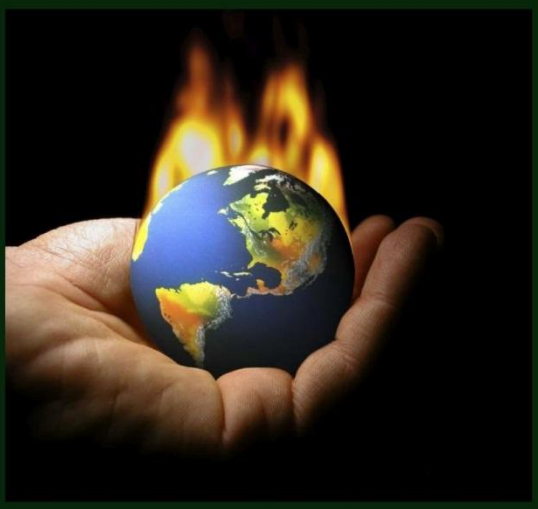
KOREA-ITALY SYMPOSIUM ON

GLOBAL CLIMATE CHANGE



DATE : 22 May 2012 (Tue) 1:45pm-6:00pm

VENUE : Ewha Womans University
Lee Sam Bong Hall

Organized by

EWHA WOMANS UNIVERSITY
CENTER FOR CLIMATE/ENVIRONMENT CHANGE PREDICTION RESEARCH (CCCPR)
SEVERE STORM RESEARCH CENTER (SSRC)

EMBASSY OF ITALY
OFFICE OF SCIENCE AND TECHNOLOGY

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on
GLOBAL CLIMATE CHANGE

Lee Sam Bong Hall, Ewha Campus Complex (ECC)
Ewha Womans University, Seoul, Korea

TUESDAY, May 22, 2012 (1:45 pm - 6:00 pm)

PROGRAMME

1:45	**WELCOME/ OPENING SESSION**
2:00	**SCIENTIFIC/TECHNOLOGICAL SESSION** **Chairman: Prof. Seon Ki PARK (Ewha Womans University)**
2:00-2:30	***Study on the role of natural versus anthropogenic forcings using the observations and model*** **Sang-Wook YEH (Hanyang University, Korea)**
2:30-3:00	***Using emission inventories to identify co-benefits and trade-off between climate change and air pollution strategies*** **Stefano CASERINI (Polytechnic of Milan, Italy)**
3:00-3:30	***Multi-national efforts on climate prediction: APEC Climate Center's climate information services*** **Jin Ho YOO (APEC Climate Center, Korea)**
3:30-4:00	**COFFEE BREAK**
4:00-4:30	***Local climate variability and energy/hydrological budget: the case of the Alps*** **Claudio CASSARDO (University of Torino, Italy)**
4:30-4:50	***On the observational determination of climate sensitivity and feedback*** **Yong-Sang CHOI (Ewha Womans University, Korea)**
4:50-5:20	***Predicting the climate on decadal time scales*** **Alessio BELLUCCI (CMCC- Euro-Mediterranean Centre for Climate Change, Italy)**
5:20-5:40	***Developing synthetic prediction system for climate-environment ecosystem interactions: Researches at CCCPR*** **Seon Ki PARK (Ewha Womans University, Korea)**
5:40-6:00	**DISCUSSION AND CONCLUSIONS**

STUDY ON THE ROLE OF NATURAL VERSUS ANTHROPOGENIC FORCINGS USING THE OBSERVATIONS AND MODEL

Sang-Wook Yeh
Department of Environmental Marine Science, Hanyang University, ERICA campus, Korea

The global mean surface temperature (GMST) gradually increased during the twentieth century. According to recent studies, the average GMST increased by approximately 0.8±0.1°C between the years 1900 and 2000 (IPCC 2007).

Based on observations and model simulations, many previous studies argue that global warming has been continuous, and that past increases in temperature can be used to predict future conditions. The effects of natural and anthropogenic variability on the global increase in temperature were estimated in several studies, however the climate science community is still endeavoring to address which mechanism is primarily responsible for global warming.

Specifically, investigations are focusing on whether natural forcing (solar forcing plus volcanic forcing) or anthropogenic forcing is the primary driver of recent and ongoing increases in the GMST. In this study, we examine this issue using a global climate proxy data and a millennium simulation of coupled general circulation model.

It is found that the changes in solar radiative forcing are able to explain much part of GMST variations in the past millennium.

Sang-Wook YEH

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2001, Ph.D (Atmospheric Science), The Seoul National University, Korea
1994, M.S (Atmospheric Science), The Seoul National University, Korea
1992, B.A (Atmospheric Science), The Seoul National University, Korea

Professional Career

Associate Professor, Department of Environmental Marine Science, Hanyang University (March, 2010-present)
Senior Research scientist, Korea Ocean Research & Development Institute (March,2005-Februay 2010)
Postdoctoral Research Scientist, COLA (February, 2002 – February,2005)
Postdoctoral Fellowship, Climate Environmental System, Seoul National University, Korea (September, 2001 – February, 2002).
Graduate Research Assistant, Atmospheric sciences, Seoul National University, Korea, March, 1998- August, 2001.
The Climate forecaster in the Air-force Army, Korea, 1994-1998.
Graduate Research Assistant, Atmospheric sciences, Seoul National University, Korea, September 1993- December 1993.
Graduate Teaching Assistant, Atmospheric sciences, Seoul National University, Mar, 1992-December, 1992.

Skills

The CGCM simulation, a hybrid coupled modeling (AGCM + an intermediate level ocean model) and the simulation of a simple ocean model (for example, Cane-Zebiak ocean model).
Experience in statistical tools such as time-series analysis, filtering, and multivariate statistical analysis (EOF, EEOF, SVD, etc.)
Experience of fotran and soft package of GrADS

Current research topic

Climate change study
Decadal variability in the North Pacific and tropical Pacific SST
Teleconnections of the tropics-North Pacific SST variability
Air-sea interactions

USING EMISSION INVENTORIES TO IDENTIFY CO-BENEFITS AND TRADE-OFF BETWEEN CLIMATE CHANGE AND AIR POLLUTION STRATEGIES

Stefano CASERINI
Politecnico di Milano, DIIAR Sez. Ambientale, Italy

Emission inventories are an essential tool to indentify the main sources of greenhouse gas (GHGs) and toxic air pollution at different scales, from local to international level.

The presentation shows an overview of the atmospheric emission inventory activities realized at a local level (Lombardy region), at country level (in Italy and Europe) and in the framework of the UNFCCC convention.

In Lombardy, a highly industrialized area in Northern Italy with 9 million inhabitants, emission inventories have been developed since 1999; they provide emission data at the municipal scale for more than 200 activities, 30 fuels and for different type of pollutants: greenhouse gases (CO_2, CH_4, N_2O and F-gases), primary particulate matter of different size (TSP, PM10 and PM2.5), pollutants involved in secondary fine particulate formation (NO_x, SO_x, VOC and NH_3), and toxic compounds (B(a)P, As, Cr, Cd, Ni, Pb). A variety of methodology, proposed by the by the IPPC guidelines (for greenhouse gas) as well as by the EMEP/EEA Air pollutant Emission Inventory Guidebook are used. Estimates are based on activity data (fuel consumption, industrial productions, etc…) collected at local, regional and national level, as well as through specific survey (i.e. for wood combustion in the residential sector), and emission factors proposed in the EEA Guidebook and in literature. From major industrial plants, specific data provided by plant managers have been used.

The result of the emission inventory allow to recognize what constitutes a win-win or a trade-off for air quality and climate change. While multiple benefits derive from policy directed to energy saving and sustainable mobility, important example of trade-off for local air pollutants and GHGs are related to biomass use in the residential sector and to the increase of diesel use in the transport sector.

Residential wood combustion is currently promoted in the framework of climate change mitigation policies; although clear GHG emissions savings are expected when biomass substitutes fossil fuels, the inventory highlights the importance of wood use in the residential sector (and in particular in old stoves and fireplaces) as the main source of PM10 and Benzo(a)pyrene in the region.

Moreover, although diesel vehicle are characterized by CO_2 emission factor lower that gasoline vehicle, NOx emissions are much higher, and are the most important sources in populated areas of Lombardy where PM10 and NO_2 air quality limits are frequently exceeded.

Stefano CASERINI

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Born in 1965, Stefano Caserini has a Master degree in Environmental Engineering and a PhD in Sanitary Engineering. He is Contract Professor of "Mitigation of Climate Change" at the Politecnico di Milano, Engineering Faculty, where he is involved in researches on atmospheric pollution, life cycle assessment, municipal waste incinerator monitoring and greenhouse gas emission assessment and reduction.

He also works as a consultant for private and public companies in the fields of emission inventory, environmental impact assessment, air quality pollution and mitigation of climate change. Since 1999 he is Project Manager of INEMAR, Lombardy Region Atmospheric Emission Inventory, currently managed by ARPA Lombardia (Environmental Protection Agency of Lombardy).

Author of many scientific publications, he is also involved in the dissemination of scientific knowledge on climate change; he published two books on the climate change debate titled "A qualcuno piace caldo" (Some like it hot) and "Guida alle leggende sul clima che cambia" (Guide to the legends on the changing climate). He is founder and coordinator of the Scientific Committee of Climalteranti, one of the main Italian blog on climate change.
(www.climalteranti.it).

MULTI-NATIONAL EFFORTS ON CLIMATE PREDICTION : APEC CLIMATE CENTER'S CLIMATE INFORMATION SERVICES

Jin Ho YOO
APEC Climate Center (APCC), Korea

During last a half of century, there have been numerous efforts to produce meaningful information beyond a theoretical limit of weather fluctuation. Slow varying lower boundary condition of atmosphere (such as Sea Surface Temperature) is proved to be a primary source of predictable information beyond weather time scale and successful dynamical forecasting of El-Nino Southern Oscillation (ENSO) accelerated scientific and technical progress, which enabled us to produce operational seasonal climate forecast. However, it is noted that there are significant model-to-model differences and this climate model dependent uncertainty is another obstacle to make reliable long-range forecast as well as climate change projection and it is also hard to be assessed theoretically due to very non-linear nature of climate model.

In the seasonal to interannual timescale, however, a beauty of democracy appears to work out. Many international cooperative projects on dynamical seasonal prediction, provided holistic set to analysis current ability of seasonal predictability. And it turns out that using multiple models provides higher chance to produce reliable forecast than any single model. However, due to the limitation of resources, it is difficult to hold many dynamical climate models in one national meteorological service. The APEC Climate Center was established in 2005 as the first multi-national collaboration to produce operational seasonal climate forecast using 17 different models from 9 member economies. The goal of APCC is to enhance socioeconomic well-being through better use of climate information available. The exchange of climate forecast information is the first step and the activities are expanding to produce value added products in various sectors as well as easier access to complex climate data and information.

Jin Ho YOO

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Doctorate of Philosophy, Seoul National University 2005
Dissertation topic: *Theoretical examination of multi-model ensemble seasonal prediction systems using various climate models*
Master of Science, Seoul National University 1998
Thesis topic: *Dynamical structure and correction of systematic error of winter time NCEP medium range forecast*
Bachelor of Science, Seoul National University 1996

Climate scientist with interest in climate predictability, Asian monsoon dynamics, and utilization of prediction information. Currently in charge of APCC operational seasonal climate prediction and international collaborations. Experienced in working and training of scientists and National Hydro-Met. Services for their seasonal prediction system development and associated research.

Professional Career

Current Position: Head of External Affairs Department (Oct. 2010-present)
APEC Climate Center, Busan, Korea
- Develop and carry out international research project and collaborative activities. (i.e. development of drought early warning system of Taiwan, with National Center for Disaster Reserach (NCDR), Taiwan, Developing multi model intraseasonal prediction system, with Unv. of Hawaii (UH), USA)
- Manage operational seasonal climate forecast monthly basis and user support system. Release outlook to 700 recipients. Manage seasonal prediction operation of WMO LC_LRFMME (World Meteorological Organization, Lead center for Long Range Forecast Multi Model Ensemble). .

Activities

Visiting Scientist (Sept. 2005-Sep.2010)
International Centre for Theoretical Physics, Trieste, Italy
- Research on south Asian monsoon variability and predictability.
- Interact with National Hydro-Met Services to develop training program and research project
- Consult regional research activities in Asian region and supervise ph-D thesis.

LOCAL CLIMATE VARIABILITY AND ENERGY/HYDROLOGICAL BUDGET: THE CASE OF THE ALPS

Claudio CASSARDO
Department of Physics, University of Torino, Italy

Several studies showed the climate change consequences in terms of temperature and precipitation at large scale, while analyses at shorter scales have been performed more recently. Another modern study concerns the importance of physical processes at the interface atmosphere-earth's (surface layer) in the climate system. In general, these act partitioning the net radiation into sensible and latent heat flux and conductive flux into the soil, and redistributing the precipitation in evapotranspiration, runoff and gravitational drainage, thus regulating the soil moisture. Due to the complicate network of feedback that regulates the climatic answer of an ecosystem, the necessity of parameterizing such processes with great accuracy has been recognized of paramount importance. In addition, the requirement of observational databases of the physical variables regulating the above mentioned processes assumes a noticeable importance for both validating the models and comparing the future climate characteristics with the actual ones.

Nevertheless, despite the relevance of the above physical variables, very few extensive experiments were devoted to their measurements, making impossible to assess hydrological and energy budgets at large scale and for long time. The recently proposed methodology CLIPS (Climatology of Surface Parameters) can estimate some relevant parameters in the surface layer using a trusted Land Surface model as a surrogate for missing observations.

During this presentation, the main result of a study conducted through a chain of model simulations culminating in the use of a Land Surface model (UTOPIA) driven by the a regional climate model (RegCM3), in turn driven by a global climate model, will be presented. The area investigated embraces the Alps, which is one of the most sensitive regions in the world to climate changes.

These results, that will be also framed within the characteristics of the current climate, highlight the relevant variations of the mean annual water balance component trends in future climate, able to potentially affect, negatively, agricultural practices and other human activities.

The increased frequency of winter precipitations reflects in a greater and more distributed runoff in winter and spring months. The lower rainfall and higher temperatures recorded in summer cause a water budget deficit, with lower soil moisture and more frequent drought situations. On the contrary, the autumnal heavier rains may cause an increase of potential flood situations. These figures, striking for the A2 scenario, but also evident in the B2 scenario, represent thus a common denominator associated with climate change expected in the future, and must therefore be taken into account, preparing appropriate measures for adaptation.

Claudio CASSARDO

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1988-1990: Ph. D. in Geophysics, University of Genoa, Italy
1986-1987: Meteorological officier, Italian Meteorological Service
1982-1986: B.S. and M.S. in Physics, University of Torino, Italy

Professor, Physics, Faculty of Sciences, University of Torino, Italy
Chairman, Commission on Water Sustainability, International Geographic Union
Director, Unit of Torino, CINFAI (national Consortium for Physics of Atmosphere and Hydrosphere), Italy

Professional Career

2000-Present: Professor, Physics, Faculty of Sciences, University of Torino, Italy

1993-2000: Researcher, Physics, Faculty of Sciences, University of Eastern Piedmont, Italy

1991-1993: Postdoctoral scientist, Atmospheric Physics, University of Torino, Italy

1991-1991: Postdoctoral scientist, Atmospheric Physics, Politecnico di Torino, Italy

ON THE OBSERVATIONAL DETERMINATION OF CLIMATE SENSITIVITY AND FEEDBACK

Yong-Sang CHOI
Center for Climate/Environment Change Prediction Research (CCCPR)
Ewha Womans University, Korea

This talk will show estimation results of climate sensitivity and feedback from observations, using the deseasonalized fluctuations in sea surface temperatures (SSTs) and the concurrent fluctuations in the top-of-atmosphere (TOA) outgoing radiation from the ERBE (1985-1999) and CERES (2000-2008) satellite instruments. I developed a method to distinguish noise in the outgoing radiation as well as radiation changes that are forcing SST changes from those radiation changes that constitute feedbacks to changes in SST. The new method does moderately well in distinguishing positive from negative feedbacks and in quantifying negative feedbacks. In contrast, simple regression methods used by several existing papers generally exaggerate positive feedbacks and even show positive feedbacks when actual feedbacks are negative. I argue that feedbacks are largely concentrated in the tropics, and the tropical feedbacks can be adjusted to account for their impact on the globe as a whole. I found that the outgoing radiation resulting from SST fluctuations exceeds the zero-feedback response thus implying negative feedback (certainly in longwave, and likely in shortwave). In contrast to this, the calculated TOA outgoing radiation fluxes from 11 atmospheric models forced by the observed SST are less than the zero-feedback response, consistent with the positive feedbacks that characterize these models. The negative feedback from observations is from both longwave and shortwave radiation, while the positive feedback from models is usually from longwave feedback. The results imply that the models are exaggerating climate sensitivity. Finally, I will also clarify a recent debate on the issue of the detrimental effect of natural cloud variations occurring independently of SST (i.e., non-feedback cloud variations) on the currently suggested estimation methods of climate feedback. Observations show that the non-feedback cloud variations are 16−20% of non-radiative forcing, which is far above the critical level leading to significant corruption of feedback estimates.

Yong Sang CHOI

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B.S. in both Earth Science Education and Statistics, February 2000,
Seoul National University, Korea.
Ph.D. in Atmospheric Science, August 2007,
Seoul National University, Korea.
Thesis title: *Remote sensing of cloud properties from the satellite multispectral imagery and its application to study of cloud radiative effect.*

Professional Career

2010.3-Present.	Assistant Professor, Department of Environmental Science and Engineering, Ewha Womans University
2011.3-Present.	Adjunct Professor, Division of EcoScience, Ewha Womans University
2012.3-Present.	Adjunct Professor, Department of Atmospheric Science and Engineering, Ewha Womans University
2008.12-2010.2	Postdoctoral research associate, M.I.T. (Advisor: Prof. Richard S. Lindzen)
2007.9-2008.11	Postdoctoral research associate, Seoul National University (Advisors: Profs. Chang-Hoi Ho and Rokjin J. Park)
2012.3-Present.	Assistant Director, ERC Center for Climate/Environmental Change Prediction Research

Activities

Member, International Advisory Committee of Korean Environment Monitoring Satellite.
Member, Science Team, The Communication, Ocean and Meteorological Satellite (COMS)
Member, American Geophysical Union, Asia Oceania Geosciences Society, and Korean Meteorological Society
Reviewer, Journal of Geophysical Research, Atmospheric Environment, Aerosol Science and Technology, Remote Sensing of Environment, Atmosfera, Asian Pacific Journal of Atmospheric Sciences, and Atmosphere.

PREDICTING THE CLIMATE OVER DECADAL TIMESCALES

Alessio BELLUCCI
National Oceanography Centre Southampton (NOCS), UK
Centro EuroMediterraneo per i Cambiamenti Climatici (CMCC) - Bologna (Italy)

Understanding the origins of predictability in the coupled ocean-atmosphere system over different temporal scales has always represented a major challenge for the climate science community.

Numerical weather predictions and century-scale climate projections encompass the tails of a wide range of phenomena, involving very different sets of interactions between various components of the climate system. Somewhat in between lie the decadal range, which is crucial in that over this timescale both natural unforced fluctuations and anthropogenically driven changes are competing factors in shaping the climate variability at both global and regional scales.

Here an overview of the most recent efforts towards reliable climate decadal forecasts is provided.

Alessio BELLUCCI

Ph.D. in physical oceanography at the National Oceanography Centre Southampton (NOCS, UK)
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Alessio Bellucci got a Ph.D. in physical oceanography at the National Oceanography Centre Southampton (NOCS, UK) and is currently working at the Centro EuroMediterraneo per i Cambiamenti Climatici (CMCC) in Bologna (Italy) as the coordinator of the Climate Variability and Prediction group. His main research interests are the role of the ocean on the global climate, with specific emphasis on midlatitude climate variability at decadal and interdecadal timescales, ocean-atmosphere interactions in the North Atlantic sector, and near-term climate predictability and predictions. Other investigation fields include the study of IPCC models systematic errors with a particular focus on the tropical biases, and ocean data assimilation. He has been involved in a number of EU Projects, including ENACT, ENSEMBLES and CIRCE Projects. He is currently co-leading the work package on decadal predictions in the EU COMBINE Project.

Bellucci, A. , S. Gualdi, E. Scoccimarro and A. Navarra, 2008: NAO-ocean interactions in a coupled general circulation model, *Climate Dynamics,* 31, 759-777, DOI 10.1007/s00382-008-0408-4.

Bellucci, A. , S. Gualdi, and A. Navarra, 2010: The double-ITCZ syndrome in coupled general circulation models: the role of large-scale vertical circulation regimes, *Journal of Climate*, 23(5), 1127-1145, DOI: 10.1175/2009JCLI3002.1.

Bellucci, A. , S. Gualdi, S. Masina, A. Storto, E. Scoccimarro, C. Cagnazzo, P. Fogli, E. Manzini and A. Navarra, 2011: Decadal climate predictions with a coupled OAGCM initialized with oceanic reanalyses, *submitted to Climate Dynamics.*

DEVELOPING SYNTHETIC PREDICTION SYSTEM FOR CLIMATE-ENVIRONMENT-ECOSYSTEM INTERACTIONS: RESEARCHES AT CCCPR

Seon Ki PARK
Center for Climate/Environment Change Prediction Research (CCCPR)
Severe Storm Research Center (SSRC)
Ewha Womans University, Korea

The global/regional environmental system is strongly affected by climate change among its various components including atmosphere, hydrosphere, biosphere, land surfaces, etc. These components have nonlinear interactions each other and exert impact on climate change itself via positive/negative feedback processes. There has been minimal effort to investigate two-way interaction between the environmental system and climate change. Especially the feedback processes associated with environmental components, through macro- and micro-scale changes, remain poorly understood.

At Ewha's Center for Climate/Environment Change Prediction Research (CCCPR), we conduct core researches in identifying nonlinear interactions and related feedback processes in the climate-environment system. Our major goal is to develop an integrated diagnosis/prediction system for climate-environment-ecosystem interactions. To achieve this goal three research groups (RGs) are working independently but with strong connections.

RG 1 focuses on climate/atmospheric environment prediction, performing 1) climate change analysis and scenario production; and 2) atmospheric chemistry/aerosol analysis and prediction. Especially, non-linear feedback processes between climate and atmospheric environment is studied in depth.

RG 2 works on ecology/water environmental prediction, with emphases on 1) vegetation and eco-system analysis and prediction due to climate change; 2) water and soil chemistry characteristics change analysis; and 3) ecosystem/water environment prediction model development. The feedback process of water and soil chemistry characteristic change to ecosystem and water environment which leads to climate change are studied in detail.

RG 3 aims at developing interaction diagnosis/prediction system, studying on 1) coupled atmosphere-land surface processes modeling; 2) remote sensing observation and monitoring; and 3) interface and integrated database (DB) development. In this task, the data interface and database system are operated to consolidate all produced data for sharing and distribution in the CCCPR and among the research communities.

Seon Ki PARK

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B.S. in Meteorology, Seoul National University (1984)
M.S. in Atmospheric Sciences, Seoul National University (1986)
Ph.D. in Meteorology, University of Oklahoma (1996)

Professional Career

Professor, Department of Environmental Sci. & Eng., Ewha Womans University (Sep. 2008 - Present)
Senior Scientist in Residence, Department of Physics, Computational Sci. & Eng., Chapman University, USA (Feb. 2009 - Feb. 2010)
Director, Center for Climate/Environment Change Prediction Research, Ewha Womans University (Sep. 2009 - Present)
Director, Severe Storm Research Center, Ewha Womans University (Mar. 2007 - Present)
Associate Dean, College of Engineering, Ewha Womans University (Feb. 2007 - Jan. 2008)
Chairman, Department of Environmental Sci. & Eng., Ewha Womans University (Aug. 2006 - Jul. 2008)
Associate Professor, Department of Environmental Sci. & Eng., Ewha Womans University (Sep. 2003 - Aug. 2008)
ASEM-DUO Fellowship Visiting Scientist, University of Torino, Italy (Jun. - Jul. 2005)
Assistant Professor, Department of Environmental Sci. & Eng., Ewha Womans University (Sep. 2001 - Aug. 2003)
Staff Scientist, Climate & Radiation Branch, NASA/GSFC/SSAI (Jan. 2001 - Aug. 2001)
Assistant Research Professor, Department of Meteorology, University of Maryland (Aug. 1999 - Dec. 2000)
Research Scientist, CAPS/CIMMS/CMRP, University of Oklahoma (Mar., 1996 - Aug. 1999)
Weather Forecasting Officer, Republic of Korea Air Force (Mar. 1987 - Jul. 1990)

Activities

President-Elect and Vice President, Atmospheric Sciences Section, Asia-Oceania Geosciences Society (AOGS) (Aug. 2011 - Jul. 2012)
Editor, *Scientific Online Letters on the Atmosphere (SOLA)*, Meteorological Society of Japan (Aug. 2009 - Present)
Editor-in-Chief, *Atmosphere*, Korean Meteorological Society (Jan. 2006 - Jan. 2009)
Editor, *Asia-Pacific Journal of Atmospheric Sciences (APJAS)*, Korean Meteorological Society (Jan. 2006 – Dec. 2011)