from the coupled models.

These model and observational studies are extensively used by the climate-impacts community, and are eventually interpreted and passed along to policy makers, for example, the Intergovernmental Panel on Climatic Change process organized by the World Meteorological Organization.

A group of twenty-seven interdisciplinary researchers involved with coupled modeling and observational analysis of the climate system, as well as representatives from the climate-impacts community who apply the results from global models, were invited to the 1992 Aspen Global Change Institute (AGCI) Summer Session II, in Aspen, Colo., to present research results and outline outstanding issues of concern. The goal was for participants to gain a greater mutual understanding of the disciplinary issues relevant to coupled models, observations, and global change and to identify connections and interfaces between disciplines and areas of study in the coupled climate system.

The following topics were addressed in the context of modeling, observational analyses, and/or impact studies: observed climate-change signals, El Niño-Southern Oscillation (ENSO), tropical cyclones, the Indian monsoon, the role of ocean circulation (in particular, the global "conveyor belt" circulation), the cryosphere (snow, sea ice, and glaciers), the biosphere (land-surface processes and terrestrial ecosystems), atmospheric chemistry and radiation (trace gases and ozone), low-frequency variability of the climate system in observations and global coupled models, climate-impact applications, and policy formation from coupled model results.

Interface issues related to the coupled

(Meehl, G.A., and D. Schimel, 1993: The coupled climate system and global change. *EOS*, **74**, 2,14.)

1992 “next steps” proposed as a strategy for the future of earth system modeling in the Eos article (obvious now, but in 1992 these were new concepts):

--higher model resolution
--improvements in model physics
--“time slice” experiments with high resolution atmospheric models
--level of complexity of ESMs related to analysis and impact studies
--must understand the mechanisms of forcing related to internal variability
--must understand the responses to a variety of anthropogenic and natural forcings
--must improve understanding of clouds and cloud feedbacks
--more observational programs and incorporate knowledge from those programs into the models
--improved representation of land surface processes
--must understand mechanisms of decadal variability such as that associated with the “conveyor belt” in the Atlantic
--include atmospheric chemistry and prognostic aerosols
--include terrestrial ecosystem components
--model results need to be appropriate for impacts analyses
--earth system models should be used to inform adaptation and mitigation strategies
--must take into account population and technological solutions related to adaptation and mitigation
--earth system model information “must be disseminated to national, state and local policymakers based on adaptations of model-based scenarios with appropriate caveats”

1998: The landmark AGCI session on extremes emerged from the IPCC Third Assessment Report (1995) where it was recognized that the impacts community wanted to study future changes in weather and climate extremes, but there was little research being done on this topic in the physical climate science community

It was decided to bring together climate modelers, observationalists, and impacts researchers in an AGCI session to chart a research agenda to study changes in weather and climate extremes for the first time

The 1998 session produced five articles in the March 2000 issue of the Bulletin of the American Meteorological Society…

An Introduction to Trends in Extreme Weather and Climate Events: Observations, Socioeconomic Impacts, Terrestrial Ecological Impacts, and Model Projections*

Gerald A. Meehl,[a] Thomas Karl,[b] David R. Easterling,[b] Stanley Changnon,[c] Roger Pielke Jr.,[a] David Changnon,[d] Jenni Evans,[e] Pavel Ya. Groisman,[b] Thomas R. Knutson,[f] Kenneth E. Kunkel,[c] Linda O. Mearns,[a] Camille Parmesan,[g] Roger Pulwarty,[h] Terry Root,[i] Richard T. Sylves,[j] Peter Whetton,[k] and Francis Zwiers[l]

ABSTRACT

Weather and climatic extremes can have serious and damaging effects on human society and infrastructure as well as on ecosystems and wildlife. Thus, they are usually the main focus of attention of the news media in reports on climate. There are some indications from observations concerning how climatic extremes may have changed in the past

An Introduction to Trends in Extreme Weather and Climate Events: Observations, Socioeconomic Impacts, Terrestrial Ecological Impacts, and Model Projections*

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Trends in Extreme Weather and Climate Events: Issues Related to Modeling Extremes in Projections of Future Climate Change*

Gerald A. Meehl,[+] Francis Zwiers,[#] Jenni Evans,[@] Thomas Knutson,[&] Linda Mearns,[+] and Peter Whetton[**]

ABSTRACT

Projections of statistical aspects of weather and climate extremes can be derived from climate models representing possible future climate states. Some of the recent models have reproduced results previously reported in the Intergovernmental Panel on Climate Change (IPCC) Second Assessment Report, such as a greater frequency of extreme warm days and lower frequency of extreme cold days associated with a warmer mean climate, a decrease in diurnal temperature range associated with higher nighttime temperatures, increased precipitation intensity, midcontinent summer drying, decreasing daily variability of surface temperature in winter, and increasing variability of northern midlatitude summer surface temperatures. This reconfirmation of previous results gives an increased confidence in the credibility of the models, though agreement among models does not guarantee those changes will occur. New results since the IPCC Second Assessment Report indicate a possible increase of extreme heat stress events in a warmer climate, an increase of cooling degree days and decrease in heating degree days, an increase of precipitation extremes such that there is a decrease in return periods for 20-yr extreme precipitation events, and more detailed analyses of possible changes in 20-yr return values for extreme maximum and minimum temperatures. Additionally, recent studies are now addressing interannual

Human Factors Explain the Increased Losses from Weather and Climate Extremes*

Stanley A. Changnon,[+] Roger A. Pielke Jr.,[#] David Changnon,[@] Richard T. Sylves,[&] and Roger Pulwarty[**]

ABSTRACT

Societal impacts from weather and climate extremes, and trends in those impacts, are a function of both climate and society. United States losses resulting from weather extremes have grown steadily with time. Insured property losses have trebled since 1960, but deaths from extremes have not grown except for those due to floods and heat waves. Data on losses are difficult to find and must be carefully adjusted before meaningful assessments can be made. Adjustments to historical loss data assembled since the late 1940s shows that most of the upward trends found in financial losses are due to societal shifts leading to ever-growing vulnerability to weather and climate extremes. Geographical locations of the large loss trends establish that population growth and demographic shifts are the major factors behind the increasing losses from weather–climate extremes. Most weather and climate extremes in the United States do not exhibit steady, multidecadal increases found in their loss values. Without major changes in societal responses to weather and climate extremes, it is reasonable to predict ever-increasing losses even without any detrimental climate changes. Recognition of these trends in societal vulnerability to weather–climate extremes suggests that the present focus on mitigating the greenhouse effect should be complemented by a greater emphasis on adaptation. Identifying and understanding this

Impacts of Extreme Weather and Climate on Terrestrial Biota*

Camille Parmesan,[+,&] Terry L. Root,[#] and Michael R. Willig[@]

ABSTRACT

Climate is a driver of biotic systems. It affects individual fitness, population dynamics, distribution and abundance of species, and ecosystem structure and function. Regional variation in climatic regimes creates selective pressures for the evolution of locally adapted physiologies, morphological adaptations (e.g., color patterns, surface textures, body shapes and sizes), and behavioral adaptations (e.g., foraging strategies and breeding systems). In the absence of humans, broad-scale, long-term consequences of climatic warming on wild organisms are generally predictable. Evidence from Pleistocene glaciations indicates that most species responded ecologically by shifting their ranges poleward and upward in elevation, rather than evolutionary through local adaptation (e.g., morphological changes). But these broad patterns tell us little about the relative importance of gradual climatic trends as compared to extreme weather events in shaping these processes. Here, evidence is brought forward that extreme weather events can be implicated as mechanistic drivers of broad ecological responses to climatic trends. They are, therefore, essential to include in predictive biological models, such as doubled CO_2 scenarios.

…culminating with a review article in Science (the 22 September 2000 issue)

These papers set the climate science and impacts community on a course of research that has become one of the central areas of study with respect to understanding past and future extremes that has been featured prominently in every subsequent IPCC assessment

SCIENCE'S COMPASS • REVIEW

REVIEW: ATMOSPHERIC SCIENCE

Climate Extremes: Observations, Modeling, and Impacts

David R. Easterling,[1*] Gerald A. Meehl,[2] Camille Parmesan,[3] Stanley A. Changnon,[4] Thomas R. Karl,[1] Linda O. Mearns[2]

One of the major concerns with a potential change in climate is that an increase in extreme events will occur. Results of observational studies suggest that in many areas that have been analyzed, changes in total precipitation are amplified at the tails, and changes in some temperature extremes have been observed. Model output has been analyzed that shows changes in extreme events for future climates, such as increases in extreme high temperatures, decreases in extreme low temperatures, and increases in intense precipitation events. In addition, the societal infrastructure is becoming more sensitive to weather and climate extremes, which would be exacerbated by climate change. In wild plants and animals, climate-induced extinctions, distributional and phenological changes, and species' range shifts are being documented at an increasing rate. Several apparently gradual biological changes are linked to responses to extreme weather and climate events.

the 20th century (*2*), and that this increase is associated with a stronger warming in daily minimum temperatures than in maximums, leading to a reduction in the diurnal temperature range (*3*). Land surface precipitation has also increased over the same period in the mid- to high latitudes, but shows a decrease in the tropics and subtropics (*2*). Given these changes, it is expected that there would also be changes in what are now considered extreme events (*4*). Therefore, if there are indeed identifiable trends in certain extreme climatic events, such as extremes in temperature or precipitation, it would add to the

The 1998 AGCI session on extremes was followed in 2005 by a session on U.S. weather and climate extremes

From that session emerged a prospectus and author team to write a US Climate Change Science Program (CCSP) report on extremes, the first-ever assessment of possible future changes of extremes over the US

The follow-up from that session in 2007 was an AGCI session that took the form of the final lead author meeting for the CCSP extremes report

Another landmark AGCI session: August, 2006, to formulate CMIP5

Participants were climate modelers, chemistry and aerosol modelers, land surface modelers, biogeochemistry modelers, IAM modelers, IAV researchers

“Firsts” in the 2006 AGCI CMIP5 session (described by Hibbard et al 2007 Eos article)

--first time the future climate change problem was divided into near-term and long-term timescales, reflecting a shift of the science with the emergence of decadal climate prediction and the needs of the stakeholder community for near-term climate change information

--this session essentially launched the field of decadal climate prediction as a new area of climate science

--the first time ESM experiments were included in a CMIP phase, reflecting the rise of carbon cycle components being included in standard AOGCMs

--first time to connect the Earth System Modeling Community with the Integrated Assessment Modeling community in planning a CMIP phase

--the first time idealized experiments to promote understanding of the climate system were formulated for inclusion in a CMIP phase

A WCRP White Paper and Eos article documented the CMIP5 experiment design formulated at the 2006 AGCI session

WCRPREPORT

World Climate Research Programme

GLOBAL IGBP CHANGE AIMES

SUMMARY REPORT

A STRATEGY FOR CLIMATE CHANGE STABILIZATION EXPERIMENTS WITH AOGCMs AND ESMs

Aspen Global Change Institute 2006 Sessi[on] Earth System Models: The Next Generatio[n]

(Aspen, Colorado, July 30-August 5, 2006)

May 2007

WCRP Informal Report N° 3/2007
ICPO Publication N° 112
IGBP Report N° 57

A Strategy for Climate Change Stabilization Experiments

PAGES 217, 219, 221

Climate models used for climate change projections are on the threshold of including much greater biological and chemical detail than previous models. Today, standard climate models (referred to generically as atmosphere-ocean general circulation models, or AOGCMs) include components that simulate the coupled atmosphere, ocean, land, and sea ice. Some modeling centers are now incorporating carbon cycle models into AOGCMs in a move toward an Earth system model (ESM) capability. Additional candidate components to include in ESMs are aerosols, chemistry, ice sheets, and dynamic vegetation [e.g., *Cox et al.*, 2000; *Friedlingstein et al.*, 2006].

In this article, we discuss a new strategy for using climate system models as part of a coupled biophysical-climate and integrated model assessment approach. The motivation is to develop a next-generation experimental design that follows on the scenario approach where concentrations and their derived emissions based on story lines were used in the development of the Intergovernmental Panel on Climate Change (IPCC) third and fourth assessment reports. We specifically address recent developments in climate system models that can shed light on greenhouse emissions scenarios. Complementary aspects of ongoing model development (e.g., observations and paleoclimate experiments) are important components of a much larger research strategy of which the modeling approach proposed here is one part.

Modeling groups are now making decisions as to what form their next-generation climate models will take with the consideration of how new climate change experiments may be evaluated in a next IPCC assessment. The experiments proposed in this article regarding stabilization scenarios warrant community experiments to address this issue even if there is not another IPCC assessment. Additionally, new emissions scenarios developed by the integrated assessment community reflect recommendations of the 25th IPCC session (held in April 2006 in the Republic of Mauritius). These advances in both the climate modeling and scenarios communities provide an opportunity for increased communication and collaboration that could recommend plausible action toward assessing human mitigation of changing climate.

This confluence of activities in model and scenario development needs to be communicated and coordinated across various groups and scientific communities. To this end, a strategy for the next-generation climate simulations should (1) identify new components in preparation for inclusion in AOGCMs; (2) establish communication for coordination through the World Climate Research Programme (WCRP), the Integrated Geosphere-Biosphere Programme (IGBP), and the Integrated Assessment (IA) modeling teams such as those involved with IPCC Working Group III (WGIII); (3) propose an experimental design for 21st-century climate change experiments; and (4) specify the requirements for new stabilization scenarios (particularly with regard to impacts, mitigation, and adaptation).

Empirical evidence and first-generation coupled carbon cycle model results indicate the possibility of a large positive carbon cycle feedback to the climate system, which challenges any particular stabilization target [*Cox et al.*, 2000; *Fung et al.*, 2005; *Friedlingstein et al.*, 2006]. While some models include a carbon cycle, none has consistently incorporated nutrient and/or micronutrient limitations, land use, fire, succession, ocean bottom chemistry, and tropospheric ozone dynamics. Taking into account the state of the art of these new components, a strategy involving an experimental design addressing two timescales is proposed for community coordinated climate change projection experiments.

Near-Term Experimental Design (2005–2030)

A major goal for 25-year model projections is to provide better guidance about the likelihood of changes in climate extremes at regional scales. Meeting this challenge will depend on scientific questions that address understanding the processes that produce extremes related to the hydrological cycle,

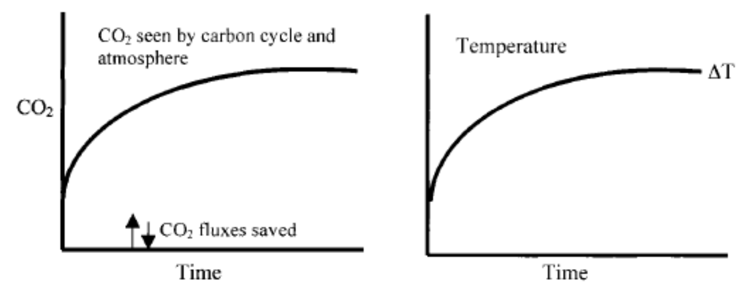


Fig. 1. Schematics of experiment 1. The carbon cycle responds to (left) increasing CO_2 concentrations and (right) changes in temperature. The land and ocean CO_2 fluxes are saved to derive emissions for Integrated Assessment (IA) modeling teams such as those involved with IPCC Working Group III (WGIII) scientists. The land and ocean CO_2 fluxes are not radiatively interactive with the atmosphere.

By K. A. Hibbard, G. A. Meehl, P. M. Cox, and P. Friedlingstein.

2008: growing directly from the 2006 AGCI session that defined the decadal climate prediction problem, the 2008 AGCI session formulated the first-ever coordinated set of decadal climate prediction experiments for the CMIP5 experimental design

Article in Bull. Amer. Meteorol. Soc., 2009
describing outcomes of AGCI session

ARTICLES

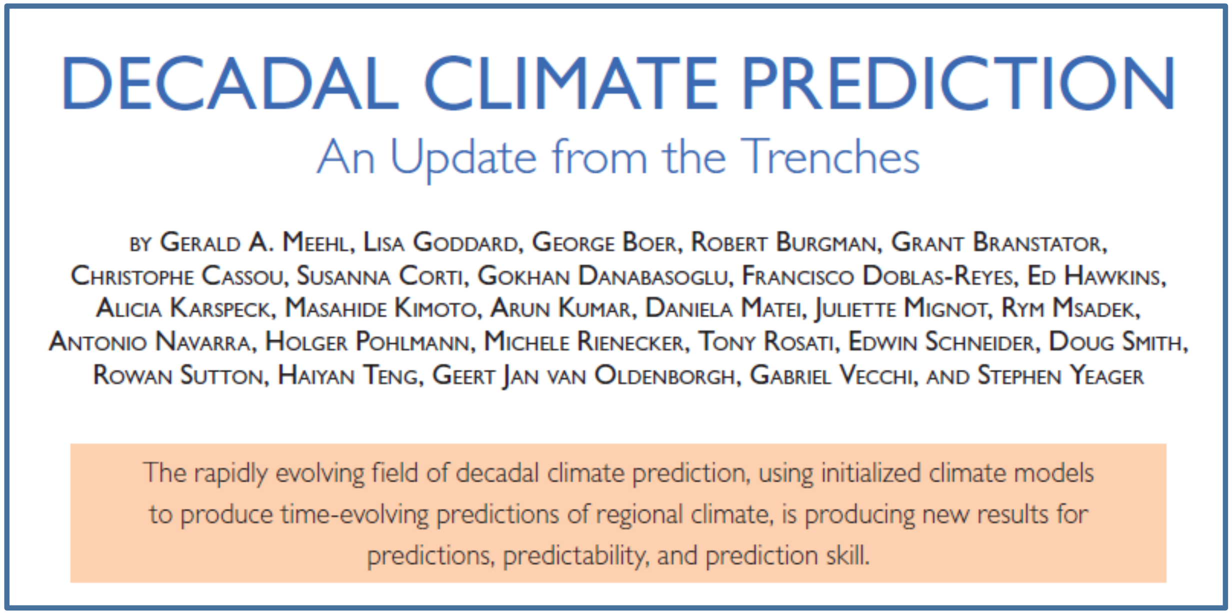
DECADAL PREDICTION

Can It Be Skillful?

BY GERALD A. MEEHL, LISA GODDARD, JAMES MURPHY, RONALD J. STOUFFER, GEORGE BOER, GOKHAN DANABASOGLU, KEITH DIXON, MARCO A. GIORGETTA, ARTHUR M. GREENE, ED HAWKINS, GABRIELE HEGERL, DAVID KAROLY, NOEL KEENLYSIDE, MASAHIDE KIMOTO, BEN KIRTMAN, ANTONIO NAVARRA, ROGER PULWARTY, DOUG SMITH, DETLEF STAMMER, AND TIMOTHY STOCKDALE

A new field called "decadal prediction" will use initialized climate models to produce time-evolving predictions of regional climate that will bridge ENSO forecasting and future climate change projections.

2011: an AGCI session was convened to assess progress in the new field of decadal climate prediction and recommend updates to the CMIP5 experiment design



DECADAL CLIMATE PREDICTION

An Update from the Trenches

BY GERALD A. MEEHL, LISA GODDARD, GEORGE BOER, ROBERT BURGMAN, GRANT BRANSTATOR, CHRISTOPHE CASSOU, SUSANNA CORTI, GOKHAN DANABASOGLU, FRANCISCO DOBLAS-REYES, ED HAWKINS, ALICIA KARSPECK, MASAHIDE KIMOTO, ARUN KUMAR, DANIELA MATEI, JULIETTE MIGNOT, RYM MSADEK, ANTONIO NAVARRA, HOLGER POHLMANN, MICHELE RIENECKER, TONY ROSATI, EDWIN SCHNEIDER, DOUG SMITH, ROWAN SUTTON, HAIYAN TENG, GEERT JAN VAN OLDENBORGH, GABRIEL VECCHI, AND STEPHEN YEAGER

The rapidly evolving field of decadal climate prediction, using initialized climate models to produce time-evolving predictions of regional climate, is producing new results for predictions, predictability, and prediction skill.

2014, Bull. Amer. Meteorol. Soc., **95**, 243—267, doi: http://dx.doi.org/10.1175/BAMS-D-12-00241.1:

2013: Given the success of the 2006 AGCI session in formulating CMIP5, it was decided to convene an AGCI session in 2013 to plan CMIP6 bringing together climate scientists, IAM modelers and IAV researchers

Eos, Vol. 95, No. 9, 4 March 2014

EOS

EOS, TRANSACTIONS, AMERICAN GEOPHYSICAL UNION

VOLUME 95 NUMBER 9
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PAGES 77–84

Climate Model Intercomparisons: Preparing for the Next Phase

PAGES 77–78

Since 1995, the Coupled Model Intercomparison Project (CMIP) has coordinated climate model experiments involving multiple international modeling teams. Through CMIP, climate modelers and scientists from around the world have analyzed and compared state-of-the-art climate model simulations to gain insights into the processes, mechanisms, and consequences of climate variability and climate change. This has led to a better understanding of past, present, and future climate, and CMIP model experiments have routinely been the basis for future climate change assessments made by the Intergovernmental Panel on Climate Change (IPCC) [e.g., IPCC, 2013, and references therein].

CMIP has developed in phases, with the simulations of the fifth phase, CMIP5, now mostly completed. Though analyses of the CMIP5 data will continue for at least several more years, science gaps and outstanding science questions have prompted preparations for the sixth phase of the project (CMIP6). This brief overview of the initial proposed design of CMIP6 is meant to inform interested research communities and to encourage discussion and feedback for consideration in the evolving experiment design (see Figure 1). A more complete description and further information are available at http://www.wcrp-climate.org/index.php/wgcm-cmip/wgcm-cmip6 and in the additional supporting information in the online version of this article.

Scientific Focus and Structure

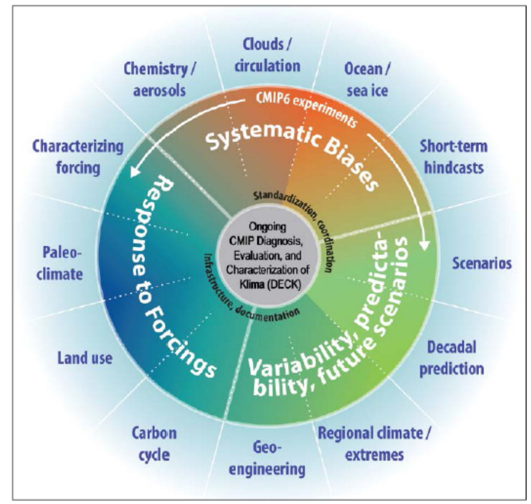
The proposed scientific backdrop for CMIP6 consists of the six grand challenges of the World Climate Research Programme

and feedbacks. The specific experiment design would focus on three broad questions: How does the Earth system respond to forcing? What are the origins and consequences of systematic model biases? How can we assess future climate changes given

climate variability, climate predictability, and uncertainties in scenarios?

Within this scientific framework, a more distributed organization for CMIP6 than in previous phases of CMIP is proposed. This would fall under the oversight of the CMIP Panel (see Figure 1), wherein an ongoing activity, CMIP, is distinguished from a particular phase of CMIP, now CMIP6. This structure involves two basic components.

First, CMIP (inner part of Figure 1) would be composed of two elements: in one, researchers would run a small set of standardized



Early-August, 2014: Following up on the 2013 CMIP6 planning session, several key CMIP6 MIPs needed to coordinate experiment designs across disciplines for CMIP6 (ScenarioMIP, LUMIP, AerChemMip)

More ground-breaking AGCI sessions:

2009: AGCI session brought together *water utility managers and climate modelers* to discuss user needs versus what climate models could provide

2010: AGCI session brought together *solar physicists and climate modelers* for the first time to discuss the possible influences of solar variability on earth's climate

Yet another landmark AGCI session: August 2012, physical and social scientists were brought together to define, for the first time, the meaning of "adaptation science", a major component of the new USGCRP Strategic Plan

Bears in tree near tent provided focus…

the result was this Science article

(Moss, R.H., and co-authors, 2013: Hell and high water: Practice-relevant adaptation science, *Science*, **342**, 696—698, doi:10.1126/science.1239569.)

:

POLICYFORUM

CLIMATE CHANGE

Hell and High Water: Practice-Relevant Adaptation Science

Adaptation requires science that analyzes decisions, identifies vulnerabilities, improves foresight, and develops options.

R. H. Moss,*† G. A. Meehl, M. C. Lemos, J. B. Smith, J. R. Arnold, J. C. Arnott, D. Behar, G. P. Brasseur, S. B. Broomell, A. J. Busalacchi, S. Dessai, K. L. Ebi, J. A. Edmonds, J. Furlow, L. Goddard, H. C. Hartmann, J. W. Hurrell, J. W. Katzenberger, D. M. Liverman, P. W. Mote, S. C. Moser, A. Kumar, R. S. Pulwarty, E. A. Seyller, B. L. Turner II, W. M. Washington, T. J. Wilbanks

Informing the extensive preparations needed to manage climate risks, avoid damages, and realize emerging opportunities is a grand challenge for climate change science. U.S. President Obama underscored the need for this research when he made climate preparedness a pillar of his climate policy. Adaptation improves preparedness and is one of two broad and increasingly important strategies (along with mitigation) for climate risk management. Adaptation is required in virtually all sectors of the economy and regions of the globe, for both built and natural systems (*1*).

However, without the appropriate science delivered in a decision-relevant context, it will become increasingly difficult—if not impossible—to prepare adequately (*2*).

Over the years, AGCI has served a uniquely critical function in stimulating connections among researchers in various global change-related disciplines to address new science challenges in innovative and creative ways

This occurs in a pleasant, retreat-like setting conducive for discussion, contemplation, and focus

It is safe to say that the pioneering AGCI science sessions have made significant contributions in steering the course of global change research

Thanks to John for hosting and organizing, and Michael for recording, 25 years of landmark AGCI sessions!

Adaptation science: