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# Newsletter

## News

臺大大氣科學系所簡訊

### The Department Retreat

The retreat of NTUAS was held on February 16, 2011 in Beitou. All faculty members attended the retreat to discuss the future direction of the department, including issues on both research and education. The meeting yielded important conclusions on the priorities in the near future. In research, the department will strengthen its collaboration with Academia Sinica and other meteorological research institutions, and will actively participate in major climate change research programs in Taiwan. In education, the department will encourage and support Ph.D. students to study abroad and attend international conferences. For undergraduate students, the emphasis will be on inspiring their interests in atmospheric sciences.

本系靜修會於2011年2月16日在北投舉行，全系教授共同參加針對教學、研究各方面的討論。會中達成有關本系未來發展的重要結論。在研究方面，本系將強化與中研院等國內氣象研究單位之合作，積極參與國內「氣候變遷」相關的重大研究計畫。在人才教育方面，本系將持續鼓勵及支持博士班學生出國進修及出席國際會議，同時注重啟發大學部學生對大氣科學的興趣，以培植未來大氣菁英人才。



Group photo of the department retreat on Feb 16, 2011.



## Prof. Chun-Chieh Wu Started Second Term as NTUAS Chairman

Professor Chun-Chieh Wu was reappointed to a second three-year term as the NTUAS chairman, starting August 1, 2011.

吳俊傑教授三年系主任的任期於2011年7月31日屆滿，第二任任期自2011年8月1日展開。

## Faculty Awards

Prof. Chung-Hsiung Sui was awarded the title of Distinguished Professor by the National Taiwan University for his outstanding contributions in both teaching and research at NTU.

Prof. Chun-Chieh Wu was selected as one of the top 50 scientific achievers in Taiwan in the past 50 years by the National Science Council (NSC) in 2010. NSC presented Prof. Wu with this award in recognition of his typhoon research in the program titled, "National Priority Typhoon Research", which made major breakthroughs in typhoon research and forecasting.

Prof. I-I Lin received the Outstanding Research Award from the National Science Council in 2010. Prof. Lin is one of the few researchers in Taiwan whose research interests span the topics of atmosphere, ocean and satellite remote sensing.

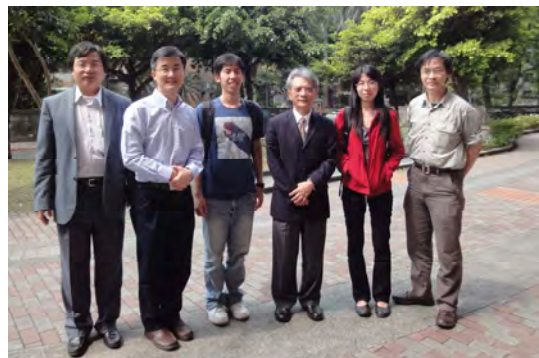
Prof. Yu-Heng Tseng received the "Dr. Shiah-Shen Huang Outstanding Paper Award" from the Meteorological Society of the Republic of China in 2010.

隋中興教授因在教學及研究兩方面的傑出表現，於2010年獲臺大特聘教授之榮銜。

吳俊傑教授因在「颱風重點研究」的具體研究成果及突破，榮獲國科會50科學成就獎。此獎目的為評選臺灣在過去50年來，科學領域最具指標性之科學成就。

林依依教授於2010年榮獲國科會傑出研究獎。

曾于恒副教授於2011年獲頒中華民國氣象學會學術期刊最佳論文獎「黃廈千學術論文獎」。



Group photo of Jade Scholarship award ceremony. From left to right, Y.-Z. Wang, C.-C. Wu, W.-C. Kuo, C.-Y. Tsay, C.-Y. Chang, P.-H. Lin.

## Faculty Services

Prof. Tai-Jen Chen completed his service as NTU Vice President (Aug 2005-Jul 2011).

Prof. I-I Lin completed her service as the Director of the Center of International Affairs, College of Science (Feb 2011-Jul 2011).

Prof. Jong-Dao Jou: Chief Executive Officer of APEC Research Center for Typhoon and Society (Nov 2010-).

Prof. Cheng-Shang Lee: Director of Taiwan Typhoon and Flood Research Institute in National Applied Research Laboratories (Aug 2011-).

Prof. Hung-Chi Kuo: Director of Center for Weather Climate and Disaster Research (Jun 2009-) and Associate Dean of College of Science (Aug 2011-).

Prof. Jen-Ping Chen: Director of Global Change Research Center in NTU (Aug 2010-).

陳泰然教授於2011年7月卸任臺大副校長職務。

林依依教授於2011年7月卸任臺大理學院國際事務中心主任職務。

周仲島教授自2010年11月起兼任亞太經濟合作颱風與社會研究中心執行長。

李清勝教授自2011年8月起兼任國家實驗研究院—臺灣颱風洪水研究中心主任。

郭鴻基教授自2009年6月起兼任臺大氣候天氣災害研究中心主任，2011年8月起兼任理學院副院長。

陳正平教授自2010年8月起兼任臺大理學院全球變遷研究中心主任。

## Jade Scholarship

The Jade Scholarship is funded by Prof. Ching-Yen Tsay, an ex-chairman of the department and the incumbent Chairman of the Industrial Technology Research Institute of Taiwan. It was established in 2010 with the first scholarship awarded to freshman Wei-Chen Kuo and junior Chiung-Yin Chang in 2011. The scholarship is open to NTUAS students who achieved full marks in the college entrance examination.

由本系系友暨前系主任、現任工研院董事長蔡清彥教授捐贈設置之「國立臺灣大學大氣科學系琢玉獎學金」，乃以獎勵大學學測滿級分進入本系，並有志於在大氣科學領域繼續深造之傑出大學部學生為宗旨。本年度第一屆之獲獎者為大學部郭威鎮同學及張瓊尹同學



## Retirements of Prof. Chung-Ming Liu, Prof. Ching-Chi Wu and Ms. Mei-Li Chang

Professor Chung-Ming Liu and Associate Professor Ching-Chi Wu retired from NTUAS at the end of July 2011.

Prof. Liu graduated from National Central University in 1977 and obtained his Ph.D. from University of Utah in 1982. He returned to Taiwan and joined the faculty of NTUAS in 1985. He was promoted to Professor in 1989, served as director of Global Change Research Center in NTU during 1993-1998 and 2004-2010. Prof. Liu's research focused on climate change, atmospheric chemistry, and atmospheric radiation.

He delivered two general education classes: Introduction to Global Change and Introduction to Climate Change, both of which always attracted a full house of students. He is exceptionally adept at passing on knowledge in ways that are both interesting and easy to understand.

Prof. Wu joined the Department as a Teaching Assistant during 1974-1983. He went to the U.S.A. for graduate study in 1983 and obtained his Ph.D. from Purdue University in 1987. Afterwards he returned to NTUAS as an Associate Professor.

Prof. Wu has dedicated himself to one of his lifelong passions – teaching. He was an instructor of Atmospheric Thermodynamics and Boundary Layer Meteorology and also served as an adjunct faculty at the Center for Teacher Education under the Provost's Office of Academic Affairs at NTU. Throughout the past 34 years, he taught diligently and has been a source of inspiration to his many students, earning their respect and affection. He has also authored several high school text books in geoscience.

Ms. Mei-Li Chang retired from the NTUAS on August 1, 2011. Ms. Chang had served as a staff in the department for more than forty years. She had dedicated herself to administrative support for the entire faculty.

The department wishes Prof. Liu, Prof. Wu and Ms. Chang the best and all happiness in their retirements.

本系柳中明教授及吳清吉副教授於 2011 年 7 月底榮退。

柳中明教授 1977 年畢業於中央大學地球物理研究所，隨後赴美獲得猶他大學博士學位，並於 1985 年至本系擔任教職。柳教授專精於全球變遷、大氣化學及大氣輻射等領域，開設氣候變遷之通識課程。工作期間曾兩度擔任臺大全球變遷研究中心主任。

吳清吉副教授原於 1974-1983 年間擔任本系助教暨講師，1983 年時出國進修，於 1987 年獲得普渡大學博士文憑後，重返本系擔任教職，於大學部開設大氣熱力學，研究所開設邊界層氣象學。吳副教授在本系任教 30 多年，化育英才無數，更擔任臺大地球科學教育學程講師，培育多位優秀的中學老師。

本系資深職員張美麗小姐於 2011 年 8 月退休，同仁皆深感不捨。張小姐於本系服務逾四十年，對系上行政事務貢獻良多。



Group photo of the retirement party for Prof. Ching-Chi Wu.

## Prof. Huang-Hsiung Hsu Accepted a New Position at Research Center for Environmental Change of Academia Sinica

Professor Huang-Hsiung Hsu accepted a new position at the Research Center for Environmental Change of Academia Sinica starting August 2011.

He received his Bachelor of Science from NTU and received his Ph.D. from University of Washington in 1986. During 1987-1989, he worked as a postdoctoral fellow in the Department of Meteorology, University of Reading. He returned to the NTUAS and served as Associate Professor starting 1989. He was promoted to Professor in 1992, and served as the Department Chairman from 2002-2005. Prof. Hsu is a dedicated teacher and researcher, with specialty in atmospheric circulation and large-scale dynamics. The courses he taught at both undergraduate and graduate levels include Earth Environment System, Climatology, Global Atmospheric Circulation, and Climate Diagnostics.

Prof. Hsu continues his affiliation at NTUAS as a joint Professor. The department is deeply indebted to Prof. Hsu for his excellent contributions while serving on the regular faculty at NTU, and looks forward to continued collaborations with him in both teaching and research programs.



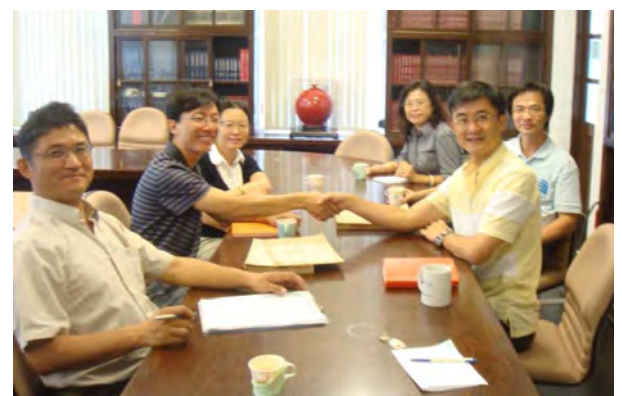
Group photo of the farewell party for Prof. Ching-Chi Wu, Prof. Chung-Ming Liu, Prof. Huang-Hsiung Hsu, and Ms. Mei-Li Chang on June 21, 2011.

許晃雄教授1978年自本系大學部畢業，於1986年獲得美國華盛頓大學大氣科學博士學位，1989年回母系執教。許教授專長為大氣環流及大尺度動力學，在任教的22年期間，開設氣候學、氣候診斷及全球大氣環流等課程，教學優良，備受學生尊崇。許教授於2011年8月轉任中研院環境變遷中心之研究員，領導氣候研究重大計劃。本系以合聘方式繼續與許教授合作，發展共同研究，許教授亦在氣候相關課程方面參與授課。

## The Departmental Library to close

The departmental library was closed in August, 2011 to vacate the space for a new laboratory and a new computer room. This closed an important chapter of the department history as the library has been a part of the department since very early days. The entire collection of books was moved to the NTU library. Periodicals remain in the department in Room C309, the new periodical and discussion room.

因系上空間重新規劃安排，本系歷史悠久之系圖書室將整併為新的研究室及資訊教室。館內藏書全部回歸至臺大總圖書館集中管理，期刊則放在新成立之C309「期刊及討論室」。



Group photo of the meeting to discuss the new arrangement for the departmental library. Handshake between Chien-Han Chen, the NTU Library Representative, and Chun-Chieh Wu, the Department Chairman.



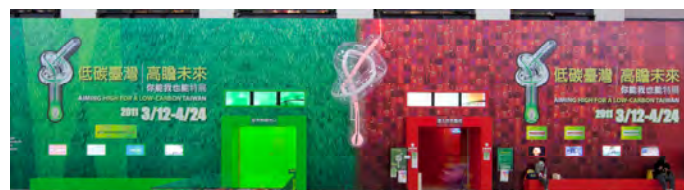
## Exhibition on “Aiming High for a Low-Carbon Taiwan”

The “Aiming High for a Low-Carbon Taiwan” exhibition, sponsored by the National Science Council and organized by NTUAS and Southern Taiwan Science and Technology University, opened on March 12, 2011 and concluded on April 24, 2011 at the National Chiang Kai-Shek Memorial Hall. The exhibition attracted over 60,000 visitors.

This event included exhibitions organized by the low-carbon energy technology industry and high school teachers and students. Approaches using digital technological art were incorporated to enhance the audiences’ sensory involvements. The objective was to inspire responsive actions and to encourage the public to take actions to reduce carbon emissions.

The exhibition consisted of six sections, each titled, “Earth in Crisis-Confronting Impact of Climate”, “Our Future?! -Self-Reflection · Choose a Future”, “The Development of Low-Carbon Energy, Action from Low-Carbon Energy”, “Low-Carbon Home, Implementation Low-Carbon Life”, “We Can Do It, Aim High for the Future”, and “Sun, Plants, Water”. The six sections included a total of 47 exhibits.

More than 200 individuals interested in climate change and low carbon technologies were recruited and trained by NTUAS as assistants in the exhibition. These volunteers provided essential support that made the exhibition possible. It is hoped that through the exhibition, more people can realize the importance of saving energy and reducing carbon emissions, and put them into practices in their daily life.



由行政院國家科學委員會科學教育處主辦之「低碳臺灣·高瞻未來-你能我也能」特展，於3月12日至4月24日在中正紀念堂展出，為期43天的展覽共計吸引了超過六萬名民眾參觀。

此特展由臺大大氣科學系、南台科技大學及國科會能源國家型科技計畫人才培育辦公室共同承辦，共分為六大展區，包括「失控的地球」、「我們的未來」、「低碳能源起飛」、「低碳生活家」、「你能我也能」及戶外展區「陽光·植物·水」。

臺大大氣系工作團隊，包含吳俊傑教授及林博雄副教授，建構氣候變遷的科學背景，融合數位科技與人文藝術於一體，目的為讓參觀民眾能深切感受人類活動、氣候變遷、全球環境與人文社經系統間的密切關係；也於展前培訓兩百多名對氣候變遷議題相當有熱忱的導覽員，讓特展更顯有聲有色，並促使大眾在關注氣候變遷的議題之餘，更能在生活中落實節能減碳。



Group photo of the closing ceremony. Dr. Gwo-Dong Chen, the director of Department of Science Education, National Science Council, standing fifth from left.

Group photo of the NTUAS working group in the open ceremony. From left to right, C.-Y. Tsai, W.-C. Lee, P.-H. Lin, C.-C. Wu, P.-H. Lee, K.-F. Lee, Y.-Y. Lin.

## Study-Abroad Program

Through the study-abroad program of NTU College of Science, the department encourages undergraduate students to participate in collaborate activities with oversea academic institutions. Junior Miss Chiung-Yin Chang took the opportunity and visited the University of California, Berkeley in early July 2011. During her month-long stay in Berkeley, she spent most of her weekdays in Prof. John Chiang's Climate Dynamics Lab., working on a small project that explores the possibility of geo-engineering the climate. To test the hypothesis, they conducted experiments on a computerized global climate model. Her job consisted of four stages: literature review, source code modification, running the model, and analyzing the outputs. "Finishing all these within one month was kind of hurry, but I really enjoyed the challenges." said Chiung-Yin. Such a special experience in a foreign country is a wonderful adventure for students. The department will seek more opportunities for undergraduates and encourage them to integrate knowledge from different subfields in order to develop more insights into atmospheric sciences.

Another activity is cruise training. A group of 20 people, including 4 scientists and 4 engineers from the US and Taiwan, 10 NTUAS undergraduate students, 1 NSYSU graduate student, and a Navy observer, participated in an 11-day research cruise on board of R/V Roger Revelle between 25 July and 4 August 2011. This sea going experiment, led by Dr. Ren-Chieh Lien at APL, University of Washington was one part of a joint project between US IWISE DRI (Internal Waves in Straits Experiment Directed Research Initiative) and the Taiwan ITOP program funded by the National Science Council. A unique 800-m long towed CTD array, designed and built at APL/UW, was used for the first time in the ocean to measure the details of hydrographic fields in the Luzon Strait where strong internal tides, nonlinear internal waves, internal solitons, and hydraulic jumps are expected. Observations of temperature, salinity, density, and pressure were sampled at 10-s time interval and 5-20 m vertical resolution in the upper 600 m, and were transmitted back to a data logger on-deck in real-time via inductive devices. The real time observations provided guidance for dynamic adjustment of observational strategies in the complex oceanic environment.

The primary scientific objectives of this cruise are to (1) measure nonlinear internal waves in Babuyan Channel (southern Luzon Strait), (2) measure lee waves behind sills, and (3) quantify internal tidal energy and energy flux in the southern Luzon Strait. Wave trains were observed with isopycnal displacements of  $\sim 20$  m. Internal tides with vertical displacements of  $\sim 100$  m and horizontal velocity amplitude of  $\sim 1$  m/s were observed. Complex small scale features including hydraulic jumps and mode-2 nonlinear internal waves were observed repeatedly during the cruise. Vertical overturning (turbulence) of order of 100 m and salinity anomaly of 0.3-0.5 psu were found in hydraulic jumps. Further analysis is needed to better understand the dynamics of these small scale features.

Ten undergraduate students from NTUAS participated in the entire sea going experiment, from the loading of towed CTD array on July 23rd till the offloading of towed CTD array on August 4th. They helped set up the CTD sensors, build CTD winch, and secure on-deck and in-lab gears before the sail. During the cruise, they served two 12-hr watches with one Watch Captain and one Vice-Captain. Their duties included (1) monitoring ocean depths using the Multibeam sensor and cable tension of towed CTD array, (2) monitoring realtime hydrographic observations and identifying interesting internal wave signals, (3) monitoring marine radar back scattering strength for internal solitary wave signal, (4) monitoring weather and sea state conditions for navigational guidance, (5) helping operations of shipboard CTD, and launching XBTs, (6) helping deploy and recover towed CTD array, and helping clean CTD sensors, and (7) logging time and positions of oceanic operations during the cruise. At the later phase of the cruise, they also participated in making decision of designing dynamic sampling strategy and executed the operations.

2011年，本系積極拓展和國外學術單位合作機會。7月初，大學部張瓊尹同學到加州大學柏克萊分校進行為期一個月的實習。7月25日至8月14日，由美國華盛頓大學連仁杰教授，帶領其專精於研究海洋之工作團隊及本系大學部10位學生，搭乘ROGER REVELLE號於南中國海進行研究實習活動，透過此難得的密集訓練，讓學生們學到一次寶貴的經驗。



Group photos of the cruise training team members.

## The Global Monsoon System Book

The WMO-sponsored book “The Global Monsoon System: Research and Forecast, 2<sup>nd</sup> edition” was published by World Scientific Publishing Company in April 2011. The book was edited by Prof. Chih-Pei Chang with five co-editors: Prof. Yihui Ding of National Climate Center of China, Prof. Richard Johnson of Colorado State Univ., Prof. N-C Gabriel Lau of Princeton University and GFDL, Prof. Bin Wang of University of Hawaii, and Prof. Tetsuzo Yasunari of Nagoya University. The 608-page book consists of 34 chapters by 90 experts who were invited by WWRP and WCRP to join the project. The chapters review the observational, modeling, theoretical and field research on all scales of monsoons, from heavy rainfall to climate change and include land and ocean interactions. The regional monsoon chapters cover the monsoon of South Asia, East Asia, Maritime Continent, Australia, Africa, and North and South America. The chapter coauthors include NTUAS Professors Chun-Chieh Wu (typhoons in West Pacific monsoon trough, with Prof. Pat Harr of the Naval Postgraduate School), Huang-Hsiung Hsu (East Asian summer monsoon, with Prof. Tianjun Zhou of the Chinese Academy of Sciences and Prof. Jun Masumoto of Tokyo Metropolitan University), and Ben Jou (mesoscale field experiment, with Dr. Wen-Chau Lee of U.S. National Center for Atmospheric Research and Prof. Richard Johnson of Colorado State University).

Prof. Chang is a Distinguished Professor of the Naval Postgraduate School, who currently conducts research as the National Science Council Chair at NTUAS. He was reappointed by WMO in 2011 to serve as the Chair of the Monsoon Panel of the Working Group on Tropical Meteorology Research.

由 WMO 世界天氣研究計劃 (WWRP) 和世界氣候研究計劃 (WCRP) 共同籌劃的「全球季風系統：研究與預報 (第二版)」一書於今年四月由世界圖書科技公司出版。此書為張智北教授主編，其他編者為中國國家氣候中心丁一匯，科羅拉多州大學 R. Johnson，普林斯頓大學劉雅章，夏威夷大學王斌，及名古屋大學 T. Yasunari 五位教授。全書 608 頁由世界各國 90 位專家執筆，共有 34 章討論季風各尺度的觀測、理論、模式、和實驗的研究及預報問題。書中有專文討論南亞、東亞、海洋大陸、澳洲、非洲、北美洲、和南美洲的區域季風，並包括劇烈降雨、氣候變遷、青藏高原、海洋作用等。本系吳俊傑、許晃雄、周仲島三位教授分別應邀擔任西太平洋季風區颱風、東亞夏季季風、及中尺度實驗觀測三章的共同作者。張智北教授為美國海軍研究學院特聘教授，現任本系國科會講座，於今年連任 WMO 熱帶氣象研究小組季風委員會主席。



## Visit of Fujian Meteorological Bureau Delegation

On Feb 21, 2011, the delegation of Fujian Meteorological Bureau made a three-hour visit to the department. The delegates were welcomed by Prof. Chun-Chieh Wu at the foyer of the department Building.

2011年2月21日，福建氣象局約十多人造訪本系，增進兩岸氣象交流。



Group photo of Fujian Meteorological Bureau Delegation in the meeting room.

## Visit of Long-An Elementary School Students

On April 1, 2011, more than forty students from the gifted class of Long-An elementary school visited the department. Department chairman Prof. Chun-Chieh Wu welcomed the group and provided a briefing about NTUAS. After the briefing, the group visited the field observational platform to watch a demonstration of the release of a sounding balloon. They then returned to the classroom and observed laboratory experiments conducted by NTUAS teaching assistants. The experiments including tornado formation and model cloud formation in a bottle were conducted to stimulate the students' curiosity in atmospheric sciences.



2011年4月1日，龍安國小資優班到系上參觀。活動開始由吳俊傑主任進行系所介紹，隨後至觀測坪參觀，解說施放探空氣球的步驟。隨後，學生們返回教室，由助教示範有趣且充滿科學知識性的大氣科學實驗。

## Visit of Taipei Chengong High School Students

On June 3, 2011, NTUAS hosted a visit from 50 students of the Taipei Chengong High School. The visitors were warmly welcome by Prof. Jen-Ping Chen who gave a briefing on NTUAS. After the briefing, Prof. Jen-Ping Chen and Prof. Huang-Hsiung Hsu led a discussion forum by sharing their research and life experiences and entertained questions from the high school visitors. The visitors then proceeded to the field observational platform to see a demonstration of releasing sounding balloons. At the end of the visit, the group presented a letter of appreciation to NTUAS.

2011年6月3日，成功高中資優班同學至系上參觀。活動開始由陳正平教授進行系所介紹，之後舉行「我的學思歷程-為什麼選擇大氣科學系」座談，由陳正平教授及許晃雄教授和學生分享求學經歷中遭遇到難題時該如何面對及解決。隨後便至觀測坪參觀，介紹展示如何施放探空氣球，活動最後在成功高中致贈感謝狀後圓滿落幕。



## Visit of Geoscience Research Club by Students from Four High Schools

On July 21, 2011, about thirty-five high school students from Taipei First Girls High School, Taipei Municipal Jianguo High School, Taipei Municipal Zhongshan Girls High School and Wanfang High School visited the department. The students are all members of the Geoscience research club who were mostly freshman with deep interest and high enthusiasm in geoscience. The group was welcome by the chairman, Prof. Chun-Chieh Wu who gave a briefing about NTUAS before the group visited the field observational platform where NTUAS students demonstrated measurement instruments.

2011年7月21日，由四所高中所組成的地球科學社至系上參觀。活動開始由吳俊傑主任進行系所介紹，隨後至觀測坪參觀。



Group photo of the visitors at NTUAS.

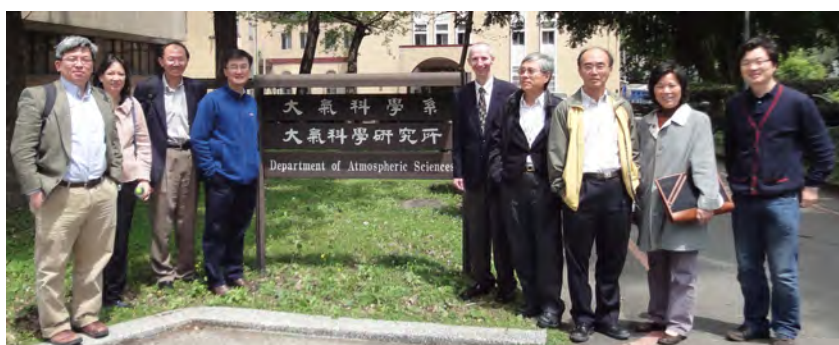
## Visit from Nature Note Program of National Education Radio

2011年10月19日，以自然生態為主軸的環境教育節目—國立教育廣播電台「自然筆記」，由主持人率領一行約30人至系上參觀。

Group photo of the visitors from National Education Radio who visited the department on October 19, 2011.



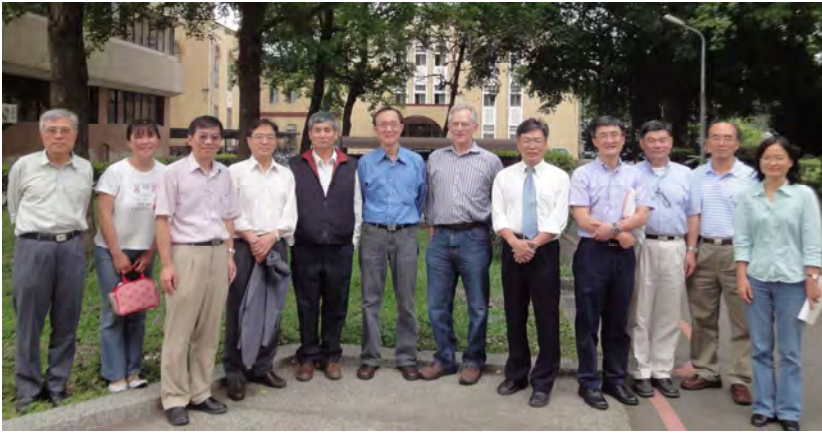
## Visits of Leading Scientists



Dr. Wayne Higgins, Director of Climate Prediction Center/NOAA (fifth from right), visited the department on March 30, 2011 and delivered a seminar entitled "Evaluation studies of CFSR".



# News



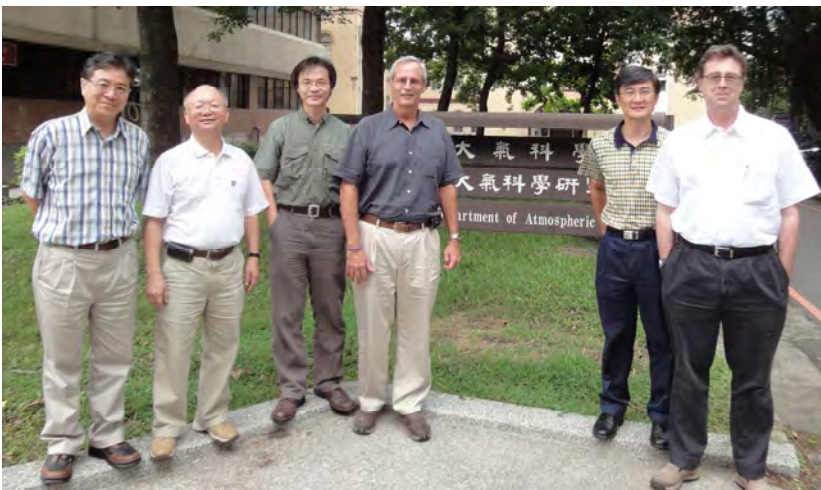
Prof. Robert Houze of University of Washington (sixth from right) visited the department on April 15, 2011 and delivered a seminar entitled "The Tropical Cloud Population".



Dr. N-C Gabriel Lau of Princeton University and Geophysical Fluid Dynamics Laboratory (fourth from right) visited the department on May 20, 2011 and delivered a seminar entitled "The Role of Air-Sea Interaction in the Evolution of the Asian Summer Monsoons: Climatological Aspects and Interannual Variability".

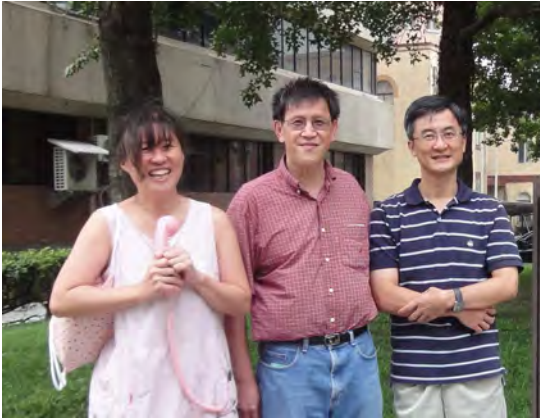


Prof. Huei-Ping Huang of Arizona State University (fourth from right) and Prof. Joshua Fu of University of Tennessee (third from right) visited the department on May 26, 2011. Prof. Huang delivered a seminar entitled "Seasonal climate prediction for South America using a thermodynamically coupled model". Prof. Fu delivered a seminar entitled "Downscaling of Global Chemistry and Climate Predictions: Regional Analysis and Local Impacts".



Dr. Frank D. Marks of Hurricane Research Division, NOAA/AOML (third from right) visited the department on June 28, 2011 and delivered a seminar entitled "HFIP Development and NOAA Advancements in Tropical Cyclone Research". Prof. Robert Fovell of UCLA (first from right) was also visiting.

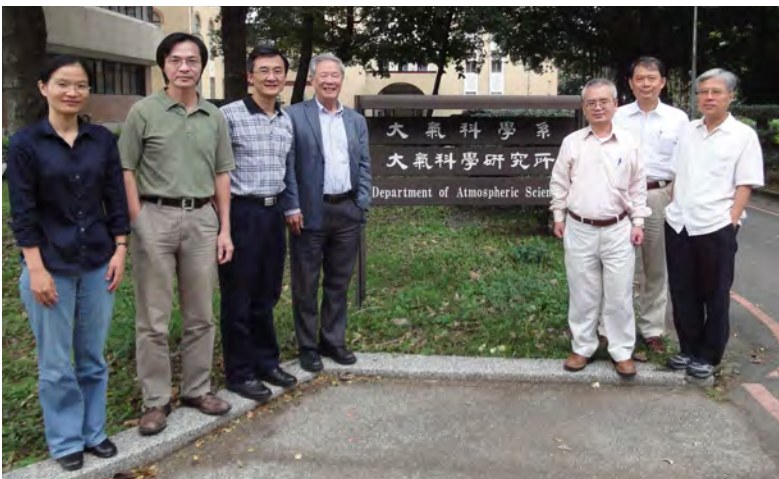




Dr. Ren-Chieh Lien of University of Washington (center) visited the department on July 19, 2011 for the research cruise on board of R/V Roger Revelle between July 25 and August 4, 2011.



Prof. Fei-Fei Jin of University of Hawaii (fourth from left), Prof. Wei-Chyung Wang of State University of New York at Albany (fifth from left), and Prof. Pao-Kuan Wang of University of Wisconsin-Madison (sixth from left) visited the department on August 4, 2011. Prof. Jin delivered a seminar entitled "Dynamics for ENSO Regimes"; Prof. Wang delivered a seminar entitled "Cross-tropopause transport of water vapor by deep convective storms and its implication".



Prof. Norden Huang of National Central University (fourth from left) visited the department on October 18, 2011 and delivered a seminar entitled "Interdecadal Climate Variability".



Dr. Shih-Yu Lee of Research Center for Environmental Changes, Academia Sinica (fifth from left) visited the department on October 25, 2011 and delivered a seminar entitled "Northern Hemisphere influence on Southern Hemisphere winds".



# Research Highlight

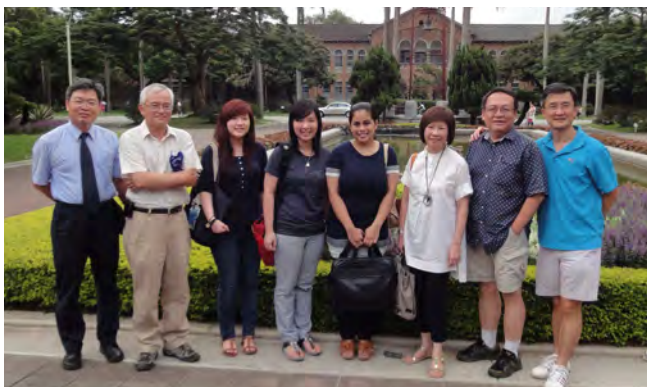
## Alumni Reunion of the 1986 Class

On August 14, 2011, many of the alumni from the 1986 class attended a reunion at the department organized by Prof. Chun-Chieh Wu. At the beginning, Prof. Wu showed a film consisted of many old photos from the college days and the previous gathering in 1996. Afterwards each of the attendees made brief introductions to let others know how they are doing now. It was a joyful meeting where everyone recalled the wonderful memory more than 20 years ago at NTU.

2011年8月14日，舉辦第28屆(1986年畢業班)大氣系友回娘家活動。活動開始前，播放由吳俊傑主任精心製作的影片，內容包含在場系友攝於大學時代的照片到15年前舉辦的同學會的剪影。隨後系友一一上臺進行現況介紹及回饋分享，會場和樂融融，彷彿又回到了20多年前大學的光陰。



Group photo of the 1986 class reunion.



The Executive Secretary of AOGS, Cheng-Hoon Khoo (third from right) visited the NTU campus. Vice President Prof. Ching-Hua Lo (first from left) is the co-chairman of the Local Organization Committee of this AOGS meeting; Prof. Chun-Chieh Wu (first from right) is the President of Atmospheric Sciences Section and Prof. Yue-Gau Chen (second from left) is the President of Solid Earth Sciences Section.

## AOGS 8<sup>th</sup> Annual Meeting, August 8-12, 2011

The Asia Oceania Geosciences Society (AOGS) 8<sup>th</sup> Annual Meeting was held at the Taipei International Convention Centre (TICC) from 8 to 12 August, 2011. Over 1600 participants from 44 countries participated in the conference. Dr. Lou-Chuang Lee, Minister of the National Science Council made the Welcome address, and Prof. Harsh Gupta, the president of AOGS, delivered the Opening address. These were followed by the Axford Lectures, which were delivered by Nobel Laureate in Physics Dr. Samuel Chao Chung Ting of the European Organization for Nuclear Research and Dr. Yun-Tai Chen of the Institute of Geophysics, China Earthquake Administration.

On 9-12 August, a number of international scientists were invited to deliver lectures in the conference. In the field of Atmospheric Sciences, two distinguished lectures were given, respectively, by Dr. Kuo-Nan Liou of University of California, Los Angeles, who introduced the Regional Climate Change: The Role of Light-Absorbing Aerosols and Snow-Albedo Feedback, and the other by Prof. Michael T. Montgomery of the Naval Postgraduate School, who gave a lecture on the Paradigms for Tropical-Cyclone Intensification. Among the other invited lecturers were Prof. Yuriy Kuleshov of Australian Bureau of Meteorology; Prof. Zeyu Chen of Chinese Academy of Sciences; Dr. Wei-Kuo Tao of NASA Goddard Space Flight Center; Prof. Wansuo Duan of Chinese Academy of Sciences; Dr. Zhiyong Meng of Peking University; Dr. Jason Cohen of MIT-Singapore Alliance for Research and Technology Center; Dr. Jui-Lin (Frank) Li of JPL/Caltech; Prof. Hyo Choi of Gangneung-Wonju National University; Dr. Shuji Shimizu of Japan Aerospace Exploration Agency; Dr. Hsin-I Chang of University of Arizona; Prof. Yukari Takayabu of University of Tokyo; Dr. Takeshi Enomoto of Japan Agency for Marine-Earth Science and Technology; Dr. Akiyoshi Wada of Meteorological Research Institute; Prof. Il-Ju Moon of Cheju National University; Prof. Udaysankar Nair of University of Alabama in Huntsville; Dr. Melinda Peng of Naval Research Laboratory - Monterey; Prof. Yuqing Wang of University of Hawaii; Prof. Johnny Chan of City University of Hong Kong.



## What Controls the Transition from Shallow to Deep Convection?

One of the major characteristics of summer-time convective systems over land is their strong response to diurnal forcing. Typically the response is conceptualized as a progression through distinct phases, including the development of the dry convective boundary layer, the emergence of shallow cumulus clouds, the transition from shallow to deep cumulus clouds, the meso-scale organizations of deep cumulus clouds and (at times) the subsequent evolution of such systems as they draw moist air from low-level jets riding over stable boundary layers. It is difficult for large-scale models to capture this diurnal cycle because it depends almost entirely on sub-grid scale parameterizations which uncertainly represent the underlying physical processes. Model studies (Bechtold et al. 2004; Guichard et al. 2004) show that the surface precipitation generally develops a couple hours earlier in the morning in single column model (SCM) representations of the diurnal cycle over land as compared to observations, as the SCM representations consistently bypass the shallow cumulus phase. These studies concluded that the most challenging part of modeling the diurnal cycle over land is to represent the development of shallow cumulus and the transition toward deep convection. In this study, we endeavor to understand this transition and the particular role of shallow convection.

To extract the essence of the transition from shallow to deep convection, we use an idealized framework to highlight the role of two control parameters, the free tropospheric lapse rate of potential temperature and the relative humidity (Fig.1). The systematic dependence of the development of convection on the potential temperature lapse rate and the humidity shows that the concept of a convective transition is a meaningful one (Fig.2). A transition time can be defined to evaluate the relationship of the transition time to the evolution of the thermodynamic state of the different simulations.

The results show that the transition time depends on both the moisture and the potential temperature lapse rate, but in a way that previous

「2011 第八屆亞洲-大洋洲地球科學學會年會」於 8 月 8 日至 12 日在臺北國際會議中心舉行，總計超過 1600 位代表與會，此乃 AOGS 首次在臺灣舉行。此次會議，眾多傑出的科學家齊聚一堂，發表專題演講，並和與會者相互討論、交流與分享，進一步強化地球科學之基礎、前瞻與應用研究。



Group photo from the Convener's Dinner. From left to right, front: Tetsuo Nakazawa (WMO), Zhaoxia Pu (University of Utah), Shigeo Yoden (Kyoto University); back: Chun-Chieh Wu (NTU), Michael T. Montgomery (Naval Postgraduate School), Yuqing Wang (University of Hawaii), and Tieh Yong Koh (Nanyang Technological University).

## Professor Chien-Ming Wu joins the Department Faculty

Prof. Chien-Ming Wu received his B.S. in 1998 and M.S. in 2000, both from NTUAS. He received his Ph.D. from UCLA in 2008, and conducted postdoctoral research at the Center for Multi-Scale Modeling of Atmospheric Processes (CMMAP). He returned to Taiwan in summer 2011 and joined NTUAS as an Assistant Professor. His research interests include the analysis and modeling of multi-scale atmospheric processes, analytical cloud models, complex terrain – convection interaction, modeling and parameterizations of transitions of large-scale moist convection (boundary layer stratocumulus, trade wind shallow convection, equatorial deep convection). The overall goal of his research is to understand the interaction between multi-scale convection and climate.

# Research Highlight

ideas do not fully encapsulate. The shallow convection persists until the environment of the shallow cumulus layer becomes unstable to the average cloud properties as illustrated by the cartoon in Fig. 3. This permits the transition time to be predicted given a consideration of the stability of the shallow cumulus layer. By analyzing the time evolution of the lapse rate of virtual potential temperature of the environment and that of the clouds in the shallow cumulus layer, we show that the transition coincides with the time when the lapse rate of the clouds becomes larger than that of the environment, suggesting that transition happens when shallow clouds become, on average, buoyant (Wu et al. 2009).

We then construct a simple model which shows that the mean cloud properties can be usefully related to the mean environmental profiles. The geometric mixing model which assumes that the clouds consist of a uniformly distributed mixing fraction of air between the surface and the observed level in the Paluch diagram (Fig. 4) is used to represent the mean cloud properties. The overall behavior of the simple mixing model suggests that the time evolution of the cloud lapse rate in the shallow cumulus layer can be represented given knowledge of the surface and environmental properties. The results also suggest the importance of the shallow cumulus in preconditioning

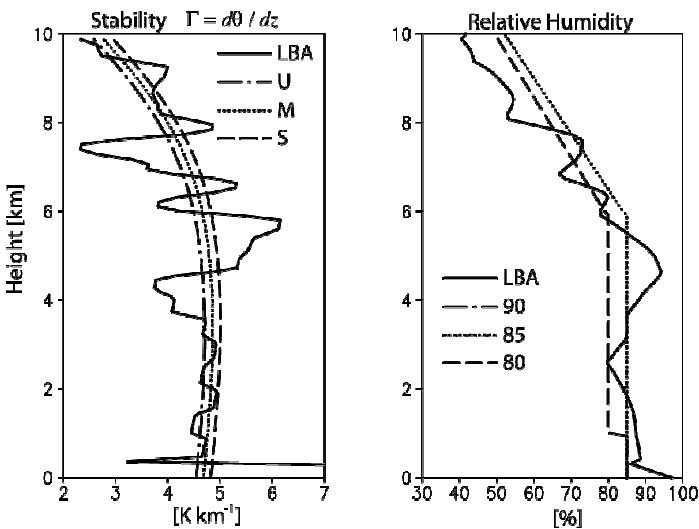


Figure 1: The initial thermodynamics profiles for the Amazon sounding and the idealized experiments. The figure on the left presents the environmental stability ( $\Gamma$ ) which is defined as  $d\theta/dz$ . The figure on the right presents the environmental relative humidity.

the environment for the development of the deep convection. While our experiments are constructed under conditions over the Amazon, the ideas we invoke are general and may be applicable to other circumstances (i.e. over the ocean or over drier land). Those ideas are readily testable with data. Thus, in addition to developing our understanding of how the representation of shallow convection affects the environmental stability, future work should focus on evaluating the extent to which processes we articulate here may be relevant to the diurnal evolution of clouds.

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Guichard, F., J. C. Petch, J.-L. Redelsperger, P. Bechtold, J.-P. Chaboureaud, S. Cheinet, W. Grabowski, H. Grenier, C. G. Jones, M. Kohler, J.-M. Piriou, R. Tailleux, and M. Tomasini, 2004: Modeling the diurnal cycle of deep precipitating convection over land with cloud-resolving models and single-column models. *Quart. J. Roy. Met. Soc.*, **130**, 3139–3972.

Wu, C.-M., B. Stevens and A. Arakawa, 2009: What controls the transition from shallow to deep convection? *J. Atmos. Sci.*, **66**, 1793-1806.

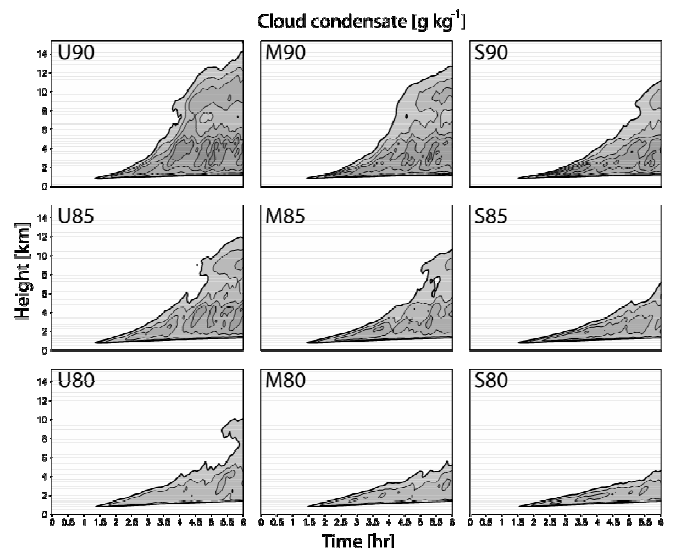


Figure 2: The domain averaged and ensemble cloud condensate for all experiments. The contour interval is 0.01 g/kg.



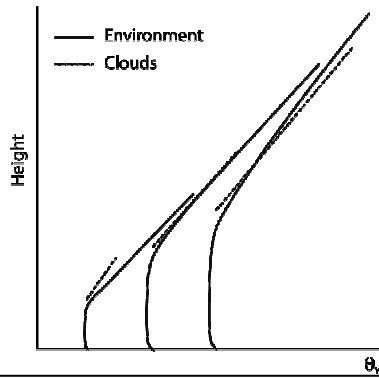


Figure 3: A schematic illustration of transition from shallow to deep convection. The thin solid, thick solid and dash lines represent the initial, environment, and cloud  $\theta_v$ . The environment  $\theta_v$  is averaged over the entire domain while the cloud  $\theta_v$  is averaged over cloudy points only. The three sets of profiles represent the profiles before, during and after then transition.

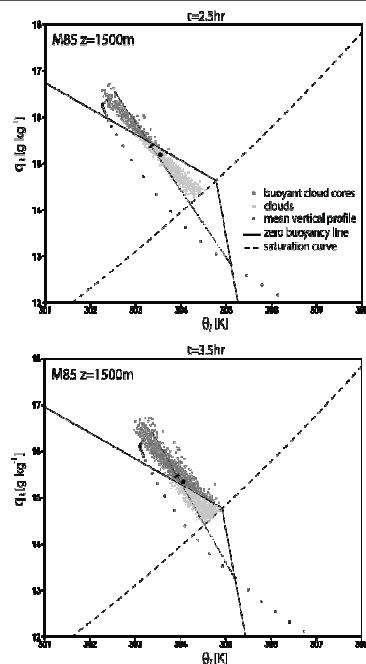


Figure 4: The scatter plot of total water mixing ratio ( $q_t$ ) and the potential temperature ( $\theta_t$ ) of the cloudy points for experiment M85 before and after transition. The dotted line represents the line connecting the surface point and the observation level. The tick mark and the dot represent the mean properties of the mixing model and the clouds.

吳健銘助理教授於 1998 年自本系大學部畢業，2000 年自本系研究所畢業，2008 年 6 月獲美國加州大學洛杉磯分校博士學位，之後在 Center for Multi-Scale Modeling of Atmospheric Processes (CMMAP) 擔任博士後研究，並於 2011 年 8 月返系任職。研究領域包括多重尺度大氣過程之分析與模擬、雲解析模式之研發與模擬、複雜地形與對流的交互作用、大尺度模式中各種濕對流間(邊界層層積雲，信風帶淺對流，赤道深對流)之轉變的模擬與其物理參數化。研究目標為瞭解多重尺度濕對流與氣候的交互作用。

## 2011 Doctor's Theses

Yen-Chu Chen	A Study of Synoptic-Dynamical Characteristic of the Compact Typhoon in the Western North Pacific
Hsiao-Wei Lai	A Subtropical Oceanic Mesoscale Convective Vortex Observed During SoWMEX/TiMREX
Pin-Fang Lin	Warm Season Afternoon Thunderstorm Characteristics under Weak Synoptic-Scale Forcing over Taiwan Island and Its Objective Prediction

## 2011 博士論文

陳熾竹	西北太平洋地區紮實颱風之天氣-動力特徵研究
賴曉薇	西南氣流實驗期間之副熱帶海洋性中尺度氣旋個案研究
林品芳	弱綜觀環境下台灣午後對流特徵及其客觀預報

# 2011 Doctors' & Masters' Theses

Shin-Gan Chen*	Characteristics and Validation of the Targeted Observations for Tropical Cyclones — ADSSV and ETKF	陳新淦*	颱風策略性觀測理論之特徵分析與驗證—駛流敏感共軛向量及系集變換卡爾曼濾波器
<b>2011 Master's Theses</b>		<b>2011 碩士論文</b>	
Mu-Hao Hsu	A Study of Concentric Typhoons and Southwesterly Monsoon	許牧豪	雙眼牆颱風與西南季風探討
Ie-Feng Fu	Influence of Land Cover on Local Mineral Dust Emission over Taiwan	傅譯鋒	臺灣土地型態對本土揚塵之影響
Chia-Wei Wang	The Observation and Model Simulation of Valley Boundary Layer	王嘉瑋	山谷邊界層之觀測與模擬
Yuan-Ming Cheng*	The Role of Boundary Layer Dynamical Processes in Tropical Cyclone Intensity	鄭元銘*	邊界層動力過程對颱風強度之影響
Nai-Hsin Lin	On the 2010 Anomalous Europe Blocking High and Wave Activity	林乃馨	2010 東歐夏季熱浪的診斷與模擬
Chia-Chung Hsu	Use the Method of PV Inversion to Discuss Effect of TC on Large-scale Circulation	徐家鍾	利用位渦反演的的方法探討熱帶氣旋活動對大尺度環流的影響
Yi-Chun Liao	Characteristics of Precipitation in Tropical Oceans	廖怡君	熱帶海洋的降雨特徵
Han-Ching Chen	Southern Hemisphere Extra-tropical Forcing on ENSO- Observation and Model Comparisons	陳漢卿	南半球中高緯度對於聖嬰的影響
I-Kuan Hu*	The Inhomogeneous Component of the Indian Ocean Basin Mode	胡亦寬*	印度洋海盆模之非均勻分量
Pei-Yu Chueh	The Influence of 11 Year Solar Cycles on the North Pacific Climate Dynamics	闕珮羽	太陽 11 年週期變化對大氣及海洋動力的影響
Chih-Hong Chen	The Subsurface Ocean Thermal Structure of Three Phases of ENSO in the North Pacific and the Associated Impact on Typhoon-Induced Cold Wake	陳致宏	北太平洋上層熱力結構之聖嬰現象三種不同相位變化與其對颱風引起的冷渦之影響探討
Tze-Chieh Hsia	The Impact of Cold Oceanic Eddies on Typhoon Intensity Evolution in the Western North Pacific Ocean	夏子傑	西北太平洋海洋性冷渦對颱風強度變化的影響

\*Recipients of the Dean's Award

\*院長獎得主

## No.4 (December 2010)

### News

- Tribute to Prof. Wen-Shung Kau
- Profs. I-I Lin and Yu-Heng Tseng received promotions
- Profs. Chun-Chieh Wu and I-I Lin received major awards
- NTUAS students visited National Central University
- Prof. Chih-Pei Chang named Chair and Co-Chief Editor of Asia-Pacific Weather and Climate book series
- AMS 29<sup>th</sup> Conference on Hurricanes and Tropical Meteorology
- Prof. Michael R. Hoffmann, Caltech, offered invited course on Environmental Organic Chemistry
- Visits of Profs. Dennis Hartmann and Ben-Kui Tan
- Department alumni reunion
- Visit of Chinese Meteorological Society
- World Geography Overseas Fieldwork 2010 in Swaziland

- Workshop on Cross-Strait Cooperative Typhoon and Heavy Rain Research Project
- Visits of Leading Tropical Cyclone Scientists
- APEC Research Center for Typhoon and Society
- Prof. Chung-Hsiung Sui joins the Department

### Meeting Highlights

- International Workshop on Typhoon Morakot (2009), March 25-26, 2010
- 10<sup>th</sup> National Workshop on Atmospheric Sciences for Graduate Students, June 14, 2010

### Research Highlight

- Tropical Intraseasonal Oscillations and Convection-Coupled Waves in Western North Pacific during Summer