National Taiwan University
Department of Atmospheric Sciences

Newsletter

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Contents

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The Launch Ceremony of the 60th Anniversary Book

The entire assembly posing at the Gallery of NTU History.

In the afternoon of June 24th, 2017, National Taiwan University Atmospheric Sciences celebrated the 60th department anniversary at the Gallery of NTU History, and launched the department book, A Gathering of Great Minds. This book is a collection of the stories of 51 alumni from the 1st to 30th graduating class. These alumni have made significant contribution to the field of Atmospheric Science and other areas in the past 60 years. The key person in the publication of this book is alumnus and editor-in-chief Ching-Ya Huang. A Gathering of Great Minds would not have been possible without her contribution. She, along with senior clerk I-Ching Tu and the student journalists have worked tirelessly to assemble this collection of stories.

Special guests at the book launch were NTU Vice President Ching-Ray Chang (Interim President), Dean of the College of Science Shiuh-Tzung Liu, Chair Professor Tai-Jen George Chen (alumnus), former ITRI Chairman Ching-Yen Tsai (alumnus), and graduate of the 1st class of NTUAS, Dr. Tang-Shan Chen. In his opening speech, Dean Chiuh-Tzung Liu said, “This book perfectly describes the history and people of Atmospheric Science in the past 60 years. Although it was a massive undertaking, we are very proud to be able to bring everyone together.” Several people also shared their thoughts, including National Central University Vice President Chen-Jung Liu, Chinese Culture University Distinguished Chair Professor Kuang-Ying Liu, former CWB Director-General Hsin-Liang Hsieh, Instrumentation Center Director Hsu-Ming Peng, and Vice President for Academic Affairs Hung-Chi Kuo. The sensational stories shared and encouragement and blessings from the faculty and special guests made this a successful book launch. We hope that the stories of these alumni will inspire students to create and pursue their own life story, and continue this department tradition of passing down pearls of wisdom.

2017 年 6 月 24 日下午，臺大大氣科學系在校史館舉辦 60 週年系慶系書「風雲際會」發表會。開場歡迎致詞中，林依依系主任介紹關於此書的緣起，是因為在 2015 年 5 月大氣科學系舉辦了一場盛大的成系 60 週年慶祝活動，因而催生了「風雲際會」這本書。這是一本完整蒐羅大氣系從第 1 屆到第 30 屆的系友於過去 60 年中，在國內外氣象科學及其他領域有很大貢獻的 51 位系友的精采人生故事的重要書籍。成書的重要關鍵人物，就是系友黃靜雅女士擔任總編輯的重任，沒有她的付出「風雲際會」完成不了，及杜宜靜幹事、還有擔任小記者的學生們，一起共同努力將這些故事集結成冊。

■ Summer of 1987 – Then department chair Prof. Ching-Yen Tsai leads a team of faculty and students to clean the ditches. The spirit of teamwork and diligence is fully displayed in this photo.

■ Alumnus and singer Yueh-Hsin Chu sings “Let us watch the clouds”(讓我們看雲趣) and “Answers in the wind”(風中的答案).

發表會開場貴賓由本校張慶瑞副校長（代理校長）、理學院劉緒宗院長、陳泰然講座教授（系友）、蔡清彥前工研院董事長（系友）及第一屆系友陳唐山博士擔任。當中劉緒宗院長致詞說：「這本書把大氣科學系 60 年來的人物歷史完美陳述，雖然是個浩大過程，但能讓大家群聚一堂，是很驕傲的事情。」隨後由中央大學劉振榮副校長、文化大學劉廣英特聘講座教授、前中央氣象局局長謝信良先生、貴儀中心彭旭明主任及臺大郭鴻基教務長接續分享。長官及師長們的精采分享及鼓勵祝福，讓此次發表茶會相當圓滿成功，期盼大氣科學系系友們精彩的人生故事可以激勵更多學子，並一起效法學習，讓精采的人生故事可以不斷上演並一直流傳下去。

Awards

Prof. Chun-Chieh Wu received the 21st National Chair Professorship in 2017.
Prof. I-I Lin received the 61st Academic Award in 2017.
Prof. Jen-Ping Chen received the Outstanding Research Award from the Ministry of Science and Technology in 2016.
Prof. Cheng-Ku Yu received the NTU Good Teaching Award in 2017.
Prof. Yen-Ting Hwang received the NTU Good Teaching Award in 2017.
Prof. Min-Hui Lo received the Ta-Yu Wu Memorial Award, Ministry of Science and Technology in 2017.

吳俊傑教授榮獲教育部第 21 屆國家講座。

林依依教授榮獲教育部第 61 屆學術獎。

陳政平教授獲 105 年度科技部傑出研究獎。

游政谷教授獲 105 學年度教學優良獎。

黃彥婷助理教授獲 105 學年度教學優良獎。

羅敏輝助理教授獲 2017 年科技部吳大猷獎。

Academician Kuo-Nan Liou, an alumnus of the Department of Atmospheric Sciences at NTU, and the founding Director of Joint Institute for Regional Earth System Science and Engineering at UCLA, the Carl-Gustaf Rossby Research Medal for 2018, the highest award from the American Meteorological Society (AMS).

系友廖國男院士榮獲 2018 年美國氣象學會（American Meteorological Society, AMS）之卡爾 - 古斯塔夫・羅斯貝獎章（Carl-Gustaf Rossby Research Medal），此勳章為表揚廖國男院士在增進大氣輻射傳輸，與雲和氣膠之間交互作用的理論及應用上的貢獻。

Personnel Changes

Prof. I-I Lin completed her three-year term of the department chairman. Prof. Po-Hsiung Lin assumed the responsibility starting August 1st, 2017.

林依依教授 3 年系主任的任期已於 2017 年 7 月 31 日屆滿，自 2017 年 8 月 1 日起由林博雄副教授繼擔本系系主任。

前系主任林依依卸任感言：

很榮幸過去的三年能夠為院、系服務。在這三年中我感受到也學習到很多，感謝劉院長的溫暖、包容及敦厚、梁副院長的沉穩及洞見、周副院長的親切及對事情的默契，以及理學院的明騏秘書、惠靜、蕭小姐、枋小姐、文瑾、劉先生等大家一起工作的快樂積極。感謝明騏秘書在各項事務上的用心與全力協助，孟庭幹事以非常強的英文專業，協助我們與英國 Reading 大學制定 MOU。當然還有我的好學長－吳前副院長（吳司長）的 Line 與 support。

在這這段期間，難免也經歷著個人的極大挑戰，因著信仰帶我走過這些日子。在身心內外煎熬時，聖經告訴我「應當一無罣慮，只要凡事藉著禱告、祈求和感謝，……，神所賜出人意外的平安，必在基督耶穌裡，保守你們的心懷意念 ...」。在面臨鄉愿情況，良心爭戰時，聖經也提醒我「凡是真實的、可敬的、公義的、清潔的 ……，這些事你們都要思念」。

最後，特別感謝系上各委員會同仁的支持及付出，以及國豐助教、明昌助教、系辦朱小姐、張先生、宜靜及謝先生的協助，從面臨爆高電費待繳的挑戰、節電計畫的進行、大學部課程改革、大氣系 60 周年系慶、陳泰然教授（前副校長）榮退，以及系友故事專書的編撰發表（特別感謝系友黃靜雅小姐）等，都要特別謝謝各位的幫忙。在此敬祝理學院及大氣系蒸蒸日上，也祝大家天天快樂。

依依　敬謝

Discuss the 2017 summer student exchange program

On March 20th, 2017, The University at Albany Dean for International Education, Dr. Harvey Charles, led four professors to attend a bilateral conference with the NTU Vice President of International Affairs and professors from the department of Atmospheric Science to discuss the 2017 summer student exchange program. The goal is to build a long-term partnership.

2017 年 3 月 20 日，美國紐約州立大學大氣環境科學系阿爾伯尼校區國際教育長（University at Albany Dean for International Education）Dr. Harvey Charles 帶領 4 位教授與臺灣大學國際事務長及大氣科學系教授們舉行雙邊會議，討論 2017 年暑假交換學生等交流，為長期合作為目標。

■ A group photo of Dr. Everette David Joseph (Third from left), Dr. Harvey Charles (Fourth from left), Ms. Elizabeth Gray (Seventh from left) and Dr. Li Zhang (Ninth from left).

Chi-Wen Sun RTS Youth Overseas Perspective Foundation

■ Group photo of the Contract signing ceremony.

In order to encourage NTUAS students to travel aboard, broaden their horizons and develop their strong suits, Taiwan Trade (RIDC) initiated the creation of the “Chi-Wen Sun RTS Youth Overseas Perspective Foundation”, and together with companies TA-SHAO, SHINE-YEA, and Mr. Chun-Chao Chang, sponsored 1 million NTD for the foundation. Chi-Wen Sun was a Law School alumnus of NTU. The foundation held its donation ceremony at NTUAS on November 15th, 2017.

為鼓勵大氣科學系（以下簡稱本系）學生走向國際、增廣見聞、發展所長，富德國際開發股份有限公司（RIDC）發起，以孫繼文長輩 (臺灣大學法律系系友）為名號，並由大壽電子有限公司（TA-SHOU）、翔業實業股份有限公司（SHINE-YEA）等三家公司及張群釗先生名義，共同贊助新台幣壹佰萬元，成立「繼文 RTS 青年海外視野基金」，於 2017 年 11 月 15 日在臺大大氣科學系舉行捐款儀式。

The NTU Azalea Festival

The NTU Azalea Festival is held in March every year, which includes department exhibitions, student club exhibitions and performances attracting high school students from all over Taiwan. NTUAS also set up a booth, providing an introduction of our department courses and information of atmospheric sciences.

臺灣大學每年 3 月都會舉辦為期兩天的杜鵑花節。活動內容包括學系博覽會、社團聯展以及表演活動，吸引臺灣各地高中生前來參觀，認識臺大各個科系，作為升學時的參考。

■ The NTU Azalea Festival was held on March 11th to 12th, 2017.

Commencement

The Commencement of NTU took place in the morning of June 4th 2017, along with the dean's award ceremony. In the afternoon, a hooding ceremony for all new graduates of NTUAS was held in the department, with family and friends sharing this cheerful moment.

臺灣大學畢業典禮在 6 月 4 日於臺大體育館舉辦。當天下午，系上進行畢業典禮，由系主任撥穗，並邀請畢業班導師及畢業生親友共同參與。

■ The students graduating from NTUAS in 2017 include 31 Bachelors, 22 Masters and 1 Ph.D.

2017 Study-Abroad Program

In order to increase theundergraduate students' knowledge of the overseas education program and provide an opportunity for undergraduate academic exchange, we invited students who took part in an overseas education exchange program at SUNY Albany on July 3rd, 2017, to share their experiences and research results at the Department of Atmospheric Science on December 7th.

為促進本系大學部學生對於海外教育計畫之認識並且提供大學部學生學術交流之機會，2017年7月3日前往美國紐約州立大學歐本尼分校進行海外教育交流，並於12月7日於大氣科學系舉辦海外教育計畫研究成果分享。

Students	Titles
蕭維廷	Understanding the correlation between typhoon precipitation and giant CCN in Taiwan
趙俐惟	Winter Extreme Snowstorms over the Coast of the Northeast United States: Sensitivity of Events to Choice of Stations
劉佩欣	The Effect of Ice Growth on the Ripening Process
王鏡惟	The Extreme Rainfall in Northeastern US in Association with the Remnants of Tropical Storm Lee
郭昱德	Microclimate Feature from ASOS & GABR Observation Data
黃偉峻	A general review of rain gauge design

Progress report on NTUAS's participation in PIRE

NTUAS Professor Ming-Jen Yang

This year's (2017) US-Taiwan PIRE Workshop was held on August 13th-14th at the National Central University Department of Atmospheric Science. The conference hosts were NCU Professor Pei-Lien Lin and SUNY Albany ASRC Director Prof. Everette Joseph. The August 13th conference started with 10 SUNY Albany students presenting their research in Taiwan during the summer, and was followed by NTUAS Prof. Chung-Tao Chou giving a talk on "Observational experiments on Taipei and New Taipei's afternoon convection and floods". Afterwards, NCU Prof. Ching-Yung Huang (also Director General of Taiwan Typhoon and Flood Research Institute) presented an introduction on the Taiwan Typhoon and Flood Research Institute, and NCU Prof. Yu-Ching Liao presented an introduction on C-POL radar and the mobile TEAM-R radar.

今年度（2017 年）的 US-Taiwan PIRE Workshop 於 8 月 13-14 日在中央大學大氣系召開，研討會主辦人為中大大氣系林沛練教授與歐本尼大學 ASRC 主任 Everette Joseph 教授。8 月 13 日的研討會先由歐本尼大學的 10 位學生們就他們暑假期間在台灣實習研究進行報告，下午則由大氣系周仲島教授就「雙北市午後對流及洪水觀測實驗」進行專題報告，接著由中大黃清勇教授（亦為颱洪中心主任）介紹颱洪中心概況，以及中大廖宇慶老師介紹 C-POL 雷達與可移動式 TEAM-R 雷達概況。

The August 14th conference started off with a round table discussion on the educational component of PIRE, and was followed by group discussions and responsibility allocations on climate issues, ensemble issues, microphysics issues, social impact issues and evaluation issues. In the afternoon, each group gave a presentation on their discussion and set commons goals for PIRE, for example, collaborating on publishing in academic journals and the number of graduate school student joint advisees.

A field trip was arranged for the students and faculty of PIRE on August 15-16. They visited the CWB Wufenshan weather radar station on the 15th in the morning, and visited the Fuguei Cape air quality and weather station operated by Academic Sinica Research Center for Environmental Changes. On the 16th, they visited YangMingShan National Park and the CWB Zhuzihu weather station.

■ NTUAS Prof. Po-Hsiung Lin (holding microphone) attending the US-Taiwan PIRE Workshop.

PIRE is an international collaborative project supported by the US National Science Foundation (NSF) and Taiwan Ministry of Science and Technology (MOST). It is planned for 5 years starting from the summer of 2015, so this year (2017) marks the end of the 2nd year, and there are 3 more years of project execution. So far, the exchange between NTU and SUNY Albany students has been very successful. Students from both sides have built strong friendships through these visits, and academic collaboration between faculties has been running smoothly. We hope that the passion and enthusiasm continues from both sides and maintains this successful collaboration in teaching and research throughout the next 3 years.

8 月 14 日的研討會先就 PIRE 計畫的教育層面進行圓桌會議（round table discussion），接著進行分組討論，分別就氣象（Climate）議題、系集預報（Ensemble）議題、雲物理（Microphysics）議題、社會衝擊（Social Impact）議題與評估（Evaluation）議題等進行細部溝通與分工的討論。下午則由各小組進行分組結論報告，以及 PIRE 計畫預定達到的目標如共同發表學術期刊論文及共同指導碩博士生數目等綜合討論。

8 月 15-16 日為 PIRE 計畫安排的教師與學生們野外參訪活動（field trip）。8 月 15 日上午參訪氣象局五分山雷達站，下午參訪中研院環變中心富貴角空氣品質與氣象監測站，8 月 16 日參訪陽明山國家公園與氣象局竹子湖氣象站。

PIRE 計畫為美國國科會（NSF）與台灣科技部（MOST）共同支持的國際合作研究計畫，於 2015 年夏季開始執行為期 5 年，故至今（2017）夏季為第二年結束，後續還有 3 年的計畫要執行。截至目前為止，台灣大學與紐約州立歐本尼大學的雙邊學生互訪相當成功，雙邊學生透過互訪都建立深刻友誼，老師間的學術合作也在如期的進行中，希望在後續的三年雙方持續熱情、激發火光，讓彼此的教學與研究合作繼續發光發亮！

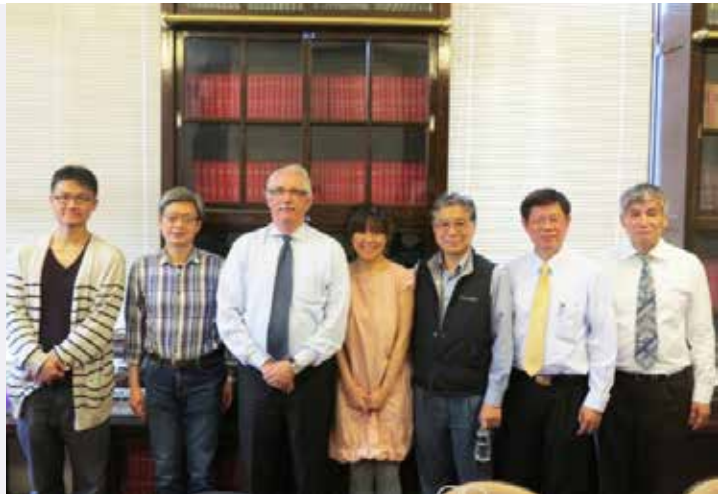
■ PIRE faculty and students visited the CWB Wufenshan weather radar station.

Visitors

Prof. John Wallace (U. of Washington) and Prof. Ngar-Cheung Lau (The Chinese University of Hong Kong) visited the department on March 29th 2017. Prof. Wallace gave a lecture on "the Atmospheric Signature of ENSO" for the graduate level course "general circulation". Using the anomalous atmospheric circulation during ENSO as an example, Prof. Wallace walked students through basic concepts of baroclinic and barotropic modes, Rossby waves, and momentum fluxes. Prof. Lau gave a lecture on "Heat waves in Southern China" during an elective class for Junior in the department "introduction to atmospheric research". Starting by showing statistics of station data and reanalysis data, Prof. Lau went over the synoptic behavior before and after heat waves and introduced the effects of urbanization. Both lectures were open to all faculties and students and inspired many discussions and questions. In the afternoon, Profs. Wallace and Gabriel had a few one-on-one discussions with faculties, postdocs, and graduate students working on natural variability and climate change in the department.

Prof. Antonio Busalacchi (President of UCAR) visited the department on March 30th, 2017 and delivered a seminar titled “The future of forecasts: earth system prediction in the 21st century”.

After the seminar, Prof. I-I Lin gave an introduction on recent departmental developments and discusses with Prof. Busalacchi issues regarding international collaboration and exchange.



Dr. Christina Patricola of Lawrence Berkeley National Laboratory visited the department on August 24th, 2017 and delivered a seminar titled “Oceanic and Atmospheric Controls on Tropical Cyclone Activity”.

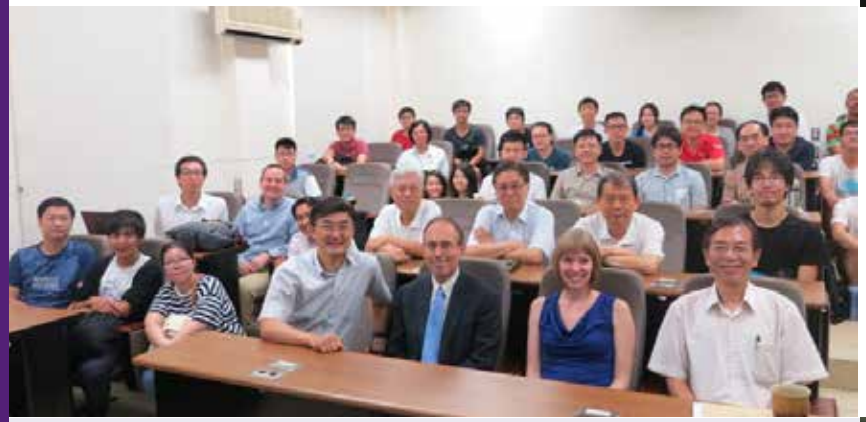
Prof. Yign Noh of Yonsei University visited the department on Sept. 28th, 2017 and delivered a seminar titled “Large eddy simulation and its application to the parameterization of turbulence in the climate model”.

Dr. Paulo Ceppi of University of Reading visited the department on Sept. 22nd, 2017 and delivered a seminar titled “Implications of evolving SST warming patterns for atmospheric circulation and climate sensitivity”.

Dr. Chi-Ming Peng visited the department on Sept. 28th, 2017 and delivered a seminar titled “Big data and Visualization Weather Service”.

Prof. Jin-Yi Yu of University of California, Irvine visited the department on Oct. 5th, 2017 and delivered a seminar titled “El Nino Research: A Historical Review”.

Prof. Jennifer Kay of University of Colorado visited the department on Sept. 29th, 2017 and delivered a seminar titled “Clouds in a Changing Arctic”.



Dr. Chris Davis of NCAR Mesoscale and Microscale Meteorology Laboratory and Dr. Angela Rowe of University of Washington visited the department on Oct. 16th, 2017. Dr. Chris Davis delivered a seminar titled “Evaluating Tropical Cyclone Forecasts in Global Models” and Dr. Angela Rowe delivered a seminar titled “Terrain-influenced precipitation processes in mid-latitude cyclones during the Olympic Mountains Experiment”.

Prof. Hiroyuki Yamada of Ryukyu University led 6 master students who were participant in “ICMCS-XII” to visit the department on Oct. 16th.

Dr. Hsiang-He Lee of Singapore-MIT Alliance for Research and Technology visited the department on Oct. 17th, 2017 and delivered a seminar titled “Haze and Its Impacts in Southeast Asia”.

Prof. Zhao Kun of Nanjing University visited the department on Oct. 24th, 2017 and delivered a seminar titled “ 華南暖季對流的雷達氣候學研究 ”.

Prof. In-Sik Kang of Seoul National University visited the department on Nov. 7th, 2017 and delivered a seminar titled “A Grey Zone GCM”.

Prof. Shih-Chieh Chang of National Dong Hwa University visited the department on Nov. 8th, 2017 and delivered a seminar titled “Fog and Ecosystem Function - a Case Study at the Chi-Lan Mountain Site”.

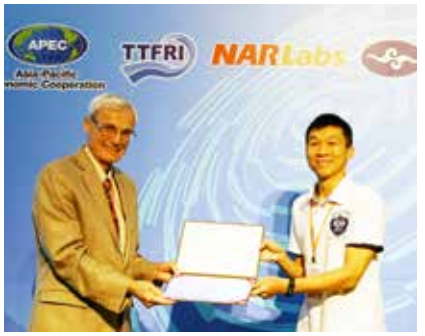
2017 APEC Typhoon Symposium –The Challenges and Opportunities for Typhoon and Flood Forecasting

2017 APEC Typhoon Symposium, “The Challenges and Opportunities for Typhoon and Flood Forecasting”, was held from May 2nd to 4th, 2017, in Taiwan. Two of our doctoral students, Hsiao-Ching Huang(黃曉晴) and Yi-Huan Hsieh (謝宜桓), and two of our master’s students Jyong-En Miao (繆炯恩) and Po-Yen Chen (陳柏言) attended this workshop and presented their work. PhD students Hsiao-Ching Huang and Yi-Huan Hsieh received the 1st and 2nd place award respectively in the PhD Program in Atmospheric Science. Master’s student Jyong-En Miao received the 1st place award in the Master’s Program in Atmospheric Sciences. Master’s student Po-Yen Chen received the Honorable Award in the Master’s Program in Atmospheric Sciences.

國家實驗研究院台灣颱風洪水研究中心於 2017 年 5 月 2 日至 3 日舉辦「2017 亞太颱風會議暨颱洪國際研討會」（2017 APEC Typhoon Symposium）。當中學生海報競賽中本系共有 4 位學生得獎，分別有 :

博士班第一名	黃筱晴
博士班第二名	謝宜桓
碩士班第一名	繆炯恩
碩士班優等	陳柏言

■ PhD student Hsiao-Ching Huang received the 1st place award respectively in the PhD Program in Atmospheric Science.



■ PhD student Yi-Huan Hsieh received the 2nd place award respectively in the PhD Program in Atmospheric Science.

■ Master’s students Jyong-En Miao received the 1st place award in the Master’s Program in Atmospheric .Sciences. Science.

National Taiwan University-Kyoto University Cloud, Typhoon and Weather Conference

The faculty and students of NTUAS and Kyoto University Atmosphere and Ocean Research Institute (AORI) held a conference on "Cloud, Typhoon, and Weather" on August 22nd-24th, 2017 at the NTU Brainstorming Conference Center. This conference is a continuation of the University Alliance of Weather Conference (UAW) between universities in Japan, Korea, Taiwan, and China, and aims to facilitate the discussion of climate research between faculty and students. UAW was created by Kyoto University and Seoul National University in 2002 to promote scholarly communication on climate model research. Taiwan was invited to participate in UAW in 2004.

This conference was planned by NTUAS Prof. Chung-Hsing Sui. A total of 88 people attended, including 21 Japanese (5 professors, 6 post-docs, 10 students), 53 from NTU (9 professors, 4 post-docs, 40 students and research assistants), 7 from Academia Sinica, 2 from National Central University and CWB, 3 Koreans (1 post-doc, 2 students), and 2 American scholars. Conference topics included the processes of convection, radiation, and water circulation, and issues on climate change, climate oscillation, and typhoons. For details, please go to the webpage https://ntuas-workshop-201708.firebaseapp.com/#/home. Presenters were mostly graduate school students who presented their work through oral or poster presentations. Most of the presentations inspired Q&A's and set the stage for continuous discussion and future collaboration. Attendees were pleased with the format, content, and impact of this conference, and support future bi-annual climate conferences between the two universities.

臺灣大學大氣科學系與日本東京大學大氣海洋研究所（AORI）氣候領域師生於今年（2017）8 月 22-24 日在臺大集思會議中心舉行了「雲、颱風與氣候」研討會。本研討會延續過去日、韓、台、中四方幾所大學間的大學聯盟氣候研討會（以下簡稱 UAW），以促進師生間的氣候研究交流。UAW 是東京大學與首爾大學兩校為促進氣候模式研究的交流而於 2002 年發起，台灣學界則於 2004 年被邀請加入 UAW 研討會。

本次研討會由大氣科學系隋中興教授籌劃，共有 88 人參加，包括日方 21 人（教授 5，博後 6，學生 10），臺大 53 人（教授 9，博後 4，學生與研究助理 40），中研院 7 人，其他單位 2 人（中央大學與氣象局），韓國 3 人（博後 1，學生 2），美國 2 位學者。會議內容包含對流、輻射、水循環過程，以及氣候變化，氣候振盪，颱風等各方面議題。詳細議程請參考網頁 https://ntuas-workshop-201708.firebaseapp.com/#/home。報告者大部分是研究所學生，透過各人自選的口頭或壁報方式，就自己的研究進展做報告。大部分的報告都引起問答的討論，建立許多持續討論與進一步交流合作的機會。參加會議師生們都肯定這次的會議形式、內容與成效，支持後續兩年舉辦一次兩校間的氣候研討會。

■ A group photo of the conference.

Climate Variability and Air-Sea Interaction Workshop

Climate Variability and Air-Sea Interaction Workshop was jointly held by Department of Atmospheric Sciences (National Taiwan University, NTU), Oceans and Atmosphere, Commonwealth Scientific and Industrial Research Organisation (CSIRO Australia), Research Center for Environmental Changes (Academia Sinica), and Department of Earth and Life Sciences (University of Taipei) on October 12 and 13 at Department of Atmospheric Sciences, NTU. Australian scientists Dr. Wenju Cai, Dr. Agus Santoso and Dr. Jing-Jia Luo and American scientist Dr. Jin-Yi Yu were invited to discuss topics about climate variability and air-sea interaction. Local scientists, post-doctoral researchers, and master students also join the discussion.

Various topics were reported in the workshop. Scientists discuss climate phenomena from both atmospheric and oceanic sides. The topics included El Niño and its impact on climate anomaly, effect of surface orography and land-sea contrast on the Madden–Julian Oscillation, the inter-basin climate impact, typhoon-ocean interaction and all the climate phenomena changes under global warming. Those topics looked diverse but connected in various spatial and temporal scales. That is why the attendees discussed enthusiastically and agitated new ideas. Dr. Wenju Cai from CSIRO, Australia had published hundreds of papers in past twenty years. Tens of Dr. Cai papers were published in Nature Series journals and were cited over 5200 times. Dr. Cai was also invited to share his experiences in writing papers. This was truly a rare and valuable opportunity. We believed that the attendees all enjoyed his talk and gained much.

臺灣大學大氣科學系協同澳洲聯邦科學與工業研究組織海洋與大氣研究所（Oceans and Atmosphere, Commonwealth Scientific and Industrial Research Organisation, CSIRO Australia）、中央研究院環境變遷中心與臺北市立大學地球環境暨生物資源學系於 2017 年 10 月 12、13 日假台灣大學大氣科學系舉辦 Climate Variability and Air-Sea Interaction Workshop。會議邀請澳洲、美國知名科學家蔡文炬博士（Dr. Wenju Cai）、Dr. Agus Santoso、羅京佳博士（Dr. Jing-Jia Luo）、余進義博士（Dr. Jin-Yi Yu）來訪，針對氣候變異度與海氣交互作用等相關議題進行討論，國內亦有科學家、博士後研究員與研究生參與報告討論。

會中議題多元，由海洋與大氣兩方面進行相關之氣候現象討論，包含有：聖嬰現象與其造成之氣候異常、MJO（Madden–Julian Oscillation）受地形與海地對比下的影響、跨海盆間的氣候影響、颱風海洋交互作用，以及前述氣候現象在全球暖化影響下之變化，題目看似分歧，卻在不同時間空間尺度下有關聯，故引起科學家之間討論熱烈、激盪出新的想法。來自澳洲 CSIRO 的蔡文炬博士在過去二十年曾發表百餘篇學術論文，其中十餘篇刊登於 Nature Series 期刊 , 引用次數超過 5200 次，議程亦安排請蔡博士分享相關經驗，此經驗分享實為難得，相信與會人士皆有所收穫。

■ Group photo at classroom B105, Department of Atmospheric Sciences, NTU.

Conference on Mesoscale Convective Systems and High-Impact Weather in East Asia

The Conference on Mesoscale Convective Systems and High-Impact Weather in East Asia (ICMCS-XII) was held between October 17th and 20th, 2017, at the NTUH International Convention Center. Starting from the 1st year of ICMCS in 2000, the conference is held every 18 to 24 months by different countries including Korea, Taiwan, Japan, China, and USA.

NTUAS Professors Hung-Chi Kuo and Chung-Tao Chou planned the 12th year of ICMCS jointly and invited international researchers from various fields to attend, including 7 NTUAS professors – Prof. Hung-Chi Kuo, Prof. I-I Lin, Prof. Ming-Jen Yang, Prof. Po-Hsiung Lin, Prof. Cheng-Ku Yu, Prof. Ching-Sheng Li, and Prof. Chung-Tao Chou. The conference focused on the evolving process of mesoscale convective systems, and presented the trends in observation, data, modeling, and forecasting techniques. This not only enhances our nation's understanding and technologies in disaster atmosphere and mesoscale weather, but also helps develop our weather disaster prevention technologies, and provides an opportunity for international professionals to learn about Taiwan's technological advances, which may lead to chances for collaboration.

東亞中尺度對流系統與高影響天氣會議（Conference on Mesoscale Convective Systems and High-Impact Weather in East Asia，簡稱 ICMCS-XII）於 2017 年 10 月 17 日至 20 日在臺灣大學醫學院國際會議中心舉行。自 2000 年第一屆中尺度系統國際研討會 （International Conference on Mesoscale Convective System，簡稱 ICMCS）開始，分別由韓國、臺灣、日本、中國及美國等國家輪流為期 18 至 24 個月主辦一次。

本次第 12 屆 ICMCS（ICMCS-12）研討會主要由臺大大氣科學系郭鴻基教授與周仲島教授共同籌劃，邀請國際各相關領域研究人員參與。包含大氣科學系 7 位教授，有郭鴻基教授、林依依教授、楊明仁教授、林博雄教授、游政谷教授、李清勝教授、周仲島教授。會議中探討中尺度對流系統的形成與演變過程，同時提供觀測、資料、

模式及預報技術的發展趨勢，除了提升我國災害性大氣與中尺度氣象相關科學與技術的進展，並促進我國氣象防災科技進一步深化，也藉此讓國際人士進一步認識臺灣科技發展的現況，謀求合作的機會。

■ Group photo of the ICMCS-XII.

Investigating the convection diurnal cycle over South China Sea and Maritime Continent using satellite observations and the superparameterized global climate model

以衛星雲雨觀測及多重尺度全球氣候模式探討南海 - 海洋大陸地區對流日夜變化

Wei-Ting Chen, Assistant Professor
助理教授　陳維婷

南海至海洋大陸地區位於印度洋和赤道西太平洋之間，是全球最大島群與最溫暖的海水的所在之處。此區域不但是南北向區域哈德里環流與東西向太平洋赤道沃克環流的主要上升區，也是重要的大尺度水氣通道，以及中緯度－熱帶地區交互作用最強烈的地區。臺灣周遭區域的天氣與氣候也經常受到南海地區對流與水氣過程的顯著影響，例如西南氣流是夏季中尺度對流與颱風等強降雨事件的主要水氣來源。然而南海－海洋大陸區域也是當前天氣與氣候數值模式中降水模擬最需要改善的區域之一，在此區域的偏差可以透過大尺度環流影響到其他區域的模擬結果。

由於南海－海洋大陸地區具有複雜的島嶼山脈地形與海岸線，其對流活動具有明顯的日夜週期與海陸對比。在南海夏季季風肇始，或有 30 ～ 60 天季內震盪等現象，造成大尺度熱力與動力環境條件發生變化時，對流日夜循環與中尺度組織程度往往隨之有顯著反應，並產生跨尺度的交互作用。要正確模擬上述現象，需要掌握對流日夜循環在海洋、沿岸、與陸地的差異性，以及對流組織化的過程，這對於使用簡單對流參數法的傳統全球氣候模式而言極具挑戰性，也可能是造成氣候模式在模擬季節不對稱轉換與季內震盪現象有所偏差的主要原因之一。

本研究室在過去兩年利用衛星雲雨觀測資料與不同尺度的大氣數值模式，研究南海－海洋大陸地區對流日夜循環的特徵與詳細物理機制，並探討其跨尺度交互作用。此研究方向透過理學院的醉月湖計畫打下關鍵基礎，是臺灣首次成功以多重尺度全球雲解析氣候模式（super-parameterized CAM）完成氣候模擬實驗，目前更耦合了單層海洋模式，發現在南海 - 海洋大陸地區的對流日夜循環、季內震盪與夏季降水模擬結果都較傳統全球模式有所改善。此外，透過分析 17 年南海夏季季風肇始期間的 TRMM 衛星降水資料，我們量化了不同組織程度的對流系統對於降水的貢獻程度與海陸差異（圖一），並依此設計理想化高解析雲解析模擬實驗，瞭解海陸分布導致對流日夜變化的激發、傳播、成長機制，及其對季風大尺度環流的反應。

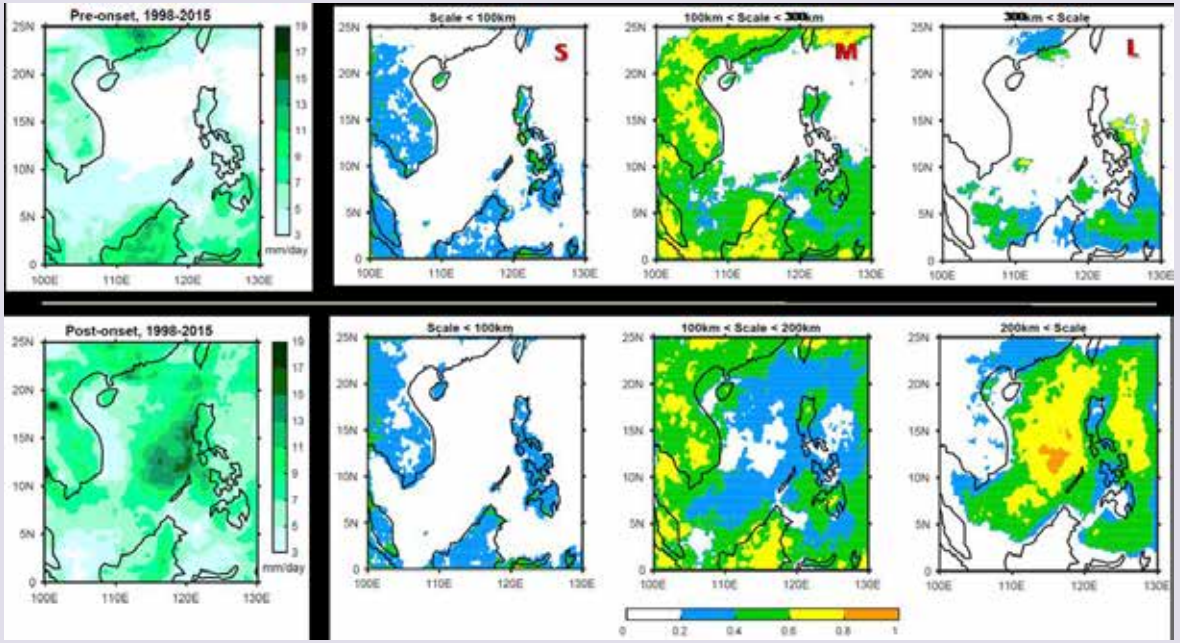
基於南海－海洋大陸地區天氣與氣候現象的重要與獨特性，本系隋中興、林博雄教授積極推動「南海－海洋大陸區對流與大尺度環交互作用」科技部三年期整合型計畫，將在在 2017-2019 年於南海地區進行密集的氣象與海洋觀測活動，上述的一系列工作做為子計畫之一，提供了重要的衛星觀測分析與數值模擬參考結果。此整合型計畫也將與國際學界的「海洋大陸年（Years of the Maritime Continent）」大型觀測與模擬研究計畫協調進行觀測，是臺灣參與此國際科研盛事的重要貢獻，期望能增進瞭解此區域天氣－氣候變化及其對全球的影響，做為提升此區域天氣預報與氣候模擬能力的重要基礎。

Current state-of-the-art global atmospheric models still exhibit significant biases in simulating precipitation over the South China Sea (SCS) and Maritime Continent (MC) region from diurnal to seasonal time scales. The complex coast lines and island topography over this region generates strong convection diurnal cycle, with significant land-ocean contrast. During summer monsoon onset or active intraseasonal oscillation, the diurnal cycle and organization of convection respond prominently to the changing large-scale dynamic and thermodynamic conditions. The physical processes controlling the triggering, propagation, and organization of the diurnal convection, and their sensitivity to large-scale ambient conditions may be the key to successfully simulate the convection cross-scale interactions over the SCS-MC region.

In the past two years, our research group has been investigating the diurnal cycle convection over SCS-MC using multi-year satellite observations and model simulations. We focus on the cross-scale interactions between diurnal convection and SCS summer monsoon onset and intraseasonal variability. We have carried out the climate simulations using multi-scale framework global model, SuperParameterized Community Atmosphere Model (SPCAM). This is the first time in Taiwan's climate research community to use the SPCAM, initiated with the support of the "Drunken Moon Project" from College of Science in NTU. We coupled the SPCAM with a slab ocean model and have identified significant improvements in diurnal cycle convection, intraseasonal variability, and summer monsoon onset over SCS-MC, as compared to conventional global models. In addition, based on composite analyses of the TRMM precipitation estimation and CloudSat vertical cloud retrievals, we have also quantified the drastic increase in large (>300 km) coastal organized precipitating systems from the pre-onset to post-onset periods during the SCS summer monsoon (e.g., Fig. 1). High resolution, idealized cloud resolving simulations based on these observational analyses are ongoing to understand the detailed physical mechanisms controlling the responses of coastal diurnal convection to monsoonal large-scale environment.

The above research activities are under the umbrella of the three-year integrated MOST project, "Convection and Large-scale Interactions over SCS-MC", lead by Professors Chung-Hsiung Sui and Po-Hsiung Lin in NTUAS. This integrated project aims to carry out intensive field observations (SCSTIMX) of the atmosphere and ocean in South China Sea during the summer and winter monsoon period in years 2017 to 2019, to understand the multi-scale convection variability and tropical-extratropical interactions over SCS; it is also a major participation from Taiwan's atmospheric and ocean science community to the important international field campaign, "Years of Maritime

Continent". These internationally-collaborated intense observations and modelling activities are expected to lead to improvements of weather forecast and climate simulation over the SCS-MC region.



■ 由 17 年（1998-2015）Tropical Rainfall Measuring Mission (TRMM) 衛星降水 3B42 推估資料，計算出南海夏季季風肇始前 20 天（上排）與後 20 天（下排）的平均降水空間分布（左一），以及不同水平尺度的對流降水系統對於總降水量的貢獻比例：水平尺度 < 100 km（左二）、100-300 km（左三）、> 300 km（左四）。

■ Fig.1 (First column) Climatology composite mean of precipitation 20 days before (upper) and after (bottom) the onset date of SCS summer monsoon based on 17-year (1998-2015) TRMM satellite 3B42 estimation. (Second-Fourth columns) The fractional contribution to total precipitation from systems of various horizontal scales during the pre-onset (upper) and post-onset (bottom) periods: Small (<100 km), Medium (100-300 km) and Large (>300 km) systems. The horizontal scale of a precipitation system is defined as the square root of contiguous areas with precipitation rate > 1 mm hr-1 detected in TRMM 3B42.

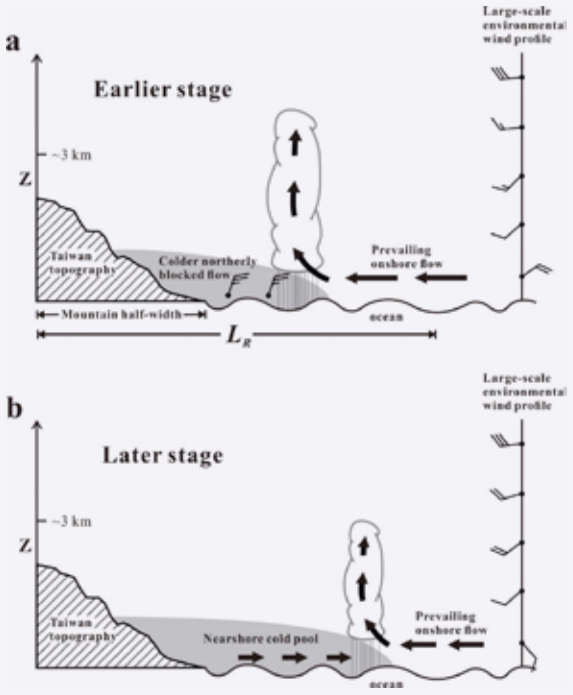
Formation and Maintenance of a Long-Lived Taiwan Rainband during 1–3 March 2003

長生命期臺灣雨帶之生成與維持機制

Cheng-Ku Yu* and Che-Yu Lin
游政谷教授＊與林哲佑

Taiwan rainbands (TRs), defined here as convective lines, which form off the mountainous eastern coast of Taiwan under weakly synoptically forced weather conditions, are a well-known mesoscale phenomenon, but their formative processes remain the subject of debate. This study uses surface and radar observations within the coastal zone of eastern Taiwan and NCEP reanalysis data to document a long-lived TR with a lifetime of ~36 h during 1–3 March 2003 to advance the current general understanding of mechanisms responsible for the TR's formation and maintenance. Detailed analyses indicate that the rainband was initiated by convergence that was produced as low-level environmental northeasterly/easterly onshore flow encountered topographically blocked northerlies that developed nearshore. The northerly blocked flow was observed to weaken and subsequently dissipate because of changing synoptic pressure patterns that caused prevailing southeasterlies/southerlies at low levels. However, colder nearshore air that resulted from the combined effects of orographic blocking, the evaporation of the TR's precipitation, and radiative cooling over coastal land continued to persist and acted to provide a continuing source of lifting for the subsequent maintenance of moist convection. Temporal variations in the precipitation intensity of the studied TR were also shown to be consistent with the theoretical prediction of the interaction between the cold pool and ambient vertical shear. This study suggests that multiple precipitation mechanisms, which involve interactions of diurnally, topographically, and convectively generated circulations along the mountainous coast, may operate and contribute to the longevity of a TR event under suitable circumstances, such as the rapidly evolving synoptic flow observed in the present case.

在弱綜觀的環境下，臺灣東部沿海地區經常有對流線的形成，本研究將此中尺度現象正名為臺灣雨帶，而其生成過程在科學層面上仍相當分歧。本研究主要使用臺灣東部沿海地區之地面觀測、雷達與 NCEP 再分析資料針對 2003 年 3 月 1~3 日的長生命期（約 36 個小時）臺灣雨帶個案進行深入探討，期望能增進我們對於臺灣雨帶生成與維持機制的了解。詳細的分析顯示低層環境向岸風（東北風 / 東風）遇到近岸的地形屏障氣流（北風）所產生的輻合為此雨帶之生成機制。隨後由於低層盛行風轉成東南風 / 東風，大環境氣壓分布也改變，進而導致地形屏障氣流逐漸減弱並消散。然而，透過地形的屏障效應、雨帶降水造成的蒸發冷卻效應與沿岸陸地上的輻射冷卻熱力作用，沿岸低層冷池得以持續存在，並提供氣流舉升強迫機制來維持雨帶的對流。此外，診斷分析顯示冷池與環境垂直風切的交互作用可說明雨帶降水強度隨時間演變的趨勢。透過此研究，我們學習到一當綜觀環境風場隨時間有明顯的變化下，多重對流強迫機制可能發生在同一個案，而這些機制牽涉日夜環流、地形效應與對流所產生環流之間的交互作用，對於台灣雨帶對流維持有著重要貢獻。



■ Fig. 1. Two-dimensional schematic vertical cross section illustrating mechanisms responsible for the formation and maintenance of the studied TR off the eastern coast of Taiwan on 1–3 Mar 2003. This section is oriented approximately perpendicular to the eastern coast of Taiwan and the rainband. We highlight the rainband's (a) earlier and (b) later development. The thick arrows indicate salient airflow features in the vicinity of the rainband, and gray shading represents the regions of the colder northerly blocked flow and the nearshore cold pool. Winds within the blocked zone and the large-scale prevailing winds to the east of the studied rainband are also shown, with full (half) wind barbs corresponding to 5 (2.5) m s-1. In (a), LR represents the Rossby radius of deformation, a theoretical horizontal scale of upstream extent for orographic blocking

■ 圖 1： 2003 年 3 月 1~3 日長生命期臺灣雨帶之（a）生成與（b）維持機制示意圖。伴隨雨帶的氣流結構以箭頭表示。灰階分別代表地形屏障氣流（blocked flow）或冷池（cold pool）的區域。LR 表示羅士比變形半徑（Rossby radius of deformation）。屏障氣流與環境風隨高度之變化情形皆以風標表示。風標 full-bar 為 5 m s-1，half-bar 為 2.5 m s-1。

Create your own Atmospheric Phenomena

動手玩大氣

王俊清、洪惠敏副教授 *

Air pollution is getting everyone's attention due to the frequent air polluted days. As we breathe air, the chemical species suspend in the air can get into our lung as well. Most of the time, we rely on the air quality data reported by Taiwan environmental protection agency. With the development of internet of thing (IoT), we can learn how to monitor our environment through some small sensors by ourselves. To provide students the knowledge of IoT to the environmental application, a new course of air pollution laboratory was introduced in the fall semester of 2016. This course provided students hands-on experience to assemble Arduino electronic prototyping platform with some developed sensors to monitor the air quality in our environment in addition to learning the fundamental knowledge regarding the cause of air pollution. With an affordable budget, the students assemble a simple air quality monitor individually. They use such device perform a final project to understand the temporal and spatial distribution of air pollutants in our environment and to derive the possible sources and effective solutions to improve the air quality.

大氣科學其實是個可以很理論也可以很應用的科學。當我們坐在教室嘗試透過物理和數學，推導完各種天氣現象的方程式，回到實驗室又是面對排山倒海而來的程式碼。幾乎所有的大氣科學實驗都是在電腦進行的，將觀測到的氣象初始資料進行資料同化以後，讓電腦做時間積分及分析來獲得研究或預報結果。然而當我們把所有的精神和心思都花費在如何改善模式或預報，或甚至想盡辦法增進電腦的運算能力時，其實大氣周遭很多事物也會受到大氣運動的影響，而大氣科學對此方面的實際探究的接觸相對而言較少。

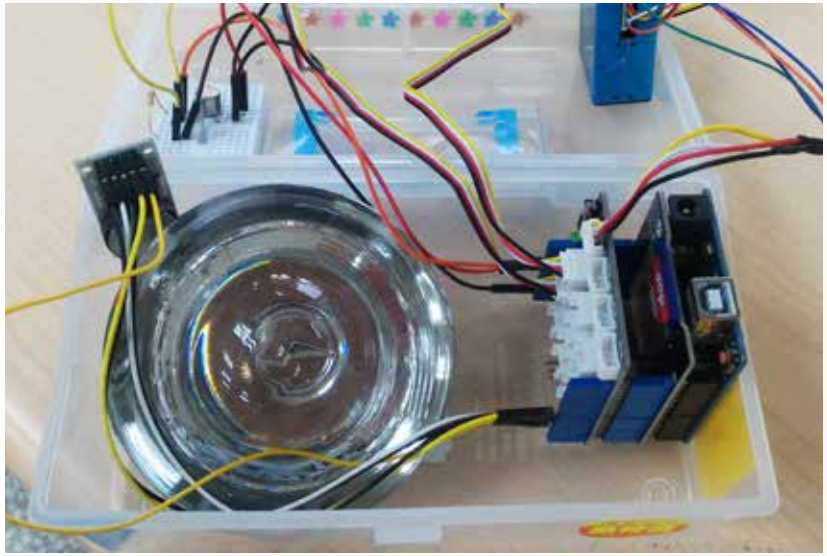
通常人類在沒有空氣的環境超過 3 分鐘便會因窒息而死亡，而近年來，我們時常在報章雜誌或新聞媒體中耳聞一些紫爆、霧霾等等如雨後春筍般用來形容空氣污染的名詞；然而在危言聳聽的氛圍下，我們究竟對我們吸入的空氣成分有多少了解？

在 105 年上學期大氣系新開設的”空氣污染實作”課程提供學生們學習現今最流行的物聯網平台常用的 Arduino 開發板，進而結合量測溫度、濕度、氣壓、二氧化碳、懸浮微粒和揮發性有機氣體等簡單的感應器來量測周遭環境的即時狀況；也許是我們上課的教室、繁忙的交通要道、或是自然產生的空氣污染源。

在課程中，學生們需學習 Arduino 開發板基本功能、了解各感測器的原理，及測試每一感測器的運作方式。有了空氣污染基本知識及初步對電子元件及感測器的認知後，則須自行設計觀測的實驗包含目的、地點、時間及所需觀測項目來進行期末主題規劃；確認觀測主題的可行性後進而組裝所需的感測器、撰寫程式碼、測試感測器與控制板間是否正確溝通且完整儲存及讀取觀測資料。在完成初步測試後，學生們就可根據自己的實驗規劃執行實地觀測。觀測期間須對觀測的設計及執行規劃進行進度口頭報告並與其他同學進行交流，在進度報告中，同學的經驗分享及建議常為觀測所遇問題提供多元的解決方法。期末則將觀測資料進行分析並繪圖找出特殊及有趣的趨勢進行口頭報告及討論。

學生們在這門課除了對於工具的學習外，透過親自實作，了解到大氣的觀測完全不是一件簡單的工作。理想的設計中時常會遇到重重的阻礙；例如實驗方法是否可以詮釋所要探討問題（控制變因的掌控），觀測點佈設是否洽當，或在觀測期間可能會遇到電源供應的問題，又或是觀測完畢後發現控制板和感測器的溝通上面出了問題，導致完全沒有資料的情形發生。在這些失敗的過程中也讓學生們體會到，搜集觀測資料可能會遇到的阻礙，及學習如何規劃一個成功的小型觀測計畫，因為真實大氣現象是無法完全重現同一情境，往後在使用寶貴的觀測資料時也會思索觀測期間可能的景象及難度並心懷感謝。此課程提供埋頭於電腦計算分析的學生們另一眼界及訓練，並了解現今科技的便利性讓自己可利用開放原始碼的單晶片微控制器（Arduino），接上一些簡單的感測器及撰寫程式碼，就可以輕鬆得到周遭環境（室內或室外）的即時空氣品質數據及氣象參數（溫度、濕度及氣壓），也可為小尺度的氣象觀測做一些貢獻。

王俊淸同學目前是大氣系四年級學生，在 105 年度上學期參與”空氣汙染實作”課程；在 105 年度下學期，延續課程所學修習獨立研究，目前進行更趨近環境濃度靈敏感測器的測試與架設。



■ 學生組裝的觀測儀器組合之一；包含溫度、濕度、氣壓、及二氧化碳、懸浮微粒和揮發性有機氣體等感應器，設置於薇閣中學量測新北投空氣品質。（王俊淸同學提供）

■ 學生組裝的觀測儀器組合之二；利用溫度、濕度、氣壓、光度、二氧化碳、懸浮微粒和揮發性有機氣體等感應器，探討不同植物對空氣品質影響。（陳威志同學提供）

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Ho, An-Chi 何安琪	Responses of Land-Atmosphere Interactions to the Change in Irrigation Area Sizet 灌溉面積變化對陸氣交互作用之影響
Lu, Kuan-Yu* 陸冠宇 *	The Role of the Boundary Layer Dynamics in Secondary Eyewall Formation 邊界層動力在颱風的雙眼牆形成過程中所扮演的角色
Chen, Ying-Ju 陳映如	Atmospheric Rivers in Western North Pacific and Influenced by Tropical Cyclones 西北太平洋大氣長河及其受熱帶氣旋之影響
Liu, Hsun-Tse 劉巽澤	Simulated convective-radiative equilibrium responses to SST forcing in a cloud resolving model 雲解析模式受海溫驅動的輻射對流平衡反應
Chao, Hsing-Ju 趙興儒	Phase Transition of Aerosols Monitored by Quartz Crystal Microbalance 利用石英晶體微天秤監測氣膠相變化
Li, Kuan-Chen 李冠辰	Understanding the Time Scales and the Mechanisms of Tropical Responses to Extratropical Forcings 探討中高緯的強迫影響熱帶環流之時間尺度與機制

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Wu, Wei-Lin 吳蔚琳	The Characteristics of Convective Aggregation in Rotating Radiative-Convective Equilibrium Simulated by a Cloud-Resolving Model 利用雲解析模式模擬旋轉輻射對流平衡下對流集結之特徵
Chang, Chiao-Wei 張巧薇	The Susceptibility of East Asian Marine Warm Clouds to Aerosol Index During Winter and Sparing From Satellite Observation 使用衛星觀測分析東亞冬春季海洋暖雲對氣膠之敏感性
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Wang, Li-Chia 王理甲	Parameterization of the maximum cloud drop number concentration in a lifting parcel 舉升氣塊中最大雲滴數量濃度的參數化方法
Chen, Yung-Chang 陳永昌	Application of Lidar Power Ratio on Determination of Cloud Base Height and Aerosols Hygroscopicity 運用光達參數”Power Ratio”判斷雲底位置與氣膠吸濕性
Liang, Shao-Lun 梁紹倫	PThe Effects of Ice Nuclei on Clouds and Precipitation: A Numerical Case Study of a Winter Frontal System in East Asia 冰核對雲和降水的影響：在東亞地區冬季鋒面系統環境下的數值模擬個案研究

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Kuo, Wei-Chen 郭威鎮	On the Convective Updraft Fraction Dependency of Sub-grid scale Vertical Transport in Zhang-McFarlane Convection Parameterization Zhang-McFarlane 積雲對流參數化中次網格對流與對流覆蓋比例關係之探討

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