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Newsletter

台大大氣系所簡訊

Contents

Editor: Chun-Chieh Wu (吳俊傑)
Advisory Editor: Chih-Pei Chang(張智北)
Editorial Assistants: Wan-Chen Lee(李宛真), Chii-Yun Tsai(蔡啟雲)

Address:
Department of Atmospheric Sciences
National Taiwan University
No.1 Sec. 4,Roosevelt Road, Taipei
10617, Taiwan
TEL:886-2-3366-3928
Website:
http://www.as.ntu.edu.tw/newsletter

News

Typhoon Research Center

The 'Typhoon Research Center' of National Taiwan University was officially founded in January 2009. Prof. Chun-Chieh Wu served as the first director. Its vision is to establish an international leading typhoon research center in Taiwan. The major themes of the Center are "Targeted observation", "Numerical simulation and data assimilation of typhoons", "Typhoon dynamics and typhoon-ocean and typhoon-terrain interactions", "Mesoscale convective systems of typhoons", and "Typhoon-climate interaction".

The missions of the NTU Typhoon Research Center include the followings:

1) Integrate manpower and facilities, conduct research programs to enhance basic understanding of typhoons, and focus on typhoon issues associated with the unique geographic location of Taiwan.

2) Develop a platform to facilitate breakthroughs in typhoon research.

3) Enhance collaboration and academic exchanges with international institutes for typhoon research.

4) Cultivate young talents for future typhoon research; establish the Typhoon Research Center as the leading typhoon research institute in Taiwan while aiming at becoming a leading research center in the world.

It's expected that the series of advanced programs conducted in the Typhoon Research Center would advance our understanding of typhoons and have critical and positive impacts on typhoon forecasting. Moreover, it is hoped that these results can make significant contributions both to our society and to future academic research.

2009 年 1 月理學院成立「台大颱風研究中心」，由本系吳俊傑教授擔任首屆主任，其願景為建立台灣地區首要國際級颱風研究中心。中心以「颱風策略性觀測」「颱風模擬與、資料同化」「颱風動力」「颱風與海洋及地形交互作用」「颱風中尺度對流系統」「颱風、、、、與氣候之交互作用」為研究主題。

A group photo of the "Advisory committee meeting of Typhoon Research Center". From left to right, front: M-D Chou(NTU), Simon Chang(NRL), S-C Liu(RCEC), K-N Liou(UCLA), P-K Wang(Univ. of Wisconsin); back: P-H Lin(NTU), C-C Wu(NTU), C-P Chang(NTU), I-I Lin(NTU). 2009 年 3 月 17 日於台大大氣系舉辦颱風研究中心諮議委員會會議。

Center for Atmospheric Resource and Disaster Studies

The 'Center for Atmospheric Resource and Disaster Studies' was founded in 2008. Prof. Jen-Ping Chen served as the first director. The center hopes to establish a strong research team equipped with powerful research tools, including atmospheric observation instruments, numerical models, and core competence of researchers. The center expects to promote research in atmospheric science and connected areas efficiently, and work towards the goal of being an international leader. At the same time, the research results will be applied to the society, particularly on disaster weather forecast, and climate change related issues. It is also expected that the center helps to integrate the resources of manpower, instruments and computing etc. in order to improve the research capability of observations and numerical simulations.

The center cooperates with government agencies and private companies; to play a key role in technological research and applications. The center facilitates the process to establish cooperative programs between NTUAS and other agencies and the acquisition of stable and sufficient research funding, thus help to stabilize working conditions for researchers. The overarching goal is to establish a systematic way for environment changes studies, and to promote related interdisciplinary cooperation.

「大氣資源與災害研究中心」成立於 2008 年 3 月，首屆主任由本系陳正平教授擔任，願景為建立一強大的研究團隊及有特色的研究工具，包括大氣觀測儀器與大氣數值模式，以期有效率地提昇本校在大氣與相關領域的科學研究，達到國際領先地位。中心的成立將可有效整合人力、儀器、計算等資源，提高研究效率，提升觀測與數值模擬的研究能力。

Professor Chun-Chieh Wu appointed as NTU Distinguished Professor

Professor Chun-Chieh Wu has been awarded the Distinguished Professor title from National Taiwan University for his outstanding contributions in both teaching and research at NTU. Previously, Prof. Wu also received the 2008 NTU Outstanding Teaching Award. Recently, Prof. Wu was elected as President in Atmospheric Science Section, Asia Oceania Geosciences Society in August, 2009.

吳俊傑教授因為在教學和研究兩方面的長年傑出表現，於 2009 年 8 月獲頒台大特聘教授之榮銜，也於去年獲頒台大教學傑出教師之殊榮。吳教授並於今年 8 月被選為亞洲—大洋洲地球科學學會大氣科學學門的主席。

Professor George Tai-Jen Chen honored by State University of New York at Albany

In April the State University of New York at Albany (SUNYA) bestowed the International Alumni Award for Exceptional Achievement to Professor George-Tai Chen of NTUAS. The award citation follows

GEORGE T.J. CHEN, M.S. '71, PH.D. '74

One of the most esteemed scientists in the earth-science research community in Taiwan, George T.J Chen also is the academic vice president of National Taiwan University (NTU), arguably the most prestigious university in Taiwan. It is this blending of administrative excellence and scientific achievement that makes him such a powerful force in Taiwan and across the globe. Chen, who earned a master's degree and a doctorate in atmospheric science from the University at Albany, joined the Department of Atmospheric Sciences at National Taiwan University, now the leading department of meteorology in Taiwan. He is a world-renowned scientist whose research includes various aspects of synoptic and mesoscale meteorology.

"Professors Chen's contribution is fundamental to the birth and growth of modern meteorology in Taiwan," said Ching-Hua Lo, dean of the College of Science at National Taiwan University. "His research which includes … monsoons, Mei-Yu fronts and mesoscale climatology, has exerted great

influences on practitioners in these fields. He also has successfully initiated many international collaboration projects working on the climate/weather studies in East Asia. The projects have greatly improved the weather forecast capability, and therefore have made great contributions to the economic and social developments in this region."

In addition to research and teaching, Chen has been a leader in educational reform in Taiwan. Chen introduced the re-assessment and the distinguished/chair professor systems to ensure high quality of teaching and research performance at University faculties, a move which has been adopted by many other universities in Taiwan. While serving as chairman of the course-reform committee of high-school Earth Science Education, Chen reformed high-school education so that the concepts of global change, sustainability and environmental protection were adopted.

Chen's supporters span the globe. "What impresses me the most … is that George has been able to maintain a very active research profile … while maintaining a heavy administrative burden that would 'kill' most people," said Lance Bosart, University at Albany Distinguished Professor and Chen's former academic and thesis advisor. "That George has been the president of the Meteorological Society of the Republic of China, the president of the Chinese Geophysical Union, the dean and then vice president of Academic Affairs at National Taiwan University (NTU), a distinguished professor at NTU and now a NTU chair professor speaks volumes about his national and international standing."

Chun-Chieh Wu, professor and chairman of the Department of Atmospheric Sciences at National Taiwan University, noted that Chen has received some of the most prestigious scientific and scholar awards in Taiwan. "Over the last 33 years, he has been serving as a leading scientist and a prominent scholar in Taiwan. He has made significant contributions to Taiwan, not only in the research community, but also in the entire educational community. Dr. Chen is not just the pride of NTU, and of Taiwan, but also of the University at Albany."

陳泰然教授於 2009 年獲得紐約州立大學奧伯尼分校國際校友特別成就獎。陳教授為國際著名研究綜觀尺度與中尺度氣象之學者，為台灣大氣科學研究之先鋒。陳教授現任為台灣大學學術副校長，致力於教育與學術研究工作。2006 年獲頒「台大講座」教授及台灣大學終身特聘教授之殊榮。

Professor Chih-Pei Chang appointed to the Joint Science Committee (JSC) of the World Weather Research Programme (WWRP)

Professor Chang, Distinguished Professor of Meteorology at the Naval Postgraduate School and currently a Visiting Research Chair at NTUAS, has been appointed as a member of the JSC of WWRP by the World Meteorological Organization. Professor Chang has served as the Chairman of the WWRP Monsoon Panel since 2007 and is a member of the Science Advisory Committee for APEC Climate Center and the Executive Secretary of the Meteorology Committee of the Pacific Science Association (PSA).

Two years ago WMO consolidated all its research programs except atmospheric chemistry and air pollution into the WWRP to advance society's ability to cope with high impact weather through research focused on improving the accuracy, lead time and utilization of weather prediction. The WWRP includes working groups, expert teams and the THORPEX programme. Of particular interest for meteorologists in Taiwan are the activities of the Working Group on Tropical Meteorology Research (WGTMR) with its Tropical Cyclone and Monsoon Panels, and the THORPEX Programme. WGTMR organizes major quadrennial workshop series to provide a forum for research scientists and operational forecasters in tropical cyclones (IWTC) and monsoons (IWM), and cooperates with THORPEX in tropical field campaigns such as T-PARC. Recently, several active NTUAS researchers were invited by PSA as its representatives to present research findings at these workshops. Important contributions were made by Professor Chun-Chieh Wu on DOTSTAR at both IWTC-VI (2006) and IWM-IV (2008), and Professor Huang-Hsiung Hsu on East Asian monsoon and Professor Ben Jou on SoWMEX/TiMREX at IWM-IV.

張智北教授年前被世界氣象組織任命為世界天氣研究計劃科學指導委員。世界天氣研究計劃包含所有 WMO 除大氣化學和污染以外的研究計劃，其中與台灣關係最密切的是熱帶氣象(颱風及季風)和 THORPEX。張教授是美國海軍研究院終身特聘教授，自 2006 年起任本系客座研究講座。他也是世界氣象組織季風委員會主席和亞太經合會氣候中心科學顧問。

Professor I-I Lin's research on Tropical Cyclone Nargis 2008 Highlighted by NASA JPL

In a press release in March 2009 NASA's Jet Propulsion Laboratory publicized the significant results obtained by NTUAS Professor I-I Lin on her work on the ocean conditions preceding Tropical Cyclone Nargis. The press release says:

NASA Study Finds 'Pre-Existing Condition' Fueled Killer Cyclone

PASADENA, Calif.-A "pre-existing condition" in the North Indian Ocean stoked the sudden intensification of last year's Tropical Cyclone Nargis just before its devastating landfall in Burma, according to a new NASA/university study. The cyclone became Burma's worst natural disaster ever and one of the deadliest cyclones of all time. Scientists at the National Taiwan University, Taipei; and NASA's Jet Propulsion Laboratory, Pasadena, Calif., used data from satellite altimeters, measurements of ocean depth and temperature and an ocean model to analyze the ocean conditions present at the time of the catastrophic storm. Nargis intensified from a relatively weak category 1 storm to a category 4 monster during its final 24 hours before making landfall on May 2, 2008.

In early May 2008, Cyclone Nargis passed over Burma (Myanmar) after forming in the Bay of Bengal.

Lead author I-I Lin of National Taiwan University and her team found the ocean conditions Nargis encountered created the perfect recipe for disaster. Cyclones thrive on warm layers of ocean water that are at least 26 degrees Celsius (79 degrees Fahrenheit). As they traverse the ocean, they typically draw deep, cold water up to the ocean surface, a process that limits their ability to strengthen, and even weakens them as they evolve. However, Nargis passed over a pre-existing warm ocean feature in the Bay of Bengal where upper ocean warm waters extended deeper than normal, from 73 to 101 meters (240 to 331 feet). "This abnormally thick, warm water layer, which formed about a month earlier, kept deeper, colder waters from being drawn to the surface, increasing the energy available to fuel Nargis' growth by 300 percent," said Lin.

"Combined with other atmospheric conditions conducive to strengthening, this warm ocean feature allowed Nargis to reach speeds of 115 knots [213 kilometers, or 132 miles, per hour] at landfall. Had Nargis not encountered this warm ocean feature, it would likely not have had sufficient energy to intensify rapidly." Nargis' rapid intensification occurred predominantly over warm ocean regions where sea surface temperatures ranged between30 and 30.2 degrees Celsius (about 86 degrees Fahrenheit) and sea surface heights ranged from 6 to 20 centimeters (2.4 to 7.9 inches) above normal. Between May 1 and 2, 2008, the storm intensified from category 1 to category 4. When Nargis briefly passed outside the warm ocean region on May 2, it weakened somewhat, only to strengthen once again as it returned to the warm ocean feature. Warm ocean features in the Gulf of Mexico contributed to the rapid intensification of hurricanes Katrina and Rita in 2005.

The satellite data were used to derive the upper ocean thermal structure for regions where no suitable direct measurements were available.

Results of the study were published this month in Geophysical Research Letters.

本系林依依副教授與其合作伙伴最近在國際期刊Geophysical Research Letters的發表最新研究成果獲得美國太空總署NASA重點介紹。NASA於2月26日發表正式新聞稿。

此研究是關於去年造成最大災情的印度洋熱帶氣旋(Nargis) 。林等人研究發現在Nargis即將登陸的24小時之內，Nargis氣旋突然由輕度氣旋增強為強烈氣旋，並且在強度最強的時候登陸。此突然增強的現象為目前熱帶氣旋(或颱風，颶風)預報的瓶頸，且因應變時間短，造成防災上更加困難。林等人及 NASA 科學家 W. Timothy Liu 利用 NASA 衛星測高資料發現這個突然增強過程發生在印度洋北部的海洋暖特徵現象上面，另外並利用 NOAA 的實測水下溫鹽剖面資料，發現在此海洋暖特徵現象對應著之水下暖水層異常增厚的現象，使得熱含量顯著增加，接著利用海洋混合模式模擬後發現，由於此海洋暖特徵現象，使得海洋深處的冷

海水不易被混合或湧升到水表面，因此深層海洋冷海水在颱風增強期間對颱風的負回饋作用被大量降低，以致由海洋到颱風的海氣潛熱及可感熱通量顯著增加。在林等人的研究估計，此暖特徵現象可提供比在一般情況下高至 3 倍之海氣通量，使 Nargis 之強度快速增強。且因為海洋的熱通量為熱帶氣旋生長及加強的必要條件，因此如果 Nargis 並未通過此海洋暖特徵現象，或是此特徵現象不存在(即一般情況下)，Nargis 颱風不可能在 24 小時內由輕度颱風發展到強烈颱風。此新的研究集合了衛星遙測技術、最新的海洋水下實測探測資料及模式的配合，成果有助於對目前熱帶氣旋(或颱風,颶風)強度預報的重要議題(即突然增強現象)的瞭解。

Professor Hung-Chi Kuo delivered National Chair Professor Lectures at four National Universities

Professor Kuo, awarded National Chair Professor for 2007-2010 by the Ministry of Education, was invited to give NCP lectures in the form of two short courses entitled “Mathematical Modeling and Science Research” and “Geophysical Fluid and Typhoon Dynamics” at National Chung-Hsing University, National Chiao-Tung University, National Cheng-Kung University, and National Sun Yat-sen University. The National Chung-Hsing University also awarded him with the university’s chair professor title.

郭鴻基教授受邀在國立中興、交通、成功和中山大學發表教育部國家講座演講，講授「數學模式和科學研究」及「地球物理和颱風動力」兩門課程。國立中興大學並另外頒發郭鴻基教授中興大學講座教授榮銜。

Tribute to Prof. Wu-Ron Hsu

On June 9, 2009 Prof. Wu-Ron Hsu delivered his last lecture at NTU before his retirement on July 31, 2009. The department chairman gathered faculty, staff and students in the classroom to pay tribute and say farewell to him. Prof. Hsu graduated from NTUAS in 1978 and obtained his Ph.D degree at Purdue University in 1986. Then he returned to Taiwan and became a professor of NTUAS in 1992. Throughout the past 23 years, he dedicated himself for the teaching and inspiring students. He was an inductor of “Statistics with Meteorological Applications” and “Advanced Atmospheric Dynamics”. Additionally, he has been devoted to atmospheric numerical simulation for 25 years, including the collaboration with National Center for High-Performance Computing to develop parallel computing for 9 years. He is also a member of Typhoon and Flood Research Institute Preparatory Office. After his retirement from NTU, he will be engaged in the research of the National Center for High- Performance Computing and will be committed to develop the numerical model of typhoon forecasting for disaster reduction in Taiwan.

The department greatly appreciates the valuable contributions of Prof. Hsu and hopes he will enjoy a happy retirement.

許武榮教授於 2009 年 7 月底退休。在 23 年教學生涯中，許教授貢獻所長，於大學部開設「統計與大氣科學」，研究所開設「高等大氣動力學」等課程，教學認真深受學生喜愛，化育無數莘莘學子。同時，也和國網中心合作，發展適合台灣防災使用的颱風預報數值模式。許教授的研究專長主要為數值模式、邊界層氣象及局部環流，目前為颱風洪水研究中心籌備處的一員。

A group photo of the farewell for Prof. Wu-Ron Hsu at SHANGHAI SHANGHAI on June 16 2009.
From left to right, front: M-D Chou, P-K Wang, T-J George Chen, S-C Liu, H Lin; back: Ben J-D Jou, P-L Lin , C-C Wu, W-R Hsu, H-H Hsu, H-C Kuo, C-P Chang, J-P Chen.

Retreat

The retreat of NTUAS was held on February 11 2009 at The Landis Resort Yangmingshan. All faculty members attended the retreat to discuss the future course schemes and arrangements. For undergraduate education, the instructors, the required courses in Academic Year 2009-2010 were assigned. A committee was established to reorganize and improve the outlines for each required courses. The Academic committee was tasked to design area-specific research tracks and to encourage students to select a track of their interest, which can provide more opportunities for undergraduates to participate in various research activities and acquire laboratory skills from them. Other important conclusions were made during the retreat including the establishment of the rules of credit transfer for doctoral students, the addition of a new course “An Introductory Survey to Atmospheric Science”, and the decision that the syllabuses for all courses are to be clearly delineated and published on the department website.

本系靜修會暨教評會於 2009 年 2 月 11 日在陽明山中國麗緻大飯店舉行。大學部課程方面，此次會議除確立 98、99 學年度必修課程之授課教師人選外，亦成立課程大綱小組，整合大學部必修課程大綱，並委請學術委員會設計研究軌道，讓大學部學生提早進入研究領域。在研究所課程方面，本系訂定博士班學分抵修辦法，預計新開設大氣科學導論，並將所有課程大綱制度化並公告於系所網頁

A group photo of “the department retreat” on Feb 11 2009.

Department Review

The third review of the Department of Atmospheric Science took place during March 18-20 2009. The committee comprised of Prof. Kuo-Nan Liou (UCLA, served as the chairman) Dr. Simon Chang (U.S. Naval Research Laboratory), Prof. Norden Huang (National Central University), Prof. Gabriel Lau (Princeton University), and Prof. Pao-Kuan Wang (University of Wisconsin).

During the three-day review, the committee held discussions with representatives of undergraduates and M.S. and Ph.D. students, postdoctoral researchers, and Department faculty and staff about all aspects of the teaching and research activities. The committee expressed their concern on several challenges faced by the department. For example, most of the professors will reach their retirement age in the next 5-10 years, the lack of space for CARDS (Center for Atmospheric Resource and Disaster Studies) and TRC (Typhoon Research Center) and the term of the department chairman is not long enough to implement new policies etc. The committee also suggested that the department may consider a comprehensive program for direct B.S-to-Ph.D. studies and to develop a strategic plan to recruit top-quality new faculty in core areas.

五年一度的系教學研究評鑑於 2009 年 3 月 18-20 日於台大大氣系舉行。此次評鑑邀請五位國內外著名學者擔任委員，包括廖國男教授(召集人)、王寶貫教授、劉雅章教授、張偉正教授、黃鍔教授。在三天行程中，評鑑委員分別和系上教師、職員、研究人員和學生代表進行座談，並深入了解系上教學及研究的運作及規畫。最後，評鑑結果指出系上目前面臨的難題，包含未來 5-10 年系上將面臨教師屆齡退休階段、系館空間不足、系主任任期較短等等。評鑑委員建議系上應規劃完善的直升博士班機制，以鼓勵同學申請，並積極尋求傑出人才以擴展研究領域。

A group photo of the “department review” during May 18 to 20 2009. From left to right, front: Norden Huang(NCU), Simon Chang (NRL), K-N Liou (UCLA), C-H Lo (NTU, Dean, College of Science), Gabriel Lau (GFDL/Princeton Univ.), P-K Wang(Univ. of Wisconsin).

Graduation Commencement

The University commenced the 2009 Graduation ceremony in the morning of June 7th. Immediately afterward, an awarding ceremony of dean's award was held at the same time. In the afternoon, there was a hooding ceremony for each graduate student held in the department, with family and friends sharing this hilarious day. The students graduating from NTUAS this year include about 24 Bachelors, 15 Masters and 4 Ph.Ds.

台灣大學 2009 年畢業典禮在 6 月 7 日上午於台大體育館舉辦，理學院隨即進行院長獎頒獎典禮。當天下午，系上進行畢業典禮，由吳俊傑主任撥穗，並邀請畢業生親友共同參與。今年總共有 24 名學士、15 名碩士及 3 名博士從台大大氣系畢業。

A group photo of graduating Students and Professors.

T-PARC (THORPEX-PARC)

In the summer of 2008, DOTSTAR, with Profs. Chun-Chieh Wu and Po-Hsiung Lin as leading scientists, participated the international THORPEX/PARC (The Observing System Research and Predictability Experiment/Pacific-Asian Regional Campaign) initiative under the World Meteorological Organization. The DOTSTAR research team has cooperated with other scientists from USA, Japan, Korea, Germany, Canada and France, utilizing four reconnaissance surveillance aircrafts and driftsondes in the task of intensive targeted observations in order to conduct scientific research on TC genesis, structure change, targeted observation, recurvature, and extratropical transition and TC forecasting. In a series of experiments lasting two months, T-PARC conducted 76 surveillance flight missions for 11 tropical cyclones, with more than 500 flight hours. One example of data collected from the observations is a three-day observation of Typhoon Sinlaku, which has been incorporated into high-resolution numerical models through advanced data assimilation techniques. The achievements are believed to mark a milestone in targeted observations research on typhoons. The details and process of the research program have been documented in a one-hour program released by the National Geographic channel.

2008 年夏天，由本系吳俊傑教授及林博雄副教授共同主持的 DOTSTAR，參與由聯合國世界氣象組織(World Meteorological Organization, WMO)所屬「觀測系統研究及預報實驗(The Observing System Research and Predictability Experiment, THORPEX)」中的「亞太區域聯合颱風觀測計畫(Pacific-Asian Regional Campaign, PARC)」，與美、日、韓、德、加、法等各國共同合作，使用四架飛機與氣球飄落送針對西北太平洋地區颱風之生成、結構改變、路徑轉折、溫帶變性及消散等科學與預報議題進行密集性策略性觀測。觀測所獲得之資料，如對辛樂克颱風連續三天的完整觀測，已被充分應用於颱風資料同化研究中，這些新的結果將為颱風及策略性觀測研究帶來嶄新的突破。

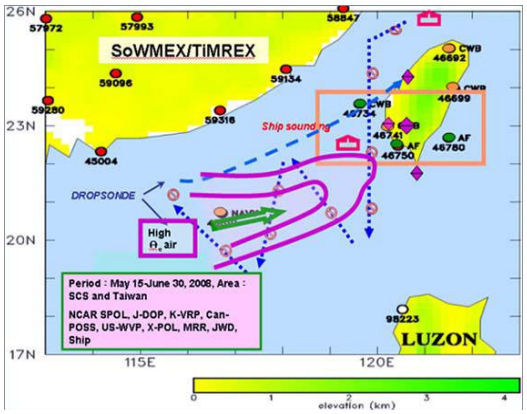
A group photo of the "T-PARC planning meeting" of lead scientists from US (Pat Harr, NPS; Jim Moore NCAR), Korea (Hee-San Lee, KMA), Japan (Tetsuo Nakazawa, MRI/JMA), Germany (Martin Weissmann, DLR), Taiwan (Chun-Chieh Wu, NTU).
T-PARC 科學團隊成員 2008 年 4 月於日本 Tsukuba 召開規劃會議

Southwest Monsoon Experiment/Terrain-influenced Monsoon Rainfall Experiment (SoWMEX/TiMREX)

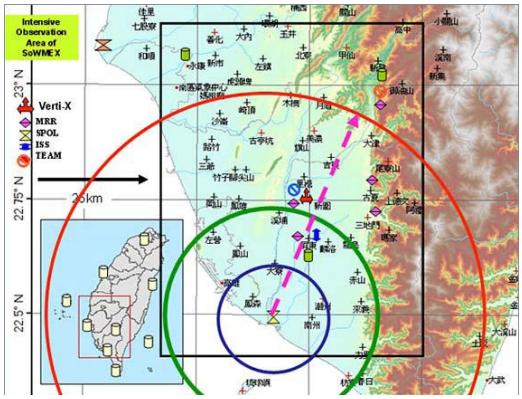
A joint field observational campaign to study heavy rainfall during the East Asian summer monsoon was launched by scientists from Taiwan and the U.S. May 15 to June 30, 2008 at the western plain and mountain slope region of southern Taiwan. The program consisted of the Southwest Monsoon Experiment (SoWMEX) supported by National Science Council and the Central Weather Bureau, and the Terrain-influenced Monsoon Rainfall Experiment (TiMREX) supported by the U.S. National Science Foundation. The goal of the program is to improve the capability of quantitative precipitation estimation and forecasting (QPE/QPF) during the East Asian summer monsoon season. Due to interaction of surging southwest monsoon winds and the steep terrain of Taiwan, such rainfall is often heavy and can lead to floods and landslides resulting in casualties and property damages. SoWMEX/TiMREX provides a unique opportunity to advance our basic understanding of physical processes involved in the development of heavy orographic precipitation through intensive field observations. The primary observational facilities are advanced radars deployed at southern Taiwan include: NCAR SPOL (S-band polarimetric Doppler radar system), TEAM-Radar (X-band mobile polarimetric Doppler radar system), and MRR (Micro rain radar systems). These advanced radar systems are complemented by dropsondes and ship soundings over the northern South China Sea to observe upstream conditions.

In addition to the research and development of QPE/QPF, SoWMEX/TiMREX will provide a unique data set for the study of the kinematic and thermodynamic characteristics of the southwesterly prevailing flows over the ocean upstream during Asian summer monsoon. It is anticipated that rainfall prediction products during the season will be improved with this extensive observation campaign. The rainfall observations will be valuable not only for early warning of flood and landslide but also for regional water resources management. In addition to Taiwan and U.S. scientists and platform, scientists from Nagoya University, Japan, Bureau of Meteorology Australia, Environment Canada, and Pukyong and Kyungpool Universities in Korea also brought their advanced observational equipments and model to participate in the QPE/QPF experiments.

由國科會和中央氣象局資助的西南氣流觀測與豪雨預測實驗計劃，簡稱西南氣流實驗(SoWMEX)，和美國國家科學基金會資助的地形季風降雨實驗計劃(TiMREX)，於 2008 年 5 月 15 日至 6 月 30 日共同舉行實地密集觀測。觀測地點為南海北部和台灣本島及臨近海域。實驗計劃總體目標係針對豪雨預警和防災需求，加強西南氣流導致的豪大雨天氣系統之基礎科學認知，改進現有短期定量降雨估計與預報精確度。實驗內容包括增加南海和台灣海峽大氣探空（機載投落送和船舶探空），針對台灣梅雨季（東亞夏季西南季風初期）探討南中國海西南氣流的熱動力性質；並利用環島都卜勒雷達，國科會新增車載 X 波段雙偏振雷達，美國 NCAR S-波段雙偏振雷達以及測雨雷達、自動氣象測站和地面 GPS 測站等儀器討進行西南季風環境下豪雨個案密集觀測和分析診斷研究。深入了解季風局部加強導致西南氣流本身的熱動力特徵，引發豪大雨天氣系統的激發機制，以及中尺度對流系統（MCS）本身內部之雲微物理和雲動力結構。該計劃同時也進行高解析度定量降雨預報數值模擬與雷達資料同化實驗，以改進現有定量降雨預報的精確度。有關於本實驗相關資訊請上實驗網頁查詢 http://sowmex.cwb.gov.tw/。



Experiment design of SoWMEX/TiMREX. The dot blue line indicates the flight route of Astra jet for dropsonde releasing and circles are locations for upper air sounding.



The intensive observation area of SoWMEX/TiMREX. The symbols indicate different radar system. The center of the circles is SPOL and the circles are with range of 12.5, 25, and 50 km in distance, respectively.

Rotate clockwise from upper left: Canada POSS, JW collision type disdrometer, US-NCAR S-band polarimetric (SPOL) radar system, Micro rain radar with wavelength of 1.25 cm, Korea vertically pointing rain profiler, and NCAR GPS dropsonde.

The NCU Team-R to NTUAS

Upon invitation by Prof. Ben Jou, on 20 May 2009, the Portable Doppler Radar team (TEAM-R) from the National Central University (NCU) visited the department. Led by the Department Chair Prof. Pei-Lian Lin and the TEAM-R Head, Prof. Yu-Cheng Liou, 15 team members including technicians and graduate students from NCU arrived in the morning and conducted a whole-day demonstration. The team was welcomed by the department including the department chair and a number of faculty members. As TEAM-R is a newly-acquired and is the only portable Doppler Radar (X band) in Taiwan, an one-hour introduction of the system, theory, and project highlights were first presented by Prof. Liou. After the introduction, the NCU team demonstrates the operations of the radar to the faculties and students from two courses (Introduction to Atmospheric Science Research and Atmospheric Observations and Instrumentations). During the demonstration, there were a lot of discussions and exchange of ideas. It was indeed a great day to have such interaction with the NCU team and an inspiring experience for many students and faculties in NTU. Many thanks to the NCU team for spending this meaningful day with us.

2009 年 5 月 20 日，本系大氣科學研究導論課程，特別邀請國立中央大學 TEAM-R 團隊至本系所進行移動式偏極化雷達儀器介紹與交流活動。中央大學團隊抵達後，先進行雷達車之定位與設定，並展開完整的介紹與討論，接著進行儀器設備及相關計畫簡報，並在本系觀測坪前進行實際雷達偵測儀器操作與資料接收之展示與說明，本系參與人員有吳俊傑主任、林依依老師、林博雄老師、周仲島老師、許武榮老師、許晃雄老師等，還有大學部及研究所學生共約 40 名。

Photos : NCU team demonstrates the operations of the radar to the faculties and students.
TEAM-R 在本系進行實際雷達資料接收之展示與說明。

International Workshop on Advanced Typhoon and Flood Research, 18-19 December 2008

International Workshop on Advanced Typhoon and Flood Research was held from December 18-19, 2008 at NTUAS. The workshop was sponsored by NTUAS and TTFRI (Taiwan Typhoon and Flood Research Institute) and cosponsored by the Departments of Atmospheric Science of National Central University and Chinese Culture University. Many leading scientists coming from Hong Kong, Japan, Korea, USA and Taiwan attended and discussed the issues related to typhoon and flood.

The workshop consisted of 27 invited presentations organized into nine sessions:

1) Advances in of tropical cyclones dynamics
2) Physical processes involved in the initial development, motion, structure and intensity change, and rainfall of tropical cyclones
3) Air-sea interaction related to tropical cyclones
4) Special observation (e.g. satellite, radar and aircraft surveillance)
5) New findings in modeling and data assimilation
6) Climate and large-scale aspect of tropical cyclones
7) Flood simulations in watershed hydrology
8) Integrations of flood forecasting and precipitation estimation
9) Other related early flood warning techniques

The scientists discussed some major research programs, including Dr. Simon Chang (U.S. Naval Research laboratory) on an integrated tropical cyclone program – from research to operations, Dr. Johnny Chan, (City University of Hong Kong) on global warming and tropical cyclone activity in the western North Pacific, Dr. Tetsuo Nakazawa (Meteorological Research Institute, JMA) on T-PARC-A new direction for typhoon research/forecast, Dr. Robert Fovell (UCLA) on microphysics influence on hurricane track, Dr. Shu-Hua Chen, (UC Davis) on the impact of Saharan air layer on tropical cyclone genesis and intensification and Dr. Kevin Cheung (Macquarie, Univ. Australia) on variability of intense tropical cyclones in the South Pacific and South Indian Ocean.

颱洪研討會於 2008 年 12 月 18-19 日於台大舉行，並順利圓滿成功。研討會由台大大氣科學系及颱風洪水研究中心籌備處共同主辦，國立中央大學大氣科學系及私立中國文化大學大氣科學系協辦。本次研討會聚集國際多位頂尖科學家探討颱洪相關議題。兩天研討會主要內容包含颱風動力，發展、移動、結構、強度及降雨、颱風及海氣之交互作用、颱風之特殊觀測儀器、颱風模擬與資料同化、颱風與氣候之交互作用、水文流體模擬、防洪及降水預測之整合等。總計有來自台灣、香港、日本、韓國，美國等地的學者共同參與此次研討會。

Attendees at the “International Workshop on Advanced Typhoon and Flood Research”.

First SoWMEX/TiMREX Science Workshop, 5-7 November 2008

The First SoWMEX/TiMREX Science Workshop was held at the Central Weather Bureau(CWB) on Nov 5 – 7, 2008 in Taipei. The workshop was cosponsored by NTUAS, CWB, National Science Council (NSC), National Science and Technology Center for Disaster Reduction (NCDR), and National Center for Atmospheric Research (NCAR). The organizers were Prof. Ben Jong-Dao Jou of NTUAS, Dr. Shui-Shang Chi of CWB, Dr. Wen-Chau Lee of NCAR and Dr. Lee-Yaw Lin of NCDR.

The three-days workshop included oral and poster presentations of invited and contributed papers. The thirty¬-three oral presentations were organized into three sessions:

1) Data Status of SoWMEX/TiMREX
2) Preliminary results of SoWMEX/TiMREX
3) Science Team Meeting of SoWMEX/TiMREX

More than 90 participants attended the meeting, including leading international scientists such as Dr. Chris Davis (NCAR), Dr. Richard Johnson (Colorado State University), Prof. Edward Zipser (University of Utah), Dr. Jim Wilson (NCAR), Dr. Jenny Sun (NCAR), Dr, Wen-Chau Lee (NCAR) from U.S., Prof. Dong-Kyou Lee (Seoul National University), and Prof. Dong-In Lee (Pukyong National University) from Korea, and Prof. Hiroshi Uyeda (Nagoya University), T Yamada (Jamstec) from Japan.

第一屆西南氣流實驗科學研討會於 2008 年 11 月 5-7 日於交通部中央氣象局舉行。本次研討會是由台大大氣科學系、交通部中央氣象局、行政院國家科學委員會、國家災害防救科技中心 、及美國國家大氣研究中心共同籌辦。主要由台大大氣系周仲島教授、中央氣象局紀水上副局長、國家害防救科技中心林李耀副執行秘書及美國國家大氣研究中心李文兆博士共同籌劃。三天研討會主要議題為討論西南氣流實驗資料收集狀態，並檢視實驗初步成果，同時也召開西南氣流實驗的科學小組會議。總計有來自臺灣、日本、韓國、美國等各地共超過 90 名的學者專家參與本次研討會。

FIRST SoWMEX/TiMREX SCIENCE WORKSHOP
Date: 5-7 November 2008
Venue: 310 Conference room, Central Weather Bureau, Taipei

CONFERENCE PROGRAM

11/5(Wednesday)	11/6(Thursday)	11/7(Friday)
08:30-09:00 Registration 09:00-09:30 Opening Remark 09:30-10:00 Photo session and Break	8:30-10:10 Session IV: Preliminary results and discussion (B) 10:10-10:30 Break	9:30-11:30 Session VIII: Wrap-up discussion
10:00-12:30 Session I: Invited talks	10:30-12:10 Session V: Preliminary results and discussion (C)	Adjourn
12:30-13:30 Lunch	12:30-13:30 Lunch	
13:30-15:10 Session II: Data status	13:30-15:30 Session VI: Preliminary results and discussion (D)	
15:10-15:40 Break	15:30-16:00 Break	
15:40-17:40 Session III: Preliminary results and discussion (A)	16:00-17:30 (1)Session VII: Science Team meeting (2)Poster	
18:00-20:00 Workshop Banquet		

A group photo of the First SoWMEX/TiMREX Science Workshop.

Structure and Dynamics of the Meiyu Frontal System

Meiyu is a unique feature of East Asia that typically occurs from mid-May to mid-June over South China and Taiwan, late May to late June in Japan (Baiu), and mid-June to mid-July over the Yangtze River Valley. The Meiyu frontal system is the key synoptic feature which causes the maximum seasonal rainfall. Numerous studies have been focused on various aspects of the Meiyu frontal system. Professor George T. J. Chen, his colleagues, and graduate students have been working in the structure and dynamics of the Meiyu frontal system, such as the Meiyu frontogenesis, frontal movement, frontal disturbances, and low-level jets (LLJ), for more than 30 years. Their recent studies on the role of convective latent heating in frontogenesis, cyclogenesis, and LLJ formation, particularly using piecewise PV inversion technique, were published mainly in Mon. Wea. Rev. (e.g., Chen et al. 2003; Chen et al. 2006; Chen et al. 2007; Chen et al. 2008) and also in a review paper (Chen 2008).

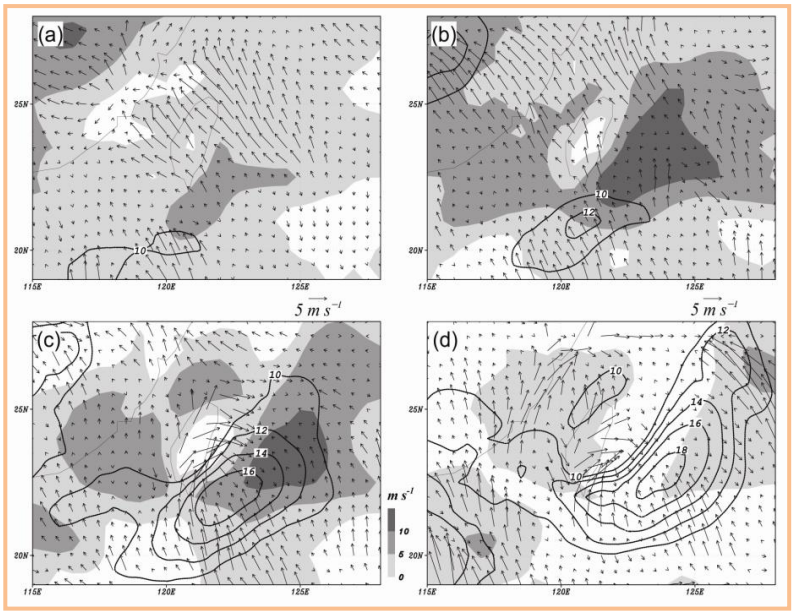


Fig. 1 Ageostrophic wind component (arrow, m s^{-1}) perpendicular to geopotential height contours and local tendency of wind component along the geopotential height contours (shaded, m s^{-1} per 12 h, gray scale shown at bottom) at 850 hPa at 6-h intervals from (a) 1200 UTC 7 to (d) 0600 UTC 8 June 1998. The 850-hPa LLJ is depicted by isotachs (thick solid) analyzed at intervals of 2 m s^{-1}, starting from 10 m s^{-1} (from Chen *et al*. 2006).

One of their major findings is that the latent heat release and the associated CISK mechanism play major roles on Meiyu frontogenesis for one type of the Meiyu fronts that are characterized by weak baroclinicity and a strong PV anomaly. For the Meiyu front with relatively strong baroclinicity, the diabatic effects become strongly frontolytic and the horizontal convergence and deformation wind fields play major roles on Meiyu frontogenesis similar to that discussed in the classical frontal theory. Results of their observational studiesall indicated that a thermally indirect circulation with rising motion in the frontal region and equatorward sinking motion is driven by the latent heat release associated with frontal deep convection. The LLJ could then form to the south of the convective heavy rainfall area through the Coriolis acceleration of the lower branch of an induced thermally indirect secondary circulation. Besides, their studies also suggested that latent heat release from the MCSs played a vital role in the strengthening and maintenance of the frontal disturbances.

Professor Chen received his B.S. from NTUAS in 1968 and M.S. and Ph.D. from the State University of New York at Albany in 1971 and 1974, respectively. He joined the faculty of NTUAS in 1975 and has been a visiting research professor at the Naval Postgraduate School in 1978 and in subsequent summers during the 1980s. In 2002 he served as the Dean of Academic Affairs of NTU and was appointed the University's Vice President for Academic Affairs since August 2005. He received the Distinguished Research Fellow Award of National Science Council, and currently is a Distinguished Professor of Department of Atmospheric Sciences and a Chair Professor of NTU. In spite of his busy schedule on the University affairs, Professor Chen is still actively doing research on the Meiyu aystem including the feedback mechanism between frontal PV center and cumulus convection on the cyclogenesis process along the Meiyu front, LLJ, frontal cyclone, and nonlinear positive Meiyu front.

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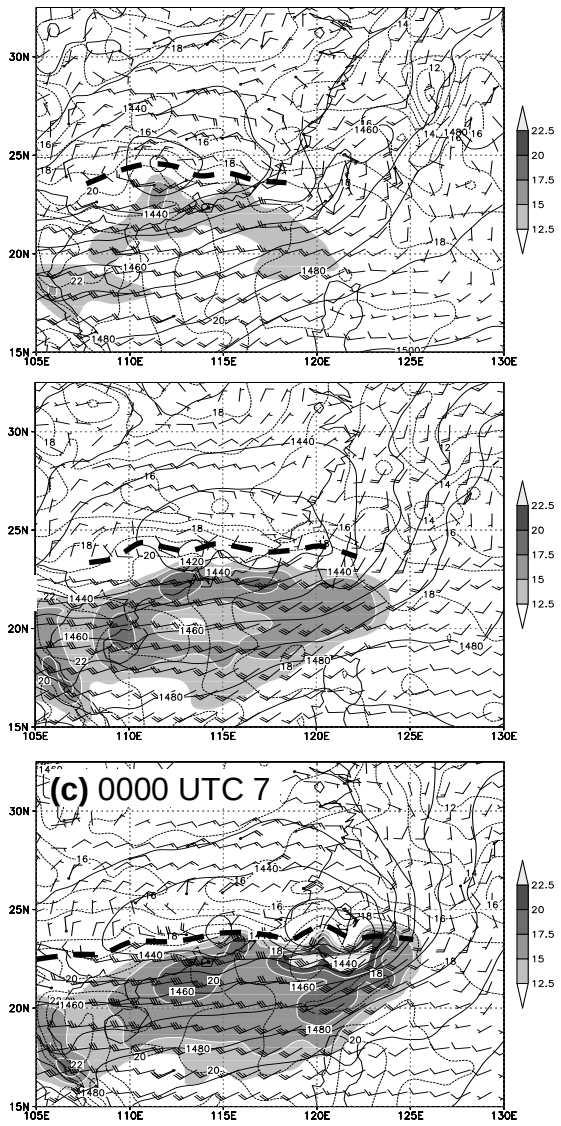


Fig. 2 850-hPa ECMWF analysis of geopotential height (solid, gpm), temperature (dashed, °C), and horizontal wind (m s^{-1}) at (a) 1200 UTC, and (b) 1800 UTC 6 Jun, and (c) 0000 UTC 7 Jun 2003. Geopotential heights and temperatures are analyzed at intervals of 10 gpm and 1°C, respectively. For winds, full (half) barbs are 5 (2.5) m s^{-1}, and wind speed ≥ 12.5 m s^{-1} is shaded. Thick wind flags in (a) and (c) are sounding data, and thick dashed lines indicate the position of Meiyu front at 850 hPa (from Chen et al. 2007)

陳泰然教授於 1968 年自本系大學部畢業，1974 年 12 月獲美國紐約州立大學（奧伯尼）博士學位，於 1975 年返系任職，於 1980 年升任正教授，並於 2005 年擔任學術副校長。期間曾擔任海軍研究院客座研究教授。曾擔任為期十年（1983–1993）的「臺灣地區中尺度實驗；TAMEX」計畫總主持人，此中美合作大型實驗計畫對國內、外大氣科學界影響深遠。研究重點為進行華南與台灣地區之梅雨與西南季風研究，特別是豪雨和定量降水相關之問題。利用傳統地面、探空觀測資料及衛星、雷達遙測資料，進行診斷分析與模式模擬研究，以瞭解伴隨豪雨和降水之環流系統特徵、結構及演變過程與機制。

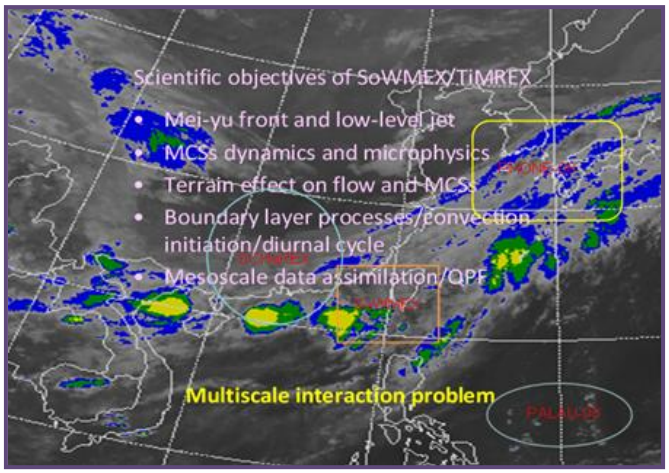
Severe Weather and Heavy Rain Research in Taiwan

Severe weather and heavy rain research has a long history in Taiwan. A significant turning point occurred in 1987 when the first operational Doppler radar was set up at Taoyuan International Airport for TAMEX (Taiwan Area Mesoscale Experiment), and the numerical weather prediction system was established at CWB. It began the era of objective and quantitative studies. Currently, Taiwan has 8 operational Doppler radars with two of them having polarimetric capability. These radars accompanied with MESONET and high speed computing facilities provide unprecedented high resolution data set for real time monitoring capability of severe weather and heavy rain events and potential nowcasting environment.

In the last 20 years, Prof. Ben Jou has applied Doppler radar and numerical models to study the processes related to severe weather and heavy rains in and around Taiwan and also worked to develop quantitative precipitation forecast (QPF) by high resolution mesoscale models. Starting from 19-90's, Prof. Jou worked closely with Dr. Wen-Chau Lee of NCAR (also an alumni of NTUAS) to develop algorithms using single Doppler radar wind data to retrieve information related to typhoon-like atmospheric vortices, such as center of the vortex, mean tangential wind distribution, radius of maximum wind, higher wave numbers of tangential wind, mean radial wind, and mean vertical velocity near the center. A recent paper (Jou et al. 2008) found that by multiplying a constant D (the distance between the data point and the radar), the algorithm of retrieving tropical cyclone characteristics can be extended to a large domain and the signature of the vortex can be simplified for visual examination. This finding made the usage of Doppler winds both for real time monitoring of landfalling typhoons and high resolution model data assimilation much easier than before.

In 2008 Prof. Jou organized an international research team to conduct an intensive field program: SoWMEX/TiMREX (Southwest Monsoon Experiment/Terrain-influenced Monsoon Rainfall Experiment). The goal was to study the southwest monsoonal flows over the open ocean and the orographic precipitation processes over complex terrain in order to improve quantitative precipitation estimation and forecasting in the county and watershed scales. Specific scientific topics of the field program include the Mei-yu front and low-level jet,

mesoscale convective systems (MCSs) dynamics and microphysics, terrain effect on flows and MCSs, boundary layer processes/convection initiation/ diurnal cycle of precipitation, quantitative precipitation estimation, and mesoscale data assimilation. The system developed in the project is being adapted by Central Weather Bureau of Taiwan as one of their operational system for very-short range severe weather prediction and QPF.



Scientific objectives of SoWMEX/TiMREX. (image courtesy of SoWMEX Project Office)

Prof. Jou graduated from NTU AS in 1976 and earned his master and PhD degrees from University of Oklahoma and University of Washington in 1978 and 1984, respectively. Afterwards he returned to join the faculty of NTUAS. Prof. Jou participated TAMEX and SCSMEX (South China Sea Monsoon Experiment) in 1987 and 1998, and conducted GIMEX (Green Island Mesoscale Experiment) in 2001. All these intensive field programs studied the mesoscale phenomena related to Mei-Yu front, mesoscale convective systems, and complex terrain effects in the Taiwan area.

Since 2000 Prof. Jou organized the 10-year Taiwan weather research program, in which several important projects have been promoted and successfully executed. These include the dropsonde project for typhoon track prediction and data assimilation system (DOTSTAR leaded by Prof. Chun-Chieh Wu of NTU), the mesoscale ensemble forecasting system in East Asia (MEFSEA led by Prof. Fang-Ching Chien of NTNU), the mobile polarimetric radar system (TEAM-R leaded by Prof. Yu-Chieng Liou of NCU), and SoWEMX/TiMREX.

Prof. Jou has won three times the Best Paper Award from Meteorological Society of Republic of China (1993, 1996, and 1999) and currently serves as the President of the Society. He has also won the best teaching award from the Ministry of Education in 1993.

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周仲島教授於 1976 年自本系大學部畢業，1984 年 12 月獲美國華盛頓大學博士學位，1985 年返系任職，於 1990 年升任正教授，並於 1987 年及 1998 年參與「臺灣地區中尺度實驗；TAMEX」及「SCSMEX 實驗，並於 2001 年進行 GIMEX 計畫。此實驗計畫主要為中尺度天氣現象之研究，包含梅雨鋒面、中尺度對流系統及 complex terrain effects，對國內、外大氣科學界影響深遠，亦擔任為期十年（2000 迄今）的「臺灣天氣研究計畫」計畫總主持人。周教授研究興趣為中尺度氣象，包括發展都卜勒天氣雷達技術並應用於天氣診斷分析及預報。

2009 Doctor's Theses

Huang,Treng-Shi	Hurricane Intensity in an Idealized three-dimensional full-physical model- Part I: Sensitivity to PBL processes Part II: Superintensity behavior
Lo,Tzu-Ting	Recent Synchronized Abrupt Warming and Change in Dominant Decadal Mode
Yang, Chung-Chuan	Characteristics of tropical cyclone tracks over western North Pacific
Jan-Huey Chen*	Dynamic analysis and inter-comparison of the targeted observations for tropical cyclones

2009 博士論文

黃椿喜	颱風強度動力研究-邊界層動量與熱交換係數敏感性及超颱特性
羅資婷	1980 年代晚期冬季氣候突變
楊忠權	西北太平洋地區熱帶氣旋路徑特徵探討
陳占慧*	策略性颱風觀測理論之動力分析與比較

2009 Master's Theses

Chang,Wen-Ming	Characteristics of Upper-Air Sounding Observation during SoWMEX/TiMREX
Chen,Tzu-Chin	Characteristics of Raindrop Size Distribution during SoWMEX/TiMREX
Huang,Shin-Yi	A case study of torrential rainfall in central Taiwan during the Mei-Yu season
Wang,Yen-Lan*	Effect of Tropical Cyclone on Large-scale Circulation
Kuo,Li-Wei	Experimental and Numerical Study on the Mechanism of Nucleation by Re-condensation
Peng,Chong-En	Effects of Air Long-range Transport on Background Ozone Concentration in Taiwan: The Cluster Analysis of Air Parcel Back Trajectories
Yang,Whui-Ting	The Characteristics Analysis and Numerical Simulation of Surface Layer UV Index in Taiwan
Wu,Hua-Fu	Barotropic Energy Dispersion Scaling Law
Wu,Yi-Hsuan	The Lightning Study by WISCDYMM Cloud Model
Lien,Guo-Yuan*	Assimilation of Tropical Cyclone Track and Structure Based on the Ensemble Kalman Filter
Chen,Ying-Ting	Interdecadal Fluctuation of Tripole Rainfall Pattern and Its Effect on Interannual and Subseasonal Variability
Lai,Kuan-Liang	The Pioneer Study of Fog and Horizontal Precipitation Measurement at Taiwan Mountain Sites
Huang,Wei-Kai	Interannual Variability of Summer Monsoon Circulation and Sub-surface Sea Temperature in the Western North Pacific
Lee,Ya-Heng	The Data Intercomparison of Radiosonde systems during SoWMEX/TiMREX and Applications

2009 碩士論文

張文明	西南氣流實驗探空資料特徵分析研究
陳姿瑾	西南氣流實驗期間之雨滴粒徑分布特徵
黃心怡	梅雨鋒面個案之模擬與分析
王嬿蘭*	颱風對於大尺度環流的影響
郭力維	再凝結核化機制的實驗與數值模擬
彭眾恩	大氣長程傳送對台灣背景臭氧之影響：空氣胞逆軌跡線之群集分析
楊惠婷	台灣地區近地面紫外線指數之特徵探討與數值模擬
吳華富	正壓渦旋能量頻散之冪次律
吳依璇	WISCDYMM 雲模式與台灣西南海域閃電之研究
連國淵*	颱風路徑與結構同化研究-系集卡爾曼濾波器
陳英婷	三極降水結構的年代際變化及其對次季節與年際變異之影響
賴冠良	霧及水平降水觀測之多重策略
黃威凱	西北太平洋夏季季風環流與海洋次表層溫度之年際變化
李亞衡	SoWMEX/TiMREX 實驗期間無線電探空系統比對校驗及資料分析

* Recipient of the Dean's Award

*院長獎得主

Faculty Position Announcement

The Department of Atmospheric Sciences is seeking applicants for one to three faculty positions at the assistant, associate or full professor levels to begin **in either February or August 2010.** We welcome applicants with Ph.D. and research expertise in the field of atmospheric sciences including **severe weather, climate, atmospheric chemistry, and other related areas.** Post-doctoral experience is preferred.

Applicants should send their curriculum vitae, statement of research and teaching interests before **December 31, 2009**, to:

Prof. Chun-Chieh Wu, Chair
Faculty Search Committee
Department of Atmospheric Sciences,
National Taiwan University,
No.1, Section 4, Roosevelt Road,
Taipei 106, Taiwan
Tel: +886-2-3366-3913
Fax: +886-2-2363-3642
E-mail: cwu@typhoon.as.ntu.edu.tw

Both regular and electronic mails are acceptable. Please also arrange for three recommendation letters to be sent directly to the Chair of the Faculty Search Committee. Upon receipt of the application, an acknowledgement email will be sent to the applicant within a week. Applicants who do not receive the acknowledgement email please contact the Chair of the Faculty Search Committee via fax or telephone for confirmation.

本系擬聘請一至三位具備大氣科學相關專長之教授、副教授、或助理教授。應徵者需具備博士學位及大氣科學相關研究經驗，如**劇烈天氣、氣候、大氣化學或其他相關領域**，具博士後經驗者尤佳。自 **2010 年 2 月或 8 月**起聘。申請者請將個人資料、研究與授課興趣於 **2009 年 12 月 31 日前**以一般信函或電子郵件寄至：

台北市羅斯福路四段一號
國立台灣大學理學院大氣科學系
新聘教師甄選委員會召集人
吳俊傑 教授收
Tel: +886-2-3366-3913
Fax: +886-2-2363-3642
E-mail: cwu@typhoon.as.ntu.edu.tw

另請安排三封推薦信寄至本系新聘教師甄選委員會召集人收，本系將於收件後一週內送出回條，逾期未收到回條者可透過電話或傳真與召集人聯繫確認。

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