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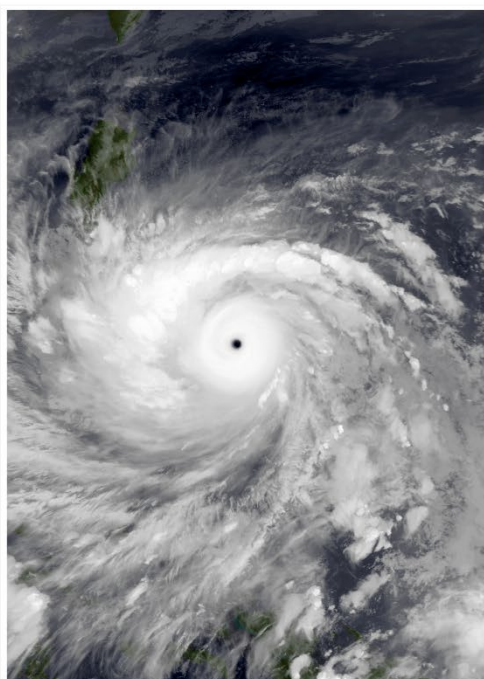


PhD student Hsiao-Ching Huang was honored with the 2025 Dr. Chia Chou Thesis Award from the Meteorological Society of the ROC in Taipei, Taiwan.

CATEGORY '6' TROPICAL CYCLONE HOT SPOTS ARE GROWING

CLIMATE CHANGE IS MAKING MASSIVE HURRICANES AND TYPHOONS MORE LIKELY IN THE WESTERN PACIFIC, NORTH ATLANTIC AND GULF

16 December 2025



Typhoon Haiyan shortly before maximum intensity while approaching the Philippines on November 7, 2013
Credit: NASA

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NEW ORLEANS — The oceanic conditions that churn up the very strongest of hurricanes and typhoons are heating up in the North Atlantic and Western Pacific, fueled by warm water that extends well below the surface. Human-caused climate change may be responsible for up to 70% of the growth of storm-brewing hotspots there, according to new research.

These hot spots are making it more likely that stronger Category '6' tropical cyclones may hit landfall in highly populated areas.

"The hot spot regions have expanded," said H-Lin, a chair professor in the Department of Atmospheric Science at the National Taiwan University.

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Press release in the 2025 American Geophysical Union (AGU) Annual Meeting on "Category '6' Tropical Cyclone Hot Spots in the Warming Climate" (2025)

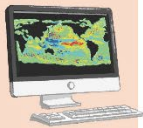


林依依

專長：跨領域-衛星遙測、大氣與海洋科學
 【颱風/颶風-海洋交互作用、氣候、與全球
 暖化、碳循環】

率先指出在全球暖化下因上下層海水暖化速率不同對未來颶風/颶風強度可能造成的影響；發現造成緬甸13萬人死亡的納吉斯颶風在登陸前突然增強以颶風暴災的原因；透過NASA衛星的海洋水下溫度資料，提出海洋暖渦是颶風升級為超級颶風的主要因子。

07
July



Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Sun.
29 十五	30 國際小行星日	1 十七	2 十八	3 十九	4 二十	5 廿一
6 廿二	7 小暑	8 廿四	9 廿五	10 廿六	11 廿七	12 廿八
13 廿九	14 六月	15 初二	16 初三	17 初四	18 初五	19 初六
20 初七	21 初八	22 初九	23 大暑	24 十一	25 十二	26 十三
27 十四	28 十五	29 十六	30 十七	31 十八	1 原住民族日	2 二十



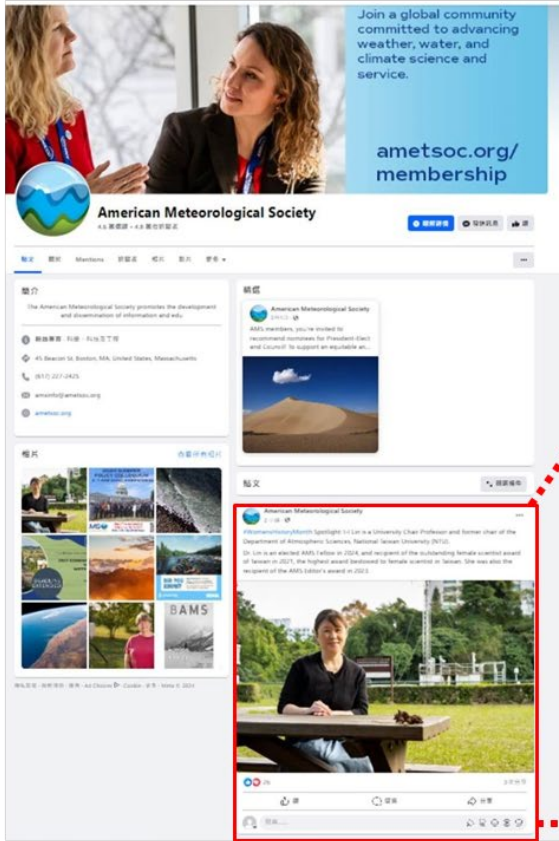
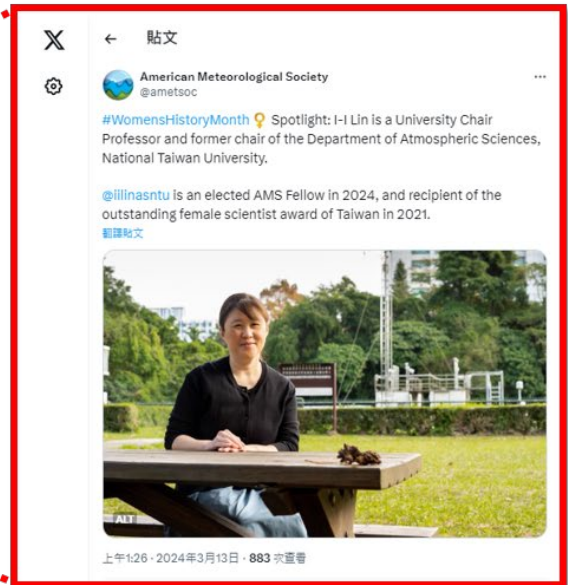
“2026 Taiwan Women Scientists Calendar”: July Featured Scientist



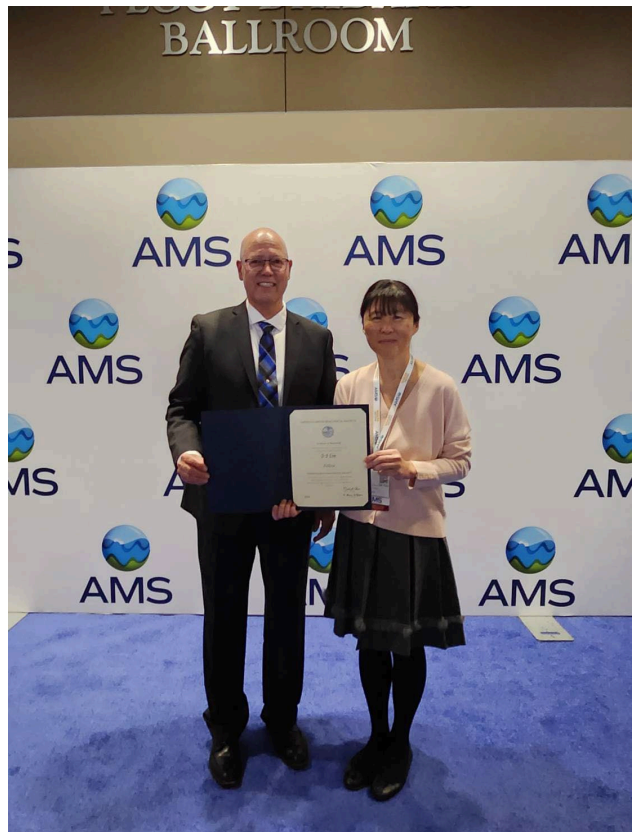
PhD student Hsiao-Ching Huang was honored with the Presidential Award for Graduate Students at National Taiwan University in 2025.



PhD student Hsiao-Ching Huang was honored with the College of Science Dean's Award at National Taiwan University in 2025.



Spotlighted by American Meteorological Society (AMS) – Women’s History Month (2024) [Facebook] [X (Twitter)]



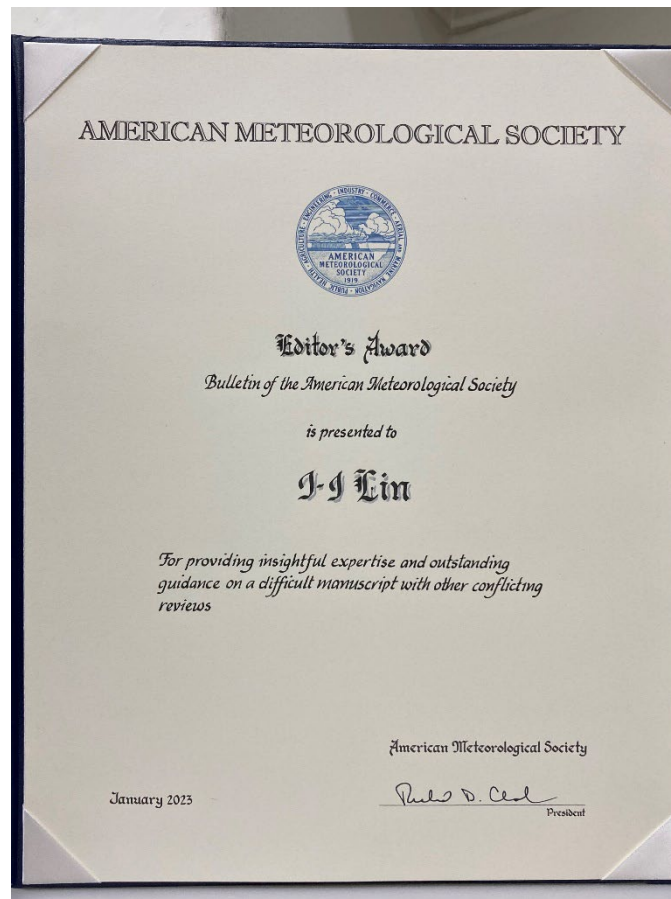
Fellow of American Meteorological Society (AMS, 2024) [\[Link\]](#) [\[YouTube\]](#)

Editor's Award - Bulletin of the American Meteorological Society



I-I Lin

For insightful and detailed comments that have been instrumental in reaching publication decisions on challenging manuscripts



The AMS Editor's Award - Bulletin of the American Meteorological Society. The award citation reads "For insightful and detailed comments that have been instrumental in reaching publication decisions on challenging manuscripts" (2023). [\[link\]](#)



台大教授林依依獲選國家講座主持人 替「媽媽科學家」請命



教育部今天舉行「第25屆國家講座主持人獎、第4屆國家產學大師獎、第65屆學術獎」頒獎典禮，台灣大學大氣科學系特聘教授林依依帶領團隊破解超級颱風成因，研究成果廣泛應用在颱風強度預報，獲選國家講座主持人；屏東科技大學獸醫系特聘教授陳右柱，專長為魚類免疫學、水產動物細菌學，他客製化建置「生產醫學平台」，獲選國家產學大師獎。

今年共有7人獲得國家講座主持人獎、4位獲選國家產學大師獎及10位獲得學術獎。行政

https://udn.com/news/story/6885/6180913?from=udn-catalistnews_ch2



獲選國家講座主持人的林依依與獲選國家產學大師獎的陳右柱。圖為林依依與陳右柱獲獎後合影。圖為林依依與陳右柱獲獎後合影。

<https://www.ner.gov.tw/news/623947cac7513d0007ff8e10>

為「媽媽科學家」請命 林依依：讓她們有在家工作的選項



台大農生環境學院特聘教授林依依獲選今年度國家講座主持人，她向國家請命，希望「媽媽科學家」能擁有在家工作的選項。圖為林依依獲獎後合影。

<https://www.chinatimes.com/realtimenews/20220321003028-260405?chdtv>

The Ministry of Education's 25th Annual National Chair Professorship Award (2022)



TAIPEI TIMES

Female scientists win awards, urge better conditions

Female scientists are often required to juggle their research and family responsibilities, researchers told an awards ceremony on Saturday, urging institutions to implement better work conditions for women.

Female researchers have been known to quickly return home to children from overseas events and work on their thesis in a postpartum care center, National Taiwan University (NTU) distinguished professor Lin Yi-yi (林依依) said.

Lin, who won Most Outstanding Researcher at the 14th annual Taiwan Outstanding Women in Science awards ceremony, said that improving work conditions for female scientists would allow them to excel at their research, which in turn would benefit the nation.

TAIPEI TIMES

From left, National Yang Ming Chiao Tung University assistant professor Wu Han-chen, National Taiwan University (NTU) distinguished professor Lin Yi-yi, NTU assistant professor Chen Yu-ming and NTU post-doctoral researcher Chuang Tsao-chi hold up their awards at the Taiwan Outstanding Women in Science award ceremony in Taipei on Saturday.

The awards ceremony — held jointly by L'Oréal and the Wu Chien-shung Education Foundation — recognizes female scientists for outstanding achievements in their field.

The Young Scientist of Excellence award was won by National Yang Ming Chiao Tung University assistant professor Wu Han-chen (吳涵宸) and NTU assistant professor Chen Yu-ming (陳毓暘).

NTU post-doctoral researcher Chuang Tsao-chi (莊葆琪) won a scholarship named for Meng Tsui-chu (莊淑娟), a woman who researched and taught at National Yang Ming University.

Lin's research, which includes satellite telemetry, the Earth's atmosphere and the oceans, analyzes data from light-sensor aircraft and advanced satellite telemetry to study the interaction between ocean waters and typhoons, as well as the effects of global warming on El Niño and La Niña weather phenomena.

Her work was recognized for its contributions to forecasting typhoons, the foundation said.

"Doing research makes me feel like I'm Alice in Wonderland. Every day, there are fascinating discoveries," she said.

However, institutions must create better environments for female researchers with children, such as allowing meetings to be conducted online, she added.

Wu's research studies green energy development and applications, including thermodynamics and pyroelectric materials. Her work has been subsidized by the Ministry of Science and Technology.

Wu said that she has had to overcome many obstacles, including being told that women "should not read too many books."

However, her love of science pushed her to forget such comments and move ahead, she said.

Chen's research studies natural languages and dialogue systems, and has been used to help artificial intelligence (AI) systems understand and analyze human languages.

She said that she was drawn to her research by a dream of developing speech-analysis systems that could be used in robots and smart home appliances.

There are disproportionately few women in AI research, Chen said, adding that more women should join the field.



第14屆台灣傑出女科學家獎得獎名單出爐!

泛科學

今年最優秀的傑出女科學家由國立臺灣大學大氣海洋系林依依教授獲選。林依依教授的研究專長為衛星遙測、大氣、高海洋科三大領域，利用先進的衛星遙測和航程數據分析海洋與氣候變遷。她以極高風險海洋之探險為目標，以及全球暖化下對氣候、生態變遷的觀察，獲選全球傑出女科學家獎。她也是全球首位以氣候變遷為研究主題，獲選傑出女科學家的女性。此外，她也是全球首位以氣候變遷為研究主題，獲選傑出女科學家的女性。此外，她也是全球首位以氣候變遷為研究主題，獲選傑出女科學家的女性。

林依依特聘教授：用跨領域思維解密氣候現象

今年最優秀的傑出女科學家由國立臺灣大學大氣海洋系林依依教授獲選。林依依教授的研究專長為衛星遙測、大氣、高海洋科三大領域，利用先進的衛星遙測和航程數據分析海洋與氣候變遷。她以極高風險海洋之探險為目標，以及全球暖化下對氣候、生態變遷的觀察，獲選全球傑出女科學家獎。她也是全球首位以氣候變遷為研究主題，獲選傑出女科學家的女性。此外，她也是全球首位以氣候變遷為研究主題，獲選傑出女科學家的女性。

林依依研究氣候現象 獲傑出女科學家獎

【本報記者林依潔報導】由L'Oréal Taiwan及吳乾生教育基金會聯合主辦的「2021台灣傑出女科學家獎」頒獎典禮，於日前在台北國父紀念館舉行。林依依教授獲選為今年最優秀的傑出女科學家。她以極高風險海洋之探險為目標，以及全球暖化下對氣候、生態變遷的觀察，獲選全球傑出女科學家獎。她也是全球首位以氣候變遷為研究主題，獲選傑出女科學家的女性。此外，她也是全球首位以氣候變遷為研究主題，獲選傑出女科學家的女性。

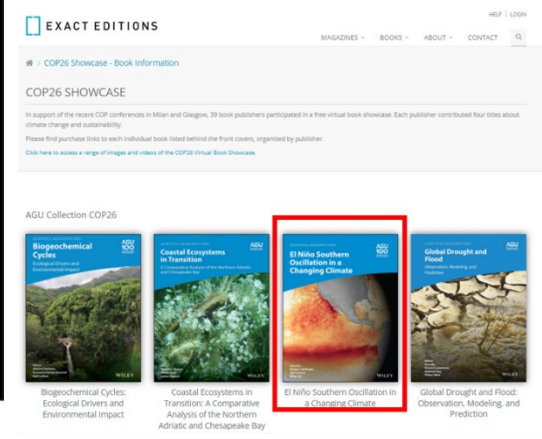
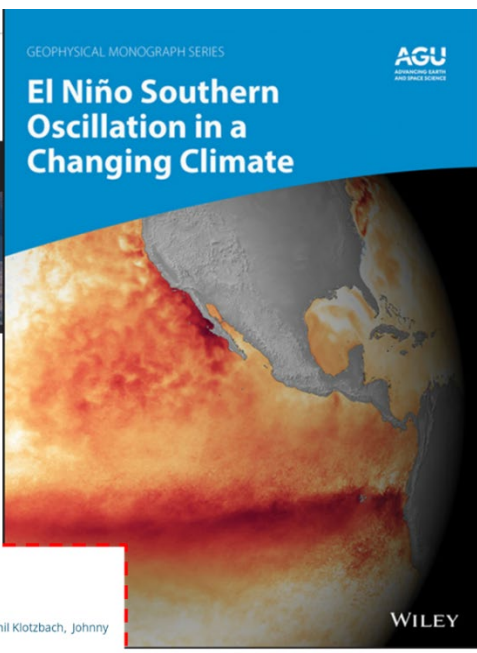
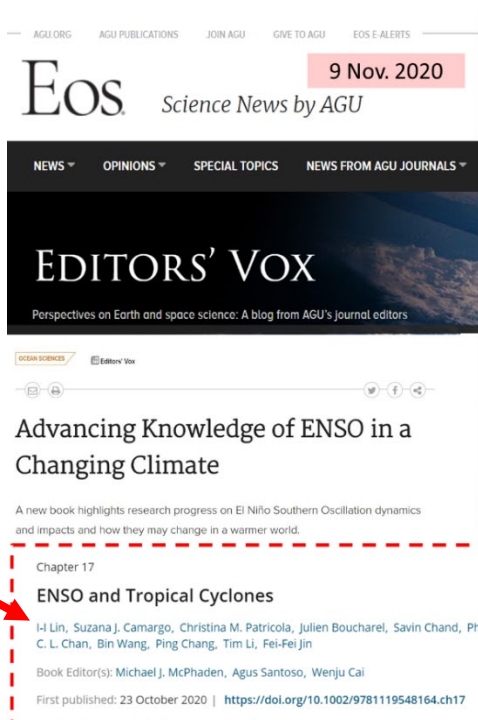
國語日報

2021 台灣傑出女科學家獎

TAIWAN OUTSTANDING WOMEN IN SCIENCE

林依依教授獲選為今年最優秀的傑出女科學家。她以極高風險海洋之探險為目標，以及全球暖化下對氣候、生態變遷的觀察，獲選全球傑出女科學家獎。她也是全球首位以氣候變遷為研究主題，獲選傑出女科學家的女性。此外，她也是全球首位以氣候變遷為研究主題，獲選傑出女科學家的女性。

The 14th Taiwan Outstanding Women in Science Award, held jointly by L'Oréal Taiwan and the Wu Chien-shung Education Foundation (2021)



Invited book chapter contribution in American Geophysical Union (AGU)'s centennial celebration monograph, El Niño Southern Oscillation (ENSO) in a Changing Climate, on 'Tropical Cyclone, ENSO, and Global Warming'. This is the only invited chapter in Taiwan. This book was successfully published with press release in USA in Nov. 2020. (2020)

One of the 4 Books from AGU Collected as special COP26 (the 26th United Nations Climate Change conference, 31 Oct. - 13 Nov. 2021, Glasgow, Scotland) Virtual Book Showcase.



Public outreach talk on 'Tropical Cyclone, Ocean and Climate' in Ministry of Science and Technology's Prospect Series in October 2020.



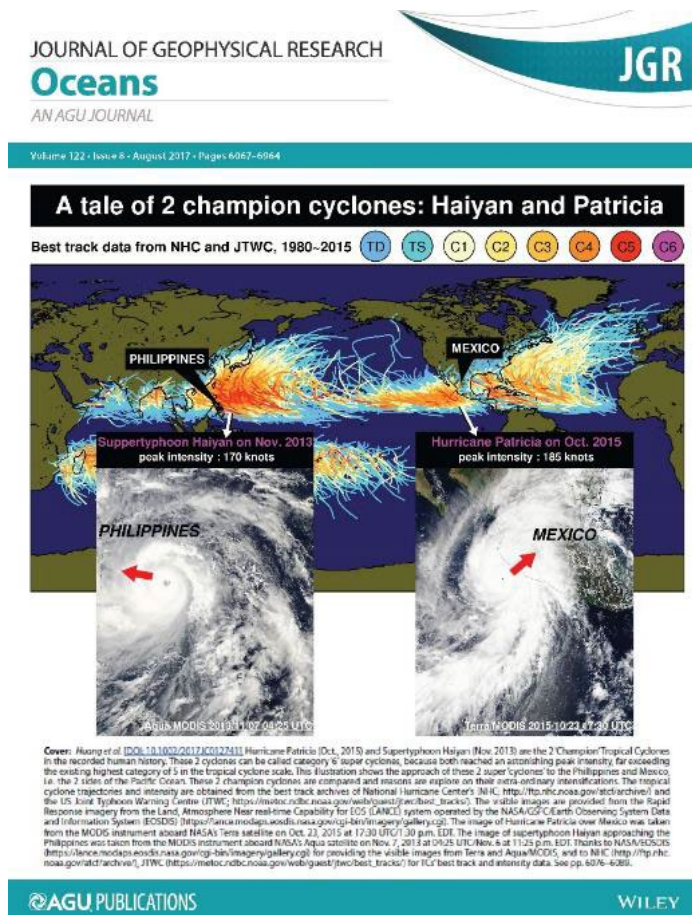
Ocean Observations in Support of Studies and Forecasts of Tropical and Extratropical Cyclones

OPEN ACCESS

Edited by:
John Siddorn,
Met Office, United Kingdom
Reviewed by:
Jili Dong², John A. Knaff¹ and Gustavo Goni²

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Invited to join the international expert team to write recommendations in future ocean observations for tropical and extra tropical cyclones in the ‘Frontiers in Marine Science’, the only invited scientist in Taiwan.(2019)



Paper featured as journal cover ((Hurricane Patricia and supertyphoon Haiyan) in the renown international scientific journal, Journal of Geophysical Research: Oceans (Hurricane Patricia and Typhoon Haiyan)(2017)



Academic Award, Ministry of Education, Taiwan.(2017)

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NATURAL HAZARDS News

Probing the Power of Pacific Supertyphoons

Despite higher than normal surface temperatures and heat contents of ocean waters where the storms developed, evidence is lacking that global warming is revving them up.

Supertyphoon Meranti had sustained wind speeds of 155–165 knots (287–306 km/h) as it approached Taiwan. This image was taken by the Moderate Resolution Imaging Spectroradiometer aboard NASA's Aqua satellite on 13 September 2016. Credit: NASA image by Jeff Schmaltz, LANCE-EOSDIS

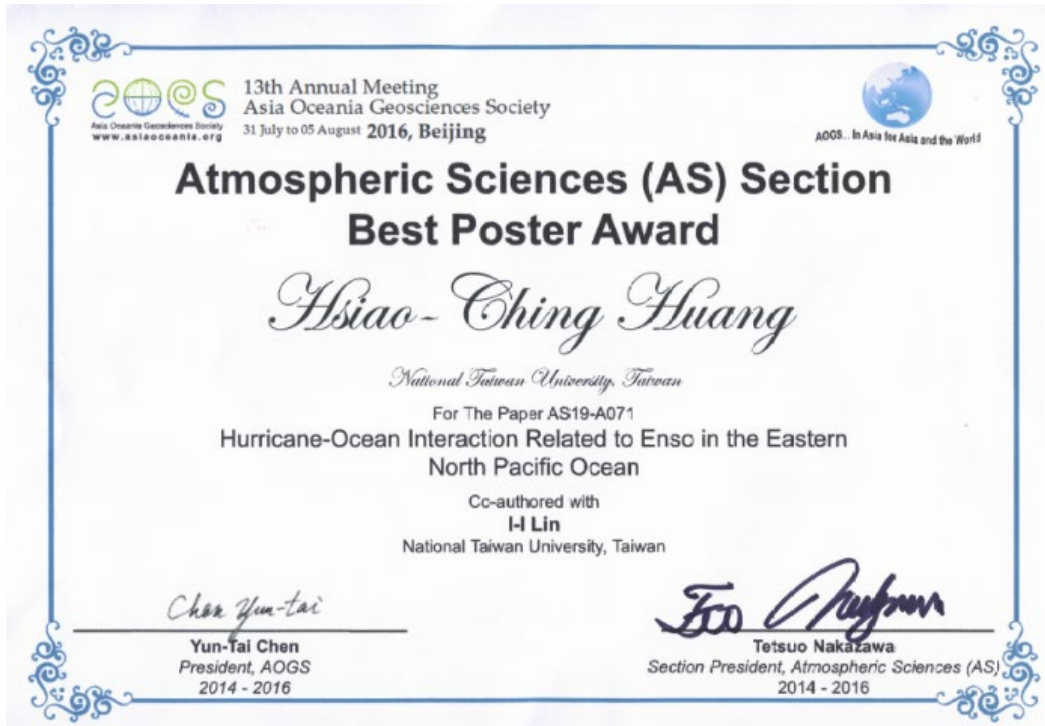
By Tim Horvath © 10 July 2017

Typhoon Meranti blasted the western Pacific in 2016, wreaking havoc in the Philippines, Taiwan, and mainland China, leaving dozens dead or missing and doing billions of dollars' worth of damage. Meranti is among some unusually ferocious Pacific storms in the past few years that seem to be in a category of their own, according to researchers who recently presented data quantifying such storms' extraordinary power and conditions of formation.

On top of bringing heavy rainfall and storm surges, the intensity of these recent tempests goes so far beyond what was previously thought to be the peak range of cyclone power that the researchers argued that they require a new level, a category 6, on a widely used rating scale for hurricanes and typhoons.

"I think it is fair to give the public more accurate information, and it's not fair to equate these two storms of the same category because the kinetic energy is doubling," I-I Lin, a professor in National Taiwan University's Department of Atmospheric Sciences, told attendees at a joint conference of the Japan Geoscience Union and the American Geophysical Union (JpGU-AGU 2017) in Chiba, outside Tokyo, in May.

Research on record-breaking Category '6' tropical cyclones featured by American Geophysical Union's Earth & Space Science News.(2017)



The joint research with her PhD student (Hsiao-Ching Huang) on the super-hurricane Patricia and relationship with super-El Niño won the best student poster award “(1000 participants and the only recipients from Taiwan for the 27 awards) in Beijing, China in the AOGS international symposium.(2016)



Outstanding College Youth of National Taiwan University (2016) & Young College Elite of 2017

ARTICLE

Received 8 Jul 2014 | Accepted 10 Apr 2015 | Published 20 May 2015

DOI: 10.1038/ncomms8182

OPEN

Recent decrease in typhoon destructive potential and global warming implications

I-I Lin¹ & Johnny C.L. Chan²

Typhoons (tropical cyclones) severely impact the half-billion population of the Asian Pacific. Intriguingly, during the recent decade, typhoon destructive potential (Power Dissipation Index, PDI) has decreased considerably (by ~35%). This decrease, paradoxically, has occurred despite the increase in typhoon intensity and ocean warming. Using the method proposed by Emanuel (in 2007), we show that the stronger negative contributions from typhoon frequency and duration, decrease to cancel the positive contribution from the increasing intensity, controlling the PDI. Examining the typhoons' environmental conditions, we find that although the ocean condition became more favourable (warming) in the recent decade, the atmospheric condition 'worsened' at the same time. The 'worsened' atmospheric condition appears to effectively overpower the 'better' ocean conditions to suppress PDI. This stronger negative contribution from reduced typhoon frequency over the increased intensity is also present under the global warming scenario, based on analysis of the simulated typhoon data from high-resolution modelling.



海洋變暖不一定導致颱風破壞潛力增加 臺大及香港城市大學合作成果榮登《Nature Communications》

在一般的認知裡，人們常常認為海洋變暖會導致颱風破壞潛力增加，但是在最近20年中，西北太平洋觀察的結果卻與此恰恰相反。雖然近年海洋變暖，但颱風破壞潛力卻逐年下降。此篇由臺灣大學大氣科學系林俊宏教授及香港城市大學陳仲偉教授發表在自然通訊期刊的最新研究，深入探索其原因，由於颱風的破壞潛力並不是只受到海洋的影響，雖然近年海洋變暖，颱風強度地勢增加，但是影響颱風破壞潛力還有另外兩個重要因子，即颱風個數及颱風生命期。林俊宏的研究發現，近20年來颱風形成個數顯著下降，同時生命期顯著縮短。由於颱風破壞潛力是由三個因素共同影響，而颱風個數下降及生命期縮短產生的負貢獻遠超過颱風強度變強的正貢獻，因此造成近20年來的颱風破壞潛力逐年降低。至於為何颱風生命期變短和颱風個數下降，研究發現該現象與不利的大氣環境有關，雖然海洋條件變得較有利颱風強度增強，但是大氣環境變得不利颱風的生命期及個數增加，所以近20年來的颱風破壞潛力逐年降低。同時，在全球暖化的情境下，他們也發現類似的現象。透過分析NOAA高解析度氣候模式所模擬simulated出的全球暖化情境下之颱風資料，他們發現全球暖化之下，西北太平洋的颱風破壞潛力降低了15%，其主要原因也與近20年來的分析結果類似，即雖然在全球暖化之下，颱風強度地勢增加，但是颱風個數要顯著的減少，使其負貢獻遠大於颱風強度增加的正貢獻，因此在西北太平洋的破壞潛力於全球暖化情境下降低了15%。

引用I-I Lin* and Johnny Chan, Recent Decrease in Typhoon Destructive Potential and Global Warming Implications, Nature Communications, in press, 2015* corresponding email: iilin@as.ntu.edu.tw

¹Department of Atmospheric Sciences, National Taiwan University, No.1, Sec. 4, Roosevelt Rd, Taipei 106, Taiwan; ²Impact Centre, School of Energy and Environment, City University of Hong Kong, Hong Kong. Correspondence: I-I Lin (email: iilin@as.ntu.edu.tw).

Paper published in Nature communications, with highlighted in the NTU web and newsletter(2015)

ARTICLE

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DOI: 10.1038/ncomms8188

OPEN

Change in ocean subsurface environment to suppress tropical cyclone intensification under global warming

Ping Huang^{1,2}, I-I Lin³, Chia Chou⁴ & Rong-Hui Huang¹

Tropical cyclones (TCs) are hazardous natural disasters. Because TC intensification is significantly controlled by atmosphere and ocean environments, changes in these environments may cause changes in TC intensity. Changes in surface and subsurface ocean conditions can both influence a TC's intensification. Regarding global warming, minimal exploration of the subsurface ocean has been undertaken. Here we investigate future subsurface ocean environment changes projected by 22 state-of-the-art climate models and suggest a suppressive effect of subsurface oceans on the intensification of future TCs. Under global warming, the subsurface vertical temperature profile can be sharpened in important TC regions, which may contribute to a stronger ocean coupling (cooling) effect during the intensification of future TCs. Regarding a TC, future subsurface ocean environments may be more suppressive than the existing subsurface ocean environments. This suppressive effect is not spatially uniform and may be weak in certain local areas.



全球暖化不利熱帶氣旋發展 臺大與中國大陸中國科學院、臺灣中央研究院合作成果榮登《Nature Communications》

全球暖化之下海洋水下環境改變不利熱帶氣旋發展，臺大與中國科學院、臺灣中央研究院合作成果榮登《Nature Communications》。

熱帶氣旋，在北大西洋稱之颶風，在西北太平洋稱之颱風，為最大的自然災害之一，並且是相當嚴重的天然災害。由於這些熱帶氣旋的發展受其所處的大氣和海洋環境有極大的影響，在全球暖化下，地球環境的改變亦有可能影響其發展。一篇最新的研究由臺灣大學、中國大陸中國科學院、台灣中央研究院合作共同發表在自然通訊期刊上，發現未來全球暖化情況下，海洋的水下環境可能變得不利熱帶氣旋發展。主要原因是雖然全球暖化發生於海表面的水溫變暖較快，但是海表下深水層水溫增加速率不如海表面一樣快。換言之，即海洋的水溫變暖較慢，水溫垂直梯度變大。如此的水溫變化能與海表淺水層水溫垂直梯度變大，即溫度垂直梯度變大，此溫度增加現象將會與熱帶氣旋和海表之間的耦合作用，該耦合作用的增強造成海表下溫度較低的海水更容易被帶到海表面，因而抑制熱帶氣旋的形成。而文章指出這樣的結果同時存在於世界上最重要的兩熱帶氣旋好發區：西北太平洋颱風好發區，及西北大西洋颶風好發區。因此雖然過去普遍認為全球暖化之下，只會造成海洋表面溫度變暖，將有利熱帶氣旋發展，但此一研究顯示海洋水下環境的改變，水溫垂直梯度變大將抑制熱帶氣旋發展。總的來說，文章指出熱帶氣旋在全球暖化下的增強程度，不僅要看海洋表面海水溫度變化而產生的增強作用，還必須考慮另一新的控制因子，即考慮水下溫度垂直變化對熱帶氣旋發展的抑制作用。

引用 Ping Huang, I-I Lin, Chia Chou, and Rong-Hui Huang, Change in Ocean Subsurface Environment to Suppress Tropical Cyclone Intensification under Global Warming, Nature Communications, accepted, 2015* corresponding email: iilin@as.ntu.edu.tw

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Center for Research in Earth Science (RESER)

Paper published in Nature communications, with highlighted in the NTU web and newsletter(2015)



英特爾科展 我獲雙首獎

12學生9件作品參賽 得獎率逾5成 歷年最佳成績

林志成/台北—洛杉磯電訪訪

我國參加今年在美國洛杉磯舉行的「英特爾國際科技展覽會」，囊括2項大會歐洲參訪研習獎、2項類科首獎、5項大會獎、3項特別獎等12個獎，是35年以來最佳成績。建中黃亦軒及北一女陳郁欣兩人均獲首獎，他們感到意外，但也很高興。

英特爾科展素有「科學奧林匹亞」之稱，今年是5月12日至16日在洛杉磯舉行，有來自國家、1700位學生、1300件作品參賽，我國有12位學生9件作品參賽，最後得獎率是55.6%，為各國之冠，是大會平均得獎率24%的2.2倍。

黃亦軒找到開花基因

我國有6位學生獲獎，除了黃亦軒及陳郁欣獲首獎最高榮譽外，建中陳培鳴及陳紹廷、北一女沈玉宜及高陽市三瓦崗中學生王廷高等4人獲大會二等獎。此外

，這次獲台灣和中國大陸各獲2項首獎。

帶領前往洛杉磯比賽的中央研究院院士林榮耀表示，我國參加英特爾科學展35年，這次是成績最好的一次，我學生對科學有興趣，願意投入時間及感到好奇老師，是他們表現出色的原因。

黃亦軒以「轉錄因子ZIP16參與阿拉伯芥開花基因的分子機制研究」作品，獲得大會植物學類科首獎。他表示，之前沒想到會得這麼大獎，因此很興奮，也很開心。

黃亦軒說，他從小就喜歡種植

物（如綠豆苗），每次看到它們開花，就很好奇，因此是在4年時開始打研究，發現植物中的ZIP16基因可以促進開花，這項成果，這個發現和實際應用，可以讓植物在多個季節開花，譬如草莓就下一定冬天吃得到，夏天也可以。

陳郁欣研究颱風強度

陳郁欣以「西北太平洋颱風強度與上層海溫動力結構關係之長期變化」作品，獲大會地球與行星科學類科首獎。她表示，得這個獎很驚喜，也很意外。

「我從小就對地球科學有興趣，想瞭解西北太平洋產生的颱風是否強度有增加？」陳郁欣指出，她的研究顯示，因為海平面上升愈來愈多，21年來這個區域生成的熱帶氣旋平均強度增加26%，登陸時的強度增加34%，因此獲獎。

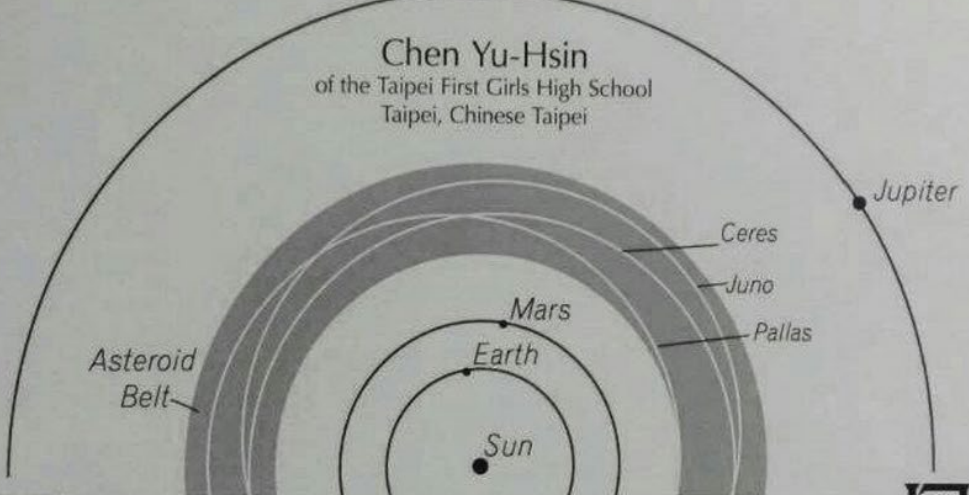


今年英特爾科展獲獎者：陳郁欣（左起）、邱紹廷、黃亦軒、陳紹廷、沈玉宜及王廷高。（科數組提供）

學生	就讀學校	獲獎獎項	獲獎金額/獎金
黃亦軒	建國中學	1. 大會生物學類科首獎 2. 大會植物學類科首獎 (US\$5000) 3. 大會物理學科一等獎 (US\$3000) 4. Monsanto公司特別獎一等獎 (US\$2500)	1. 新台幣20萬元 2. 臺南後保送大學 3. 出國留學獎學金
陳郁欣	北一女	1. 大會地球與行星科學類科首獎 2. 大會地球與行星科學科一等獎 (US\$5000) 3. 大會地球與行星科學科一等獎 (US\$3000) 4. 德國數學學會特別獎三等獎 (US\$500)	1. 新台幣20萬元 2. 臺南後保送大學 3. 出國留學獎學金
陳培鳴 陳紹廷	建國中學	1. 大會生物學科首獎 (US\$500) 2. 美國生物學會特別獎 (US\$2500)	1. 新台幣5萬元 2. 臺南後保送大學
沈玉宜	北一女	大會化學科四等獎 (US\$500)	1. 新台幣5萬元 2. 臺南後保送大學
王廷高	高雄市立三民國中	大會數學科四等獎 (US\$500)	1. 新台幣5萬元 2. 臺南後保送高中

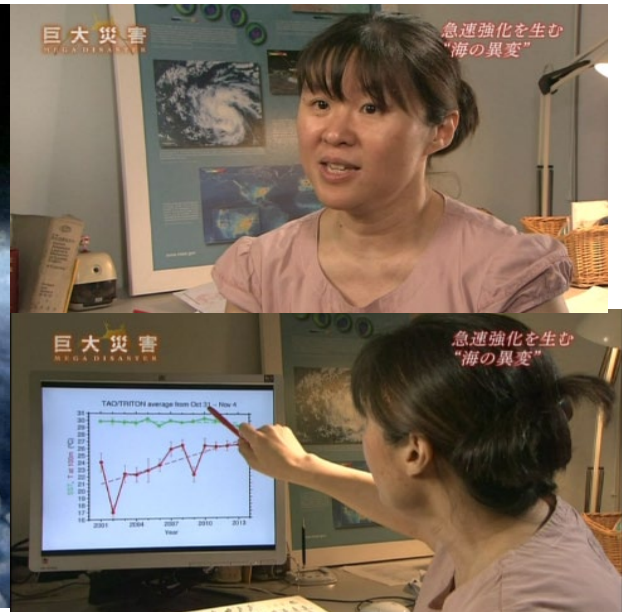
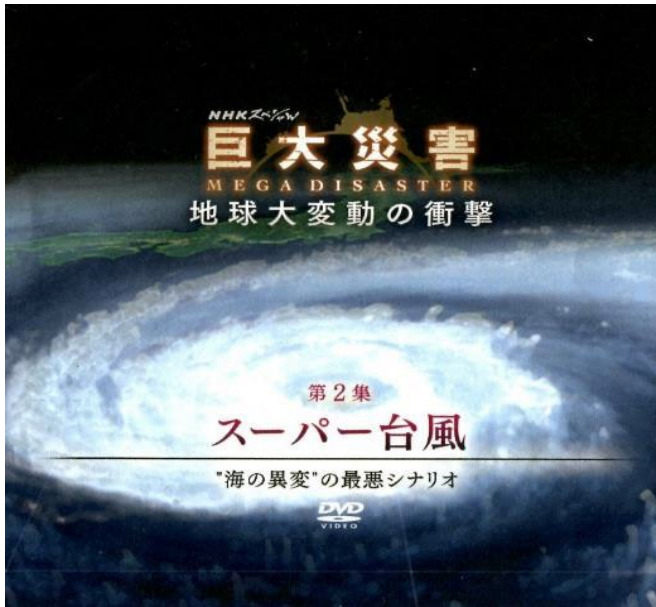
In recognition of achievement as a top award winner in the 2014 Intel International Science and Engineering Fair, a high school science competition of Society for Science & the Public and Intel Foundation,

Minor Planet (31336) Chenyuhsin
discovered by the LINEAR Program of MIT Lincoln Laboratory is named for



MIT Massachusetts Institute of Technology • Lincoln Laboratory

Minor planet (31336) Chenyuhsin is named for Chen Yu-Hsin - Chen Yu-Hsin was awarded best of category and first place in the 2014 Intel International Science and Engineering Fair for her earth science project, and also received the European Union Contest for Young Scientists Award.(October 2015)



Featured in Japan NHK's special documentary 'Mega Disasters' (31 August 2014) with focus on the importance of ocean subsurface warming and supertyphoons.(2014)

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Home » News & Features » State of the Climate in 2013: Spotlight on authors

State of the Climate in 2013: Spotlight on authors
Author: Deke Arndt
Tuesday, July 15, 2014

As the assessment now known as the BAMS State of the Climate report pushes well into its third decade, the level of international participation is at an all-time high. More than 420 authors from institutions in 57 countries contributed to this year's report. This kind of diversity ensures that a range of scientific disciplines, including atmospheric scientists, tropical meteorologists, oceanographers, and glacier experts, examine the climate system.

It also helps strengthen international data sharing and showcases a number of innovative ways to analyze and display data. Most importantly, it underscores that the climate we live in is not only shared around the world, but also that it affects different people in different places in different ways. Here is a snapshot of some of the contributors to the *State of the Climate in 2013*.

Martin Sharp
University of Alberta
Edmonton, Alberta, Canada
Chapter 5i: Arctic (Glaciers and Ice Caps)
Sixth year with SoC

Ryan Fogt
Ohio University
Athens, Ohio
Chapter 6: Antarctica
Seventh year with SoC
Fifth as editor

Khadija Kabidi
Morocco's National Meteorological Direction / North Region
Rabat City, Morocco
Chapter 7e: Regional Climates (Africa)
Eighth year with SoC

Dr. Ladislaus Chang'a
Tanzania Meteorological Agency
Dar es Salaam, Tanzania
Chapter 7e: Regional Climates (Africa)
Third year with SoC

Serhat Sensoy, MSc, Engineer
Turkish State Meteorological Service
Ankara, Turkey
Chapter 7f: Regional Climates (Europe & the Middle East)
Eighth year with SoC

I-Lin Lin
National Taiwan University
Taipei, Taiwan
Chapter 4: The Tropics (Tropical Cyclone Heat Potential)
Fourth year with SoC

Jose A. Marengo
Brazil's National Institute for Space Research INPE
Cachoeira Paulista, Sao Paulo/Brazil
Chapter 7d: Regional Climates (South America)
Ninth year with SoC

Skie Tobin
Australian Bureau of Meteorology
Melbourne, Australia
Chapter 7h: Regional Climates (Oceania)
Fourth year with SoC

BAMS paper State of the Climate in 2013: spotlighted for the Tropics chapter by NOAA in July 2014.(2014)

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Science 29 November 2013:
 Vol. 342 no. 6162 p. 1027
 DOI: 10.1126/science.342.6162.1027

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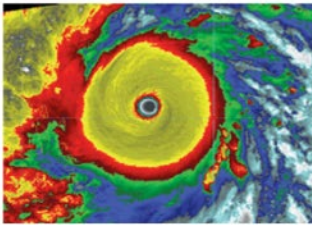
NEWS & ANALYSIS
CLIMATOLOGY
Clues to Supertyphoon's Ferocity Found in the Western Pacific
 Dennis Normile

Tropical storm watchers agree that Haiyan was probably the strongest typhoon to make landfall when it slammed into the Philippines on 8 November, packing winds of up to 314 kilometers per hour. What gave Haiyan, which killed thousands and displaced millions, its deadly wallop?

Researchers think they have at least a partial answer to that question: unusually warm subsurface Pacific waters east of the Philippines. A related phenomenon—rising sea levels in the western Pacific—likely abetted Haiyan's devastating storm surge, which caused more deaths than the winds themselves.

Typhoons draw heat from the ocean for the energy that generates their winds. Typically, as a storm's winds increase, they stir up deeper, cooler ocean waters that temper its strength. This cooling effect "is nature's brake to stop typhoons from intensifying," says I-I Lin, a specialist in typhoon-ocean interactions at National Taiwan University in Taipei.

Drawing on data from satellite observations and Argo floats—thousands of instrumented, subsurface probes that measure ocean temperature, salinity, and current speeds—Lin and others have documented a steady 2-decade rise in subsurface temperatures in the western North Pacific and a bulging warm water layer. The warmer and thicker layer is available to feed a measure called the



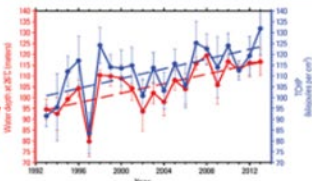
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Feeding the monster.
 Unusually warm Pacific waters supercharged Haiyan.

CREDIT: JOHN KNAFF, NOAA/NESDIS/RAMMB, CSU/CIRA

to stop typhoons from intensifying," says I-I Lin, a specialist in typhoon-ocean interactions at National Taiwan University in Taipei.

From Pun, Lin et al. 2013



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Pun, Lin and Lo GRL 2013 paper highlighted by Science in Nov. 2013.(2013)

Pun, Lin et al. 2013
was highlighted by the AVISO CNES
(French Space Agency) as
Image of the Month in Aug. 2013

20 YEARS OF ALTIMETRY FOR TYPHOONS
Image of the Month - August 2013

Sea trends (global trend removed) over the North-West Pacific: the Main Development Region (MDR) where most typhoons are formed and intensified is indicated by the black box.

Depth of the 26°C isotherm (D26, red, left axis) and Tropical Cyclonic Heat Potential (TCHP, blue, right axis) averaged over the main development region, calculated using dynamic steric heights (mass-corrected sea level anomalies) during the typhoon season (July-October) from 1993 to 2011. A clear increase can be seen (Credits National Taiwan University/WHO).

Tropical cyclones are known to be intensified by the heat of the upper ocean. The North-West Pacific is the most active area on earth for tropical cyclone (typhoon) formation and intensification, and one of the most densely populated coastal regions, thus making typhoon

Pun, Lin and Lo GRL 2013 paper highlighted by the International AVISO Altimetry Organization under CNES (French Space Agency) as "Image of the Month" for August 2013.(2013)

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AN OCEAN COUPLING POTENTIAL INTENSITY INDEX FOR TROPICAL CYCLONES.

I.-I. Lin, P. Black, J. F. Price, C.-Y. Yang, S. S. Chen, C.-C. Lien, P. Harr, N.-H. Chi, C.-C. Wu, E. A. D'Asaro

Geophysical Research Letters, Volume 40, Issue 9, pages 1878–1882, 18 May 2013.

Department of Atmospheric Sciences, National Taiwan University, Taipei, Taiwan and

Research Center for Environmental Changes, Academia Sinica, Taipei, Taiwan and

Science Application International Corporation, Inc and Naval Research Laboratory, Monterey, California, USA and

Woods Hole Oceanographic Institution, Woods Hole, Massachusetts, USA and

Rosenstiel School of Marine and Atmospheric Sciences, University of Miami, Miami, Florida, USA and

Naval Postgraduate School, Monterey, California, USA and

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GRL 2013 paper was highlighted by Advance in Engineering.(2013)



National Taiwan University Outstanding Teaching Award in Sep. 2009

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.

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

Twice featured by NASA with official press release and reported by USA Today, Science Daily, NTU news and other media.(February and March, 2009)
 (http://www.jpl.nasa.gov/news/news.cfm?release=2009-031)
 (http://climate.jpl.nasa.gov/news/index.cfm?FuseAction=ShowNews&NewsID=53)

Front cover: Weybourne Atmospheric Observatory, UK

Weybourne Atmospheric Observatory, officially opened by Sir William Waldegrave in 1994, experiences an uninterrupted, "clean air" seaward aspect to the North. We are also able to measure plumes from many differing origins including London and the Arctic.

Ozone, oxides of nitrogen and sulphur, carbon monoxide, carbon dioxide, oxygen, hydrogen, and condensation nuclei are routinely measured. New instrumentation is also available to determine GHG's and VOC's utilising Gas chromatography and PTRMS.

A SODAR RASS and Sonic system is run providing meteorological information about the atmospheric column above the site.

The facility also has ample room to house temporary external applications; with the ability to provide 32amp, 16amp and three-phase electrical supply. Accommodation in the area is both plentiful and high quality. Norwich International airport is forty minutes drive away ensuring that mainland Europe is easily accessible.

For more information:
Contact: Dr Brian Bandy
(b.bandy@uea.ac.uk)

national report



H-Lin obtained her Ph.D. degree in Remote Sensing from the University of Cambridge, England in 1995. From 1995-1999, she worked as a Research Scientist in the Centre for Remote Imaging, Sensing, and Processing of the National University of Singapore. In 2000 she returned to her home country, Taiwan, and is currently an Associate Professor in the Department of Atmospheric Sciences, National Taiwan University. Her research interest is in using synergy of multiple remote sensing data to study air-sea interaction problems, including typhoon-ocean interaction, dust storm-ocean interaction, and the role of surfactants in air-sea gas exchange.

Multiple remote sensing for air-sea biogeochemical interaction research in the western north Pacific and neighbouring seas

H-Lin, Dept. of Atmospheric Sciences, National Taiwan University, Taipei, Taiwan. <http://smart.as.ntu.edu.tw/>
Contact: ililn@as.ntu.edu.tw

Air-sea biogeochemical interaction related processes are a critical component in the Earth's ecological and climate system. However, due to the complex and dynamic nature of these processes, many of the processes are poorly-observed and little understood. This is especially true in the vast western North Pacific Ocean and the neighbouring seas as this vast oceanic region is subject to frequent atmospheric episodic forcing from events like typhoons and dust storms. It has been difficult to use discrete ship-borne point measurements with irregular time and spatial intervals to observe these highly episodic processes. With the

advancement in space-borne remote sensing offering frequent and systematic observations, it has become more feasible to take a glimpse at these complex dynamic processes. In this research, multiple remote sensors are used as it is necessary to have observations of a suite of physical and biogeochemical parameters for both atmosphere and ocean. In this research, five types of remote sensing data are used and they are: (a) ocean colour data (chlorophyll-a concentration and ocean colour spectra) from the NASA's SeaWiFS (Sea-viewing Wide Field-of-view Sensor) and MODIS satellites (O'Reilly et al., 1998); (b) aerosol optical thickness and fine mode fraction data from the NASA

Featured by the by the international SCOR (Scientific Committee on Ocean Research) in the SOLAS (Surface Ocean Lower Atmosphere Study) newsletter.(2008)



10 Outstanding Young Women Award of the Republic of China(2007)

Scientists had long suspected that strong winds cause entrainment, or vertical mixing, in tropical and subtropical oceans, explained Lin and colleagues in a paper published in the October 2003 issue of *Geophysical Research Letters*. But it took measurements from the three satellite sensors to prove it.

"This research is important because it confirms that the impact of cyclones on ocean primary production is significant, at least in the South China Sea," Lin said. "It also points to the potential impact tropical cyclones have on climate change, since primary production is critical to global climate."

The new technology has also illuminated future research options for the scientists. "We've now established a method to quantify the cyclone-induced phytoplankton growth using a combination of remote-sensing data and models," Lin said. "This method can be applied to other typhoon cases and in different oceanic regions, too. Previously, it was impossible to do such work due to the lack of observations by traditional means."

For more information, visit the following web sites:

Tropical Rainfall Measuring Mission (TRMM)

<http://trmm.gsfc.nasa.gov/>

SeaWiFS Project

<http://seawifs.gsfc.nasa.gov/SEAWIFS.html>

NASA Quick Scatterometer (QuikSCAT)

<http://www.jpl.nasa.gov/misrosci/quikscat.html>

Air-Sea Interaction & Climate

<http://nasa-www.jpl.nasa.gov/>

References:

"Killer Storms in Philippines and Japan," BBC News. Accessed July 26,

2004.

<http://news.bbc.co.uk/1/hi/world/asia-pacific/324472.stm>

"Typhoons leave 3 dead in Japan, 42 dead in Philippines," CNN.com.

Accessed July 26, 2004.

<http://news.com.com/2000/WEATHER/07/0Mbc.asa.typhoons.rpt>



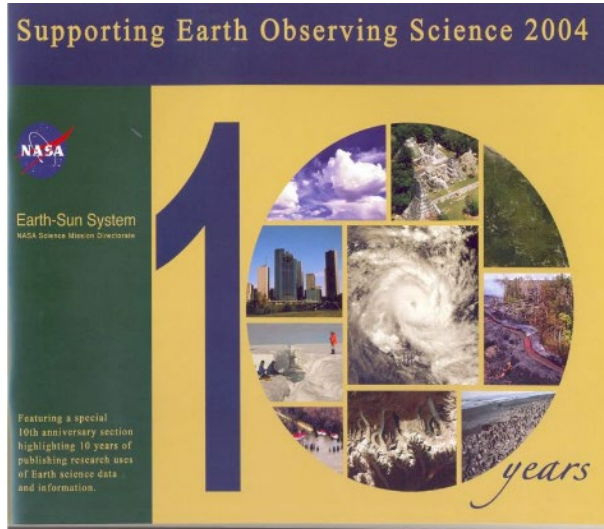
Ocean Research in Taiwan. Lin holds a PhD in remote sensing from the University of Cambridge, England.

H. Lin is an assistant professor in the Department of Atmospheric Sciences at the National Taiwan University in Taiwan. From 1995 to 1999, she worked as a research scientist at the Centre for Remote Imaging, Sensing, and Processing (CRISP) at the National University of Singapore. She also served as principal investigator at the Remote Sensing Laboratory at the National Center for



holds a MS and PhD in atmospheric sciences from the University of Washington.

W. Timothy Liu is a senior research scientist at the Jet Propulsion Laboratory, California Institute of Technology. His research focuses on ocean-atmosphere interactions and satellite oceanography. Liu is leader of the Air-Sea Interaction and Climate Team and principal investigator for both the NASA Scatterometer (NSCAT) and TOPEX/Poseidon projects. He



Reported in NASA's 10-years anniversary of earth observation highlights.(2004)

nature

news and views in brief

7 August 2003

Vol 425 No 6949 PP 630

Oceanography :

Bloom in Cyclone



By Tim Lincoln,
NATURE Magazine



Citation in *Nature: News and Views in Brief*, 7 August, 2003, vol. 425, no. 6949, pp. 630, 'Oceanography: Bloom in Cyclone' (original paper see Lin I-I *et al.*, 2003c, *Geophysical Research Letters*).(2003)

Oceanography

Bloom in cyclone

Geophys. Res. Lett. doi: 10.1029/2003GL017141 (2003)

For three days in July 2000, cyclone Kai-Tak whipped across the South China Sea. I. Lin and colleagues have made the most of a combination of satellite views of this tropical storm and its effects, and in their latest paper have documented the resulting bloom of phytoplankton. They calculate that the bloom constituted a 10-fold increase in growth, or primary production, over normal conditions.

This is not unexpected, as storms are known to stir marine waters from depth and bring nutrients to the sunlit upper zone where phytoplankton can use them in photosynthesis. But tropical cyclones are especially unpredictable beasts, and making measurements from ships or moored arrays would be an ineffective and hazardous business. Hence the virtue of satellite data — in this case from three different sensors, which the authors have used to inform models of physical ocean mixing and primary production.

The further calculations of Lin *et al.* produce a bigger picture. Kai-Tak was of only moderate force, but they estimate that this storm alone was responsible for 2–4% of new annual production in the South China Sea. Given cyclone incidence, they believe that the overall figure could amount to 20–30%.

Tim Lincoln

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Atmospheric Science:

**Quick,
quick,
slow**



By Tim Lincoln, **NATURE** Magazine

Atmospheric science

Quick, quick, slow

Geophys. Res. Lett. doi:10.1029/2002GL015674 (2003)

In July and August 2000, remote-sensing instruments tracked the consequences of two typhoons, Kai-Tak and Bilis, during their passage over oceans in Southeast Asia. Analyses of the data have produced a refined picture of the relationship between sea-surface temperature and wind speed.

Typhoons are driven by the energy from a warm sea-surface, and in turn drag up water from depth as they pass, leaving surface patches that can be up to 6 °C cooler than the surrounding ocean. As I.-I. Lin and co-workers point out, this situation provides a natural experiment. Taking advantage of this, they find that the speed of surface winds drops dramatically over such patches compared with wind speed over neighbouring ocean. This agrees with a previously proposed mechanism of wind-speed modulation at the sea surface. In Lin and colleagues' data, every 1 °C drop in sea temperature typically corresponds to a decrease of about 1 m s⁻¹ in wind speed. The cold patches don't take long to warm up again, however, and — most notably — the authors find that events can be played out on comparatively small scales (100–400 km), and quite fast (within a day). **Tim Lincoln**

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December 8, 2002

CNN Europe	CNN Asia	Languages	On CNN TV	Transcripts	Headline News	CNN International
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Typhoons a boon for ocean life

SAN FRANCISCO (AP) — Typhoons, the violent storms that are the bane of life across much of Asia, are a boon for life at sea, where the cyclones stir up the nutrients that microscopic algae crave, according to scientists.



Scientists in Taiwan and the United States recently used a trio of NASA satellites to observe how the passage of even moderate typhoons over the South China Sea can generate upwellings of nutrient-rich water from deeper in the ocean and spark massive blooms of phytoplankton.

"It's a natural hazard, it destroys life, but what I am showing is it also enhances life," said Timothy Liu, a senior research scientist at the National Aeronautics and Space Administration's Jet Propulsion Laboratory in Pasadena, California, on Saturday.

Through photosynthesis, the algae absorb carbon dioxide from the atmosphere and convert it to oxygen, offsetting emissions of carbon dioxide from the burning of fossil fuels. The algae are also an important food source for marine life.

Scientists tracked the typhoons to see what kind of effect they had on the sea life

Liu, working with research scientist I-I Lin of Taiwan's National Center for Ocean Research in Taipei, combined data culled from three satellites to show the positive effects of storms on marine life. They presented their results Saturday at the fall meeting of the American Geophysical Union.

"Typhoons were completely neglected before, because it was impossible to quantify" their effect on the algae, Lin said.



The violent storms are seen as the bane of life across much of Asia

Typhoon Kai-Tak passed over the South China Sea on July 5, 2000, lingering for four days before traveling northward over Taiwan, based on data acquired from NASA's Quikscat, a satellite that measures wind speeds over water.

In its aftermath, sea surface temperature measurements made by the joint U.S.-Japanese Tropical Rainfall Measuring Mission satellite showed a 16-degree

Fahrenheit drop in the area where the counterclockwise-spinning storm had been parked. Colder water, drawn upward by the typhoon, caused the drop, Lin said.

By July 12, 2000, four days after the typhoon had moved on, a third satellite, the Sea Viewing Wide-Field-of-View Sensor, began to measure a dramatic change in the ocean color that matched in extent the previously observed cold spot.

A 300-fold increase in ocean chlorophyll, contained in the algae, accounted for the color change, Liu said.

The bloom persisted for a month.

Liu and Lin said they tracked about 20 typhoons that swept the South China Sea over the course of 2000 using the novel three-satellite method.

"The hypothesis was there, but there was no evidence to tie it together," Liu said of the typhoon-phytoplankton connection.

CNN reported the finding on the impressive ocean biogeochemical responses induced by typhoon Kai-Tak (i.e. Lin et al. GRL 2003b).