Frontier Newsletter

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TOWARD THE PREDICTION OF GLOBAL CHANGE
Frontier Research Center for Global Change

Special Topic

On the National Supporting Office of the IPCC/WG1 and the IPCC/WG1 Fourth Assessment Report (AR4)

On the February 1st, 2007, local time (February 2nd, Japan time), The Fourth Assessment Report (AR4) by Working Group 1 (WG1) "The Physical Science Basis" has released on the last day of the 10th Session of WG1 in Paris. The following is the report by Dr. Hiroki Kondo who was attended the session as the in charge of the WG1 National Support Office.

Hiroki Kondo, Senior Scientist

1. Brief introduction of IPCC

Since its establishment in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), the Intergovernmental Panel on Climate Change (IPCC) has been publishing its assessment reports on climate change three times (the first in 1990, the second in 1995 and the third in 2001), summarizing the updated findings in scientific, technological and socio-economic sectors. They have been providing essential basis for policy makers for their decisions on climate change issues and particularly played important roles in creating United Nations Framework Convention on Climate Change (UNFCCC, adopted in 1992) and the Kyoto Protocol (adopted in 1997).

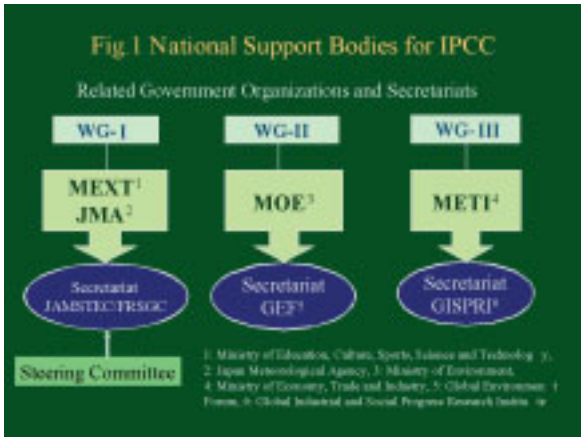
The Fourth Assessment Report (AR4) by each Working Group has been or will have been finalized by early May and the remaining part, the Synthesis Report, will have been done in November 2007, completing all parts of the AR4.

The theme of the Working Group Ⅰ (WG Ⅰ) is "the Physical Science Basis", that of the Working Group Ⅱ (WG Ⅱ), "Impact, Adaptation and Vulnerability" and that of the Working Group Ⅲ (WG Ⅲ), "Mitigation.

2. National supporting activities for WG Ⅰ

Each Working Group of the IPCC selected Lead Authors (LAs), Coordinating Lead Authors (CLAs), and Review Editors (REs) for every chapter of the AR4. They have assembled together several times at so-called LA meetings to meticulously consider how to proceed in writing drafts. As a basic principle, the IPCC assesses latest research findings only by such papers as accepted by peer-reviewed academic journals. Therefore researchers to contribute to the IPCC are required to write papers acceptable by such journals. Fig.1 shows national bodies supporting such activities as above. National liaison meetings have been organized several times as necessary for better national coordination for the AR4.

The FRCGC of the Japan Agency of Marine-Earth Science and Technology (JAMSTEC) is operating a Secretariat office to support national activities of WG1 (for details see http://www.jamstec.go.jp/ipccwg1/). Its strategies have been recommended by the WG1 National Steering Committee with members of experts including LAs and REs. It is running a website, exchanging information, organizing research workshops to present recent outcomes and to discuss how to address existing challenges. It is also cooperating with the JMA through the experts of the above Committee to finalize its translation drafts of AR4 documents including the SPM of the WG Ⅰ, just approved by the 10th Session of the WG Ⅰ (Paris, 29 January -1 February 2007) .



3. Discussions and results of the latest WG Ⅰ meeting in Paris

The above WG Ⅰ meeting was attended by representatives from 107 counties and related International Organizations and others. The Japanese delegation consisted of 9 participants from the METI, JMA, MOE and JAMSTEC and others.

Most part of the deliberation was concentrated on the approval of the Summary for Policy Makers (SPM) on a line-by-line basis, the draft of which had been extracted from the underlying report prepared by scientists as an academic document. After long discussions, the SPM draft with considerable amendments was finally approved. The underlying report was then accepted with the understanding that editorial corrections mainly for its consistency with the approved SPM would be made as necessary.

The meeting went beyond the midnight to about 1:00 a.m. on 2 February 2007. Proposed amendments in the SPM include the addition of a figure and the revision of wordings affecting the meaning of respective sentences. But what consumed time by far the most was on how to express uncertainties appropriately.

4. The characteristics of the AR4

Firstly, the AR4 of the WG Ⅰ indicates from the analysis of observations that "warming of the climate system is unequivocal, …" It recognizes that the global warming is now really happening. While the Third Assessment Report (TAR) showed that the global mean surface temperature had increased 0.6℃ in hundred years up to 2000, the AR4 says it has increased 0.74℃ in hundred years up to 2005. The increase has grown larger even in 5 years. Furthermore, the average warming rate in the past 50 years is 0.13℃ per 10 year (1.3℃ per 100 years, almost twice the average increase rate in the past 100years). Thus the warming has clearly been accelerating.

Secondly, the AR4 assesses on the attribution of the recent climate change on a further certain basis by stating that "most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations," while the TAR concluded "most of the observed warming over the last 50 years is likely to have been due to the increase in greenhouse gas concentrations."

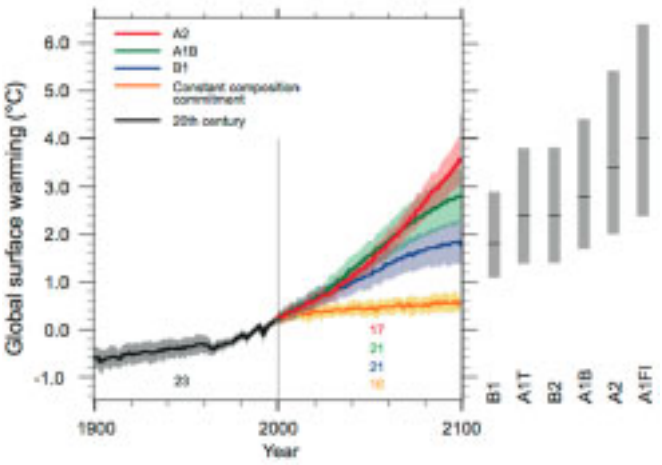


Fig. 2 Change of global average surface temperature for each emission scenario

The words very likely in AR4 means the probability of occurrence of 90-95%, and the word likely in either TAR and AR4 means that of 66%-90%.

Thirdly, on the important aspect of future projection, climate models contributing to the AR4 show considerable developments in both available number and model quality. They have now enabled to find both the best estimate and the likely range of the projected values for a given emission scenario. For example, the best estimate of the temperature increase by 2100 from 1990 for the A1B

scenario (typical features include rapid economic growth but balanced energy sources) is 2.8℃ (see Fig. 2). The AR4 also projects the increase of frequency in extreme events in the future such as severe rainfalls and heat waves, and that of the intensity of tropical cyclones such as Typhoons and Hurricanes.

Program Activity

Climate Variations Research Program

Report on the "Symposium on Predictability of Climate Variations in the Indo-Pacific Sector"

"Symposium on Predictability of Climate Variations in the Indo-Pacific Sector" was held at Shinagawa Prince Hotel on March 8 and 9, 2007. The hosts of this meeting were FRCGC, APEC Climate Center, Korea, Japan Society for the Promotion of Science and Ministry of Education, Culture, Sports, Science and Technology, and also supported by Japan Oceanographic Society and Meteorological Society of Japan. About 40 leading scientists of climate variations research were invited not only from Japan, but also from U.S.A., Australia, China, Taiwan, Korea, India, France, and Italy. Current wide topics on Indian Ocean Dipole, Asian monsoon, midlatitude air-sea interaction, predictability of ENSO and teleconnections were presented and discussed. End of the symposium, Yamagata PD summarized all the topics and noticed that international close cooperative framework was indispensable for further progress of predictability research on climate variations. The symposium was successfully finished under a consensus on this matter achieved by all participants.

Hydrological Cycle Research Program

Report on the International Symposium on Weather Modification by Dr. Naomi Kuba

The International symposium on weather modification was held from 31 January to 1 February 2007 in Tsukuba. It was hosted by the Japanese Cloud Seeding Experiments for Precipitation Augmentation and Meteorological Research Institute, Japan Meteorological Agency. I attended this meeting to present our research to estimate the effect of hygroscopic seeding on the development of precipitation. It is hoped that hygroscopic seeding increases precipitation over the catchment area of dam where a water shortage is serious problem in summer. However, the impact has not been estimated sufficiently by scientific works. Recently weather modification and precipitation augmentation are not in the spotlight in Japan. On the other hand, it was shown that they are supported as a national project and many researchers and staff are engaged in this project. There were amazing presentations that AgI (silver iodide) seeding by rocket launcher increased precipitation in China and that airborne seeding increased cloud area and precipitation in Thailand. There were also some skeptical opinions about their results. I will estimate the effect of weather modification scientifically on neutral position.

Atmospheric Composition Research Program

Introduction of Dr. Yu Liu, who is observing air pollutants in China in our program

Before I joined FRCGC I worked in the State Key Laboratory of Atmospheric Boundary Layer Physics and Atmospheric Chemistry (LAPC), Institute of Atmospheric Physics (IAP), Chinese Academy of Sciences (CAS). My major is focused on atmospheric physics, especially on the micrometeorology over the complex terrain of Atmospheric Boundary Layer (ABL). And my favorite research area is on field observation. During my doctoral courses, I took part in the Everest Environment Monitoring in the summer of 2001 and 2002 at higher than 5000 meters altitude, and participated in the Arctic Scientific Research Expedition 2002 at Longyearbyen, the capital of Svalbard, Norway. After I started my research work in IAP, our group did an ABL Experiment on complex terrain at Baiyangdian district, Hebei Province, China in both November 2004 and September 2005. In August 2005 we also performed Beijing Urban ABL Observation for Beijing 2008 Olympic Game. After coming to FRCGC, I have been being engaged in long-term observation work on monitoring ozone, CO, and black carbon in East Asia area, especially in China and Kyrgyz.

Ecosystem Change Research Program

Report of the Symposium Co-organized by Ecological Society of Japan- Kanto Branch and FRCGC by Dr. Reiichiro Ishii

On February 18, 2007, a symposium entitled "Terrestrial Ecosystem Observation of Today and the Future: Beyond the Gap Between Scales and Techniques of Observations" was held at Miyoshi-hall, YES. This symposium was co-organized by Ecological Society of Japan- Kanto Branch and FRCGC. Although ecology and environmental science share terrestrial ecosystems as a primary research target, their observations often differ with regard to spatial scales and the techniques employed because of their different scientific backgrounds. To enhance the exchange of knowledge and information between the both disciplines, which has been limited in the past, we invited two experts from these fields, Dr. Nakashizuka (Tohoku Univ., forest ecology) and Dr. Honda (Chiba Univ., remote-sensing) to review the current situation and show the future scope for co-operation from their perspectives. Then, three commentators, Drs. Hanba (Kyoto Inst. Tech., plant physiology), Takatsuki (Univ. Tokyo, animal ecology) and Kato (FRCGC, simulation modeling) made suggestions from their own specific view points. During the period of open discussion with the audience (about 70 persons), the necessity of mechanisms for sharing observation data of broad areas across scales was strongly recognized by all participants. We in Ecosystem Change Research Program will take advantage of the valuable suggestions from the symposium to help for the advance our predictive ecosystem research.

Global Warming Research Program

Report of the AGU Fall Meeting by Dr. Kurahashi Takasumi

2006 American Geophysical Union (AGU) Fall Meeting was held in San Francisco, U.S.A from 11, December to 15, 2006. Four researchers of our program joined the meeting. Three of them belong to the paleoclimate group; Group Leader Dr. Abe, Dr. Saito, and myself. We had a lively discussion for 5 days. In a session on the paleoclimate, we presented the results of our research on the effects of massive discharge of fresh water to the North Atlantic on the climate. This study was based on the numerical simulation by our Coupled Atmosphere-Ocean General Circulation Model (CGCM). In another session, we presented our study on the effect of oceanic physical change on the carbon cycle. This study is applicable to the problem of glacial-interglacial variations of atmospheric CO_2 concentration. In a session on the Antarctic ice core, we also gave a presentation of the study on the effect of ice-sheet flow on the ice-core data, which is done by using a numerical ice sheet model. Many people who were interested in our studies came to us and made active discussions. We also listened to a lot of presentations and got the latest research trends. I think it was very significant meeting as we could exchange opinions with many researchers in our field. It will help us to improve our research and models in the future.

Global Environment Modeling Research Program

Research activities in the "Kyousei Project 7"

To enhance accurate estimates of seasonal to interannual (S-I) climate variations by a coupled general circulation model (CGCM), we have optimized the oceanic initial conditions and the bulk adjustment factors that control air-sea flux values using a 4-dimensional variational data assimilation method. This is the first to apply an adjoint method to a fully CGCM toward a realistic modeling of S-I climate variations. The dynamically and thermodynamically self-consistent product in that the strongest El Nino Southern Oscillation phenomenon and the Indian Ocean Dipole Mode event during 1997-1998 are better defined by our assimilation is available for supply to general users (http://www.jamstec.go.jp/frcgc/k7-dbase2/eng/). We are now conducting process studies using this dataset and are performing further assimilation experiments toward a more precise simulation and prediction of S-I coupled climate variations. Some results have already been published in Geophysical Research Letters of the American Geophysical Union.

Dr. Matsuno had an honor to explain at KOUSHO HAJIME in the presence of the Emperor and Empress of Japan

Dr. Taroh Matsuno, Senior Scientist of the Frontier Research Center for Global Change (FRCGC) had an honor to give a lecture in the presence of the Emperor and Empress of Japan at the ceremony of the KOUSHO HAJIME - Imperial New Year's Lectures - takes place every January at the Imperial Palace. The following is the report on the ceremony by Dr. Matsuno.

Lecturing for the New Years First Lecture Ceremony at the Imperial Palace

Taroh Matsuno, Senior Scientist


Dr.Taroh Matsuno

On 12th of January 2007, I delivered a lecture for the Emperor and Empress of Japan, and other imperial families on the occasion of the New Years First Lecture Ceremony held in the Imperial Palace. According to the Imperial Court Office, the ceremony was initiated by Emperor Meiji with intention to encourage learning. There has been a custom that the emperor listens to lectures given by authorities in various fields. First they were Japanese and Chinese (equivalent to Latin in Europe) literatures and then Western literatures were added. Later on the three fields became humanities, social and natural sciences. This time I was selected as a natural scientist and gave a lecture entitled "Increase of Carbon Dioxide and Climate Change."

The event is a ceremonial one and therefore it is different from ordinary "lecture for the Emperor" which will be explained later. The ceremony takes place in a hall called "Matsuno-ma (!)" (Pine Hall) and more than 50 people attend including some members of the Japan Academy, the Chairs of the Diet and occasionally some ministers. Three lecturers give a talk for 15 minutes each without any time for question and answer. There is a serious difficulty especially for natural scientists that lecturers cannot use pictures or diagrams as visual aids of explanation; lecture means oral speech only! Fortunately in the case of my lecture topic this time, the limitation was not fatal. Important messages like "the global mean temperature has increased near 0.8℃ in a century," and "Tropical cyclones will become more intense and heavy rainfall will become more frequent" must have been understood without any figures. The other two lectures were on "Family law in ancient Greece" by Emeritus Professor Itoh, European history expert and "Perspective on East Asian Civilization" by Emeritus Professor Aoki, cultural anthropologist.

I had an experience before to give a lecture for the Emperor on global warming and climate change. Unlike the ceremony of this year, it was done as a part of the Emperor's study to be informed of the latest state of society and cultural/scientific topics. It was in 1993 when the global warming became a big issue. There were, of course questions and answers.

On that occasion in connection with my explanation on warming effect of the atmospheric carbon dioxide, the Emperor mentioned that he understands that the climate of the era of dinosaurs was warm due to abundant carbon dioxide. Because of this episode, in the lecture of this year, I mentioned about climate change on geological time scale as introduction and then talked about the present status of global warming projection research. In contrast to the talk in 1993 when knowledge about the problem was not plentiful in world wide scientific community and even less in Japan, in the lecture of this year I included the results of projection research conducted in Japan by my colleagues some of which are now at the most advanced state. I was very honored and happy to give a lecture based on our own research on such a monumental occasion.

Report

Dr. Takaya Lectured High School Teachers

On November 8th, 2006, Dr. Koutaro Takaya, Researcher at the Climate Variations Research Program, gave a lecture on "Climate and Ocean - Climate Variability over Japan in Winter." The lecture was given at the request of the High School Teachers Association in Chiba Prefecture as part of the Association of Geo-science Education Conference FY2006, which was held at the Chiba General Education Center in Chiba city. The lecture was given to science teachers who teach geo-science in Chiba prefecture. Dr. Takaya expounded the variability of Siberian High and the East Asian Winter Monsoon, which affects the winter climate in Japan. He also explained relation between the winter monsoon variability and El Nino/La Nina.

Forty participants attended the session, and had many questions for Dr. Takaya following the lecture. All the participants found it a very meaningful conference, as did Dr. Takaya.

Dr.Koutaro Takaya

Dr. Tsushima Taught Elementary School Students

On January 19th, 2007, Dr. Yoko Tsushima, Researcher at the Global Warming Research Program, taught 6th grade students of the Ooka Elementary School in Yokohama at the Earth Science Museum on the Yokohama campus of the Japan Agency for Marine-Earth Science and Technology (JAMSTEC). The school aims to educate children to create and develop their own learning opportunities together with teachers and society. To this end, the school encourages the home and the community to participate in its educational activities. The students have studied global warming in the integrated class for a year, and they finally received this wonderful opportunity to participate in the summary of the classes.

Dr. Tsushima talked on the "Global Warming Mechanisms and Predictions," and introduced some research outputs. She received many sharp questions on global warming, such as "How much higher will the sea level around Yokohama increase by global warming?", and "What kind of activities are being conducted in this institute to prevent global warming?"

After a few days, we received reports on the lesson from the students. Their reports showed that Dr. Tsushima's message - "We can change the future" - had definitely been understood by the students.

Dr.Yoko Tsushima

Scenes at the class

Dr. Suzuki Gave a Keynote Lecture at the 13th Public Meeting of Environmental Activities in Yokohama

About 130 participants at the event

On February 18th, 2007, Dr. Tatsuo Suzuki, Researcher at the Global Warming Research Program, gave a keynote lecture at the 13th Public Meeting of Environmental Activities in Yokohama. The lecture was held at the Kanagawa Prefectural Citizens' General Center in Yokohama.

Dr.Tatsuo Suzuki

The meeting is held every year to introduce ecological environment preservation activities undertaken by the Leaders' Association for Environmental Studies, which consists of members who have attended a training course to enhance and develop their actions, and which is provided by the Kanagawa Environmental Research Center, the Promotion Committee of Global Warming Prevention Activities, and the Kanagawa Environmental Counselors Association.

Dr. Suzuki's talk was on the "Future Prediction of Global Warming - What Global Warming Brings?" He explained the mechanisms and causes of global warming, and introduced his group's research on the future global warming prediction and other interesting outputs. Especially, some simulation pictures of the future 100 years left a strong impression in the minds of the participants. In spite of heavy rain on the day of the lecture, there were about 130 participants at the event, and they listened to Dr. Suzuki's talk enthusiastically.

※ For details about the Kanagawa Environmental Research Center, please visit their website at http://www.k-erc.pref.kanagawa.jp/en_hp/en_index/en_index.htm. For information about the Leaders' Association for Environmental Studies, their website (in Japanese) can be found at http://members.at.infoseek.co.jp/k_leader/.

IORGC/FRCGC Award in the FY2006

On March 19th and 20th, 2007, the IORGC / FRCGC Joint Annual Symposium for FY2006 ※ was held at Miyoshi Memorial Auditorium in JAMSTEC Yokohama Institute for Earth Sciences. The Ceremony for Achievement Award was performed on the first day of the symposium. From FRCGC, six researchers were commended for their achievements as outstanding performance awardees. We wish their further success in the next fiscal year.

Masami Nonaka, Researcher

Climate Variations Model Group, Climate Variations Research Program
Achievement: Valuable contributions to the progress in understanding the extra-tropical air-sea interactions by analyzing hight resolution oceanic simulation data

Kazuyuki Saito, Postdoctoral Researcher

Large-Scale Hydrological Cycle Process Group, Hydrological Cycle Research Program
Achievement: Impact of large-scale orography and land surface processes over Eurasia on the global-scale hydro-climate

Prabir Patra, Researcher

Greenhouse Gases Modeling Group, Atmospheric Composition Research Program
Achievement: Quantitative analysis of global carbon cycle using a three-dimensional atmospheric transport model

Hisashi Sato, Postdoctoral Researcher

Terrestrial Ecosystem Model Group, Ecosystem Change Research Program
Achievement: Development of a Dynamic Global Vegetation Model

James Annan, Researcher

Global Warming Research Group, Global Warming Research Program
Achievement: Studies on quantification of uncertainties which arise from climate model prediction

Motohiko Tsugawa, Researcher

Next-Generation Model Development Group, Global Environment Modeling Research Program
Achievement: Development of an oceanic generalcirculation model based on cubic grid

※ This symposium is held at the end of every fiscal year to promote mutual understanding of research accomplishments among researchers of IORGC and FRCGC, and also to promote cross-cutting research between IORGC and FRCGC.

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