Chun-Chieh Wu (吳俊傑)

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Date of Birth: 30 July, 1964

Education:

Graduate: Massachusetts Institute of Technology, Ph.D., Department of Earth Atmospheric, and Planetary Sciences, May 1993
Thesis under the supervision of Professor Kerry A. Emanuel on "Understanding hurricane movement using potential vorticity: A numerical model and an observational study."

Undergraduate: National Taiwan University, B.S., Department of Atmospheric Sciences, June 1986

Recent Positions: Professor and Chairman
Department of Atmospheric Sciences, National Taiwan University
August 2008 to present

Director
NTU Typhoon Research Center
January 2009 to present

Adjunct Research Scientist
Lamont-Doherty Earth Observatory, Columbia University
July 2004 - present

Professor
Department of Atmospheric Sciences, National Taiwan University
August 2000 to 2008

Visiting Fellow
Geophysical Fluid Dynamics Laboratory, Princeton University
January – July, 2004 (on sabbatical leave from NTU)

Associate Professor
Department of Atmospheric Sciences, National Taiwan University
August 1994 to July 2000

Visiting Research Scientist
Geophysical Fluid Dynamics Laboratory, Princeton University
August 1993 – November 1994; July to September 1995

Awards: Gold Bookmarker Prize

Wu Ta-You Popular Science Book Prize in Translation
Wu Ta-You Foundation, 2008

Outstanding Teaching Award, National Taiwan University, 2008
Outstanding Research Award, National Science Council, 2007
Research Achievement Award, National Taiwan Univ., 2004
University Teaching Award, National Taiwan University, 2003, 2006, 2007
Academia Sinica Research Award for Junior Researchers, 2001

Memberships:

Member of the American Meteorological Society.
Member of the American Geophysical Union.
Member of AOGS
Member of the Chinese Meteorological Society (Taiwan).
Member of the Chinese Geoscience Union (Taiwan).

Professional Services:

Advisory committee member, Atmos. Sci., Div. of Natural Sciences, National Science Council, Taiwan, 2008/1 – present
Chairman, Panel committee, Atmos. Sci., Div. of Natural Sciences, National Science Council, Taiwan, 2005/1 –2007/12
Principal Investigator, Priority Typhoon Research Project (including the DOTSTAR program, 追風計畫) National Science Council, Taiwan, 2002/8 - present
Editor, Terrestrial, Atmospheric, and Oceanic Sciences (an SCI journal), Chinese Geoscience Union, 2005/8 – present
Member of the Council, Meteorological Society of ROC, 2007/03 - present
Associate Editor, Terrestrial, Atmospheric, and Oceanic Sciences (SCI), Chinese Geoscience Union, 2004/12 – 2005/7
Chief Editor, Atmospheric Sciences, Meteorological Society of ROC, 2002/1 – 2003/12
Associate Editor, Monthly Weather Review, American Meteorological Society, 2002/1 – 2003/1
Managing Editor, Terrestrial, Atmospheric, and Oceanic Sciences (SCI), Chinese Geoscience Union, 1997/6 – 2003/12
Panel committee member, Atmos. Sci., Div. of Natural Sciences, National Science Council, Taiwan, 2002/1 – 2004/12
Referee of journals (*J. Atmos. Sci., Mon. Wea. Rev., JGR, GRL, Tellus,* …)

Publication List :

(A) Refereed Publications

Total number of citations from SCI-journal papers (1993-2008): 435

53. Wu, C.-C., K. K.-W. Cheung, J.-H. Chen, and C.C. Chang, 2009: The Impact of Tropical Storm Paul (1999) on the Motion and Rainfall Associated with Tropical Storm Rachel (1999) near Taiwan. Mon. Wea. Rev. (revision) (SCI)
52. Chou, K.-H., C.-C. Wu*, P.-H. Lin, and S. Majumdar, 2009: Validation of QuikSCAT wind vectors by dropwindsonde data from DOTSTAR. Submitted to *J. Geophysical Research.* (SCI)
51. Chen, J.-H., M. S. Peng, C. A. Reynolds, and C.-C. Wu, 2009: Interpretation of Tropical Cyclone Forecast Sensitivity and Dynamics from the NOGAPS Singular Vector Perspective. *J. Atmos. S*ci. (in revision) (SCI)
50. Lin, I-I, C.-H. Chen, I.-F. Pun, W. T. Liu., and C.-C. Wu, 2009: Warm Ocean Anomaly, Air Sea Fluxes, and the Rapid Intensification of Tropical Cyclone Nargis. *Geophys. Res. Lett.*, **36**, L03817, doi:10.1029/2008GL035815. (SCI)
49. Wu, C.-C., K. K. W. Cheung and Y.-Y. Lo, 2008: Numerical Study of the Rainfall Event Due to Interaction of Typhoon Babs (1998) and the Northeasterly Monsoon. *Mon. Wea. Rev.* (in press) (SCI)
48. Wu, C.-C., J.-H. Chen, S. J. Majumdar, M. S. Peng, C. A. Reynolds, S. D. Aberson, R. Buizza, M. Yamaguchi, S.-G. Chen, T. Nakazawa , and K.-H. Chou, 2008: Inter-comparison of Targeted Observation Guidance for Tropical Cyclones in the North western Pacific. *Mon. Wea. Rev.* (in press) (SCI)
47. Yamaguchi, M., T. Iriguchi, T. Nakazawa, and C.-C. Wu, 2008: An observing system experiment for Typhoon CONSON (2004) using a singular vector method and DOTSTAR data. *Mon. Wea. Rev.* (in press) (SCI)
46. Lin, I-I, I.-F. Pun, and C.-C. Wu, 2008: Upper Ocean Thermal Structure and the Western North Pacific Category-5 Typhoons. Part II: Dependence on Translation Speed. *Mon. Wea. Rev.* (in press) (SCI)
45. Wu C.-C., S.-G. Chen, J.-H. Chen, and K.-H. Chou, 2009: Typhoon-Trough Interaction from both Adjoint-Derived Sensitivity Steering Vector (ADSSV) and Potential Vorticity (PV) Perspectives. *Mon. Wea. Rev.*, **137**, 852–862. (SCI)
44.. Wu C.-C., H.-J. Cheng, Y. Wang, and K.-H. Chou, 2009: A numerical investigation of the eyewall evolution in a landfalling typhoon. *Mon. Wea. Rev.,* **137**, 21-40. (SCI)
43. Yang, C.-C., C.-C. Wu*, K.-H. Chou, and C.-Y. Lee, 2008: Binary interaction between Typhoons Fengshen (2002) and Fungwong (2002) based on the potential vorticity diagnosis. *Mon. Wea. Rev.,* **136**, 4593-4611. (SCI)
42. Lin, I-I, C.-C. Wu, F. Pam, and D.-S. Ko, 2008: Upper ocean thermal structure and the western North Pacific category-5 typhoons. Part I: Ocean features and category-5 typhoon's intensification. *Mon. Wea. Rev.*, **136**, 3288-3306. (SCI)
41. Hsu, H.-H., C.-H. Hung, A.-K. Lo, C.-C. Wu, and C.-W. Hung, 2008: Influence of tropical cyclone on the estimation of climate variability in the tropical western North Pacific. *J. Climate*, **21**, 2960-2975. (SCI)

40. Jian, G.-J., and C.-C. Wu, 2008: A Numerical Study of the Track Deflection of Supertyphoon Haitang (2005) prior to its landfall in Taiwan. *Mon. Wea. Rev.*, **136**, 598-615. (SCI)
39. Chou, K.-H., and C.-C. Wu*, 2008: Development of the typhoon initialization in a mesoscale model – Combination of the bogused vortex with the dropwindsonde data in DOTSTAR. *Mon. Wea. Rev.*, **136**, 865-879. (SCI)
38. Zang, X., T. Li, F. Weng, C.-C. Wu, and L. Xu, 2007: Reanalysis of Western Pacific typhoons in 2004 with multi-satellite observations. *Meteorol. Atmos. Phys.*, DOI: 10.1007/s00703-006-0240-5., 3-18. (SCI, IF=1.149)
37. Wu, C.-C., K.-H. Chou, P.-H. Lin, S. D. Aberson, M. S. Peng, and T. Nakazawa, 2007: The impact of dropwindsonde data on typhoon track forecasts in DOTSTAR. *Weather and Forecasting*, **22**, 1157-1176. (SCI, IF=1.375)
36. Wu, C.-C., C.-Y Lee, and I-I Lin, 2007: The effect of the ocean eddy on tropical cyclone intensity. *J. Atmos. Sci.*, **64**, 3562-3578. (SCI, IF=2.755)
35. Wu, C.-C., J.-H. Chen, P.-H. Lin, and K.-S. Chou, 2007: Targeted observations of tropical cyclones based on the adjoint-derived sensitivity steering vector. *J. Atmos. Sci.*, **64**, 2611-2626. (SCI, IF=2.755)
34. Zeng, Z. and Y. Wang, and C.-C. Wu, 2007: Environmental Dynamical Control of Tropical Cyclone Intensity – An Observational Study. *Mon. Wea. Rev.*, **135**, 38-59. (SCI, IF=2.267)
33. Galewsky, J., C. P. Stark, S. Dadson, C.-C. Wu, A. H. Sobel, and M.-J. Hong, 2006: Tropical cyclone triggering of sediment discharge in Taiwan. *J. Geophysical Research*, **111**, F03014, doi:10.1029/2005JF000428. (SCI, IF=2.80)
32. Wu, C.-C., K.-H. Chou, Y. Wang and Y.-H. Kuo, 2006: Tropical cyclone initialization and prediction based on four-dimensional variational data assimilation. *J. of Atmos. Sci.*, **63**, 2383–2395. (SCI, IF= 2.163)
31. Lin, I-I, C.-C. Wu*, K. A. Emanuel, I-H. Lee, C. Wu, and F. Pan, 2005: The interaction of Supertyphoon Maemi (2003) with a warm ocean eddy. *Mon. Wea. Rev.*, **133**, 2635–2649. (SCI, IF=2.003)
30. Wu, C.-C., P.-H. Lin, S. Aberson, T.-C. Yeh, W.-P. Huang, K.-H. Chou, J.-S. Hong, G.-C. Lu, C.-T. Fong, K.-C. Hsu, I-I Lin, P.-L. Lin, C.-H. Liu, 2005: Dropwindsonde Observations for Typhoon Surveillance near the Taiwan Region (DOTSTAR): An Overview. *Bulletin of Amer. Meteor. Soc.*, **86**, 787-790. (SCI, IF=3.055)
29. Wu, C.-C., P.-H. Lin, I-I Lin, T.-C. Yeh, 2004: A Review on "Dropsonde Observation for Typhoon Surveillance near the TAiwan Region (DOTSTAR)" and "Typhoon-Ocean-Bio-Geochemistry Interaction" Research Projects. *Atmos. Sci.* **32**, 275-292. (in Chinese with an English abstract)
28. Wu, C.-C., T.-S. Huang, and K.-H. Chou, 2004: Potential vorticity diagnosis of the key factors affecting the motion of Typhoon Sinlaku (2002), *Mon. Wea. Rev.*, **132**, 2084-2093. (SCI, IF=1.859).
27. Liu, C.-M., M.-T. Yeh, L.-Z. Peng, C.-C. Wu, and S. C. Liu, 2004: Simulation comparison of winter continental air mass and summer maritime air mass on background ozone near Taiwan. *Atmos. Sci.* (in Chinese with an English abstract), **32**, 1-22.

26. Wang Y., and C.-C. Wu, 2004: Current understanding of tropical cyclone structure and intensity changes - A review. *Meteor. and Atmos. Phys.*, **87**, 257-278, DOI: 10.1007/s00703-003-0055-6. (SCI, IF=1.097)
25. Wu, C.-C., K.-H. Chou, H.-J. Cheng, and Y. Wang, 2003: "Eyewall Contraction, Breakdown and Reformation in a Landfalling Typhoon", *Geophys. Res. Let.,* **30** (17), 1887, doi:10.1029/2003GL017653. (SCI, IF=2.422)
24. Lin, I.-I., W. T. Liu, C.-C. Wu, G. Wong, C. Hu, Z. Chen, W.-D. Liang, Y. Yang, and K.-K. Liu, 2003: New evidence for enhanced ocean primary production triggered by tropical cyclone. *Geophys. Res. Lett.*, **30** (13), 1718, doi:10.1029/2003GL017141. (SCI, IF=2.422)
23. Wu, C.-C., T.-S. Huang, W.-P. Huang, and K.-H. Chou, 2003: A new look at the binary interaction: Potential vorticity diagnosis of the unusual southward movement of Typhoon Bopha (2000) and its interaction with Typhoon Saomai (2000). *Mon. Wea. Rev.*, **131**, 1289-1300. (SCI, IF=2.179)
22. Lin, I.-I., W. T. Liu, C.-C. Wu, J. C. H. Chiang, and C.-H. Sui, 2003: Satellite observations of modulation of surface winds by typhoon-induced ocean cooling. *Geophys. Res. Lett*., **30** (3), 10.1029/2002GL015674. (SCI, IF=2.422)
21. Wu, C.-C., T.-H. Yen, Y.-H. Kuo, and W. Wang, 2002：Rainfall simulation associated with Typhoon Herb (1996) near Taiwan. Part I: The topographic effect. *Wea. and Forecasting,* **17**, 1001-1015. (SCI, IF=0.782)
20. Wu, C.-C., T.-H. Yen, Y.-H. Kuo, and W. Wang, 2002: A numerical study of the rainfall associated with Typhoon Herb (1996) using PSU/NCAR MM5. 4th East Asian and Western Pacific Meteorology and Climate. Word Scientific Series on Meteorology of East Asia, Vol.1. Eds: C.-P. Chang, G. Wu, B. Jou, and C. Y. Lam. 252-260.
19. Wu, C.-C., 2001: Numerical simulation of Typhoon Gladys (1994) and its interaction with Taiwan terrain using GFDL hurricane model. *Mon. Wea. Rev.*, **129**, 1533-1549. (SCI, IF=1.769)
18. Cho, K.-H., C.-C. Wu, and T.-H. Yen, 2001: The evolution of Typhoon Zeb in a non-hydrostatic mesoscale model. *Atmos. Sci.* (in Chinese with an English abstract), **29**, 291-314.
17. Kuo, H.-C., C.-C. Wu, and C.-S. Lee, 2001: The challenge of typhoon research. *National Science Council Monthly* (in Chinese), **29**, 859-866.
16. Wu, C.-C., M. Bender, and Y. Kurihara, 2000: Typhoon forecasts with the GFDL hurricane model: Forecast skill and comparison of predictions using AVN and NOGAPS global analyses. *J. Meteor. Soc. Japan*, **78**, 777-788. (SCI)
15. Wu, C.-C., H.-C. Kuo, H.-H. Hsu, and B J.-D. Jou, 2000: Weather and climate research in Taiwan: Potential application of GPS/MET data. *Terrestrial, Atmospheric, and Oceanic Sciences*, **11**, 211-234. (SCI-e)
14. Wu, C.-C., and W.-P Huang, 2000: Numerical Simulation of Typhoon Flo(1990) using a non-hydrostatic mesoscale model: The impact of initial data and initialization. *Atmos. Sci.* (in Chinese with an English abstract), **28**, 293-315.
13. Wu, C.-C., and H.-J. Cheng, 1999: An observational study of environmental influences on the intensity changes of Typhoons Flo (1990) and Gene (1990). *Mon. Wea. Rev.*, **127**, 3003-3031. (SCI)

12. Wu, C.-C., and Y.-H. Kuo, 1999: Typhoons affecting Taiwan: Current understanding and future challenges. *Bulletin of Amer. Meteor. Soc.*, **80**, 67-80. (SCI)
11. Wu, C.-C., and T.-H. Yen, 1999: Typhoon bogusing and simulation using MM5. *Quarterly Journal on Meteorology Contents* (in Chinese), **160**, 29-44.
10. Wu, C.-C., Y.-T Cho, and S.-D Wang, 1999: The Effect of Taiwan Terrain on Typhoon Gladys(1994) Part I: Observational Study. *Atmos. Sci* (in Chinese with an English abstract)., **27**, 1-28.
9. Wu, C.-C., Y.-T Cho, and T.-H Yen, 1999: The Effect of Taiwan Terrain on Typhoon Gladys(1994) Part II: Numerical Simulation. *Atmos. Sci.* (in Chinese with an English abstract), **27**, 29-59.
8. Wu, C.-C., C.-Y. Tsay, C.-S. Lee, and Y.-H. Kuo, 1998: Meeting summary of the "International Workshop on Typhoon Research in the Taiwan Area". *National Science Council Monthly* (in Chinese), **26**, 232-242.
7. Wu, C.-C., and M.-L. Lu, 1997: An investigation of the theory on the maximum potential intensity for hurricanes . *Atmos. Sci.* (in Chinese with an English abstract), **25**, 79-98.
6. Wu, C.-C., and Y.-T Cho, 1997: Evaluation of the GFDL hurricane prediction system in the western North Pacific in 1995 and 1996. *Atmos. Sci.* (in Chinese with an English abstract), **25**, 449-481.
5. Wu, C.-C., and Y. Kurihara, 1996: A numerical study of the feedback mechanisms of hurricane-environment interaction on hurricane movement from the potential vorticity perspective. *J. Atmos. Sci.*, **53**, 2264-2282. (SCI)
4. Wu, C.-C., and K. A. Emanuel, 1995a: Potential vorticity diagnostics of hurricane movement. Part I: A case study of Hurricane Bob (1991). *Mon. Wea. Rev.*, **123**, 69-92. (SCI)
3. Wu, C.-C., and K. A. Emanuel, 1995b: Potential vorticity diagnostics of hurricane movement. Part II: Tropical Storm Ana (1991) and Hurricane Andrew (1992). *Mon. Wea. Rev.*, **123**, 93-109. (SCI)
2. Wu, C.-C., and K. A. Emanuel, 1994: On hurricane outflow structure. *J. Atmos. Sci.*, **51**, 1995-2003. (SCI)
1. Wu, C.-C., and K. A. Emanuel, 1993: Interaction of a baroclinic vortex with background shear: Application to hurricane movement. *J. Atmos. Sci.*, **50**, 62-76. (SCI)

(B) Conference papers

101 Wu, C.-C., Targeted Observation for Improving Tropical Cyclone Predictability – DOTSTAR and T-PARC. Proc., International workshop on Tropical Cyclone-Ocean Interaction in the Northwest Pacific. Jeju Island, Korea.

100. Wu, C.-C., Targeted Observation for Improving Tropical Cyclone Predictability – DOTSTAR and T-PARC. Proc., Second International Workshop on Prevention and Mitigation. Bandung, Malaysia.

99. Chou, K.-H., C.-C. Wu, S. Majumdar, and P.-H. Lin, 2008: Validation of QuikSCAT wind vectors by dropwindsonde data from DOTSTAR. Proc., International Workshop on Advanced Typhoon and Flood Research, Taipei, Taiwan.

98. Wu, C.-C., Inter-comparison of targeted observation guidances for tropical cyclones in the western North Pacific. Proc., International Workshop on Advanced Typhoon and Flood Research, Taipei, Taiwan.
97. Wu, C.-C., 2008: Targeted observations in DOTSTAR and T-PARC. WMO Fourth International Workshop on Monsoons (IWM-IV), 20-25 October 2008, Beijing, China
96. Lin, I-I, C.-C. Wu, and I.-F. Pum, 2008: Upper ocean thermal structure & the western North Pacific supertyphoons. Proc., 5th Annual General Meeting, Asia Oceania Geosciences Society, Busan, Korea.
95. Wu, C.-C., 2008: Targeted Observations for Improving Tropical Cyclone Predictability – DOTSTAR to TH08 and T-PARC. Proc., 5th Annual General Meeting, Asia Oceania Geosciences Society, Busan, Korea.
94. Chen, J.-H., M. S. Peng, C. A. Reynolds, and C.-C. Wu, 2008: Interpretation of tropical cyclone forecast sensitivity and dynamics from a NOGAPS singular vector perspective. Proc., 28th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Orlando FL. 4A.3.
93. Chen, S.-G., C.-C. Wu, J.-H. Chen, K.-H. Chou, and P.-H. Lin, 2008: Typhoon-trough interaction from both adjoint-derived sensitivity steering vector (ADSSV) and potential vorticity (PV) perspectives. Proc., 28th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Orlando FL. P1F.5.
92. Chou, K.-H., and C.-C. Wu, 2008: Development of the typhoon initialization – combination of the bogused vortex and the dropwindsonde data in DOTSTAR. Proc., 28th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Orlando FL. P1F.6.
91. Chou, K.-H., and C.-C. Wu, 2008: Eyewall evolution for typhoons crossed the terrains. Proc., 28th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Orlando FL. 17C.2.
90. Huang, T.-S., M. T. Montgomery, and C.-C. Wu, 2008: Sensitivities of hurricane intensity to planetary boundary layer schemes in a full physics three dimensional nonhydrostatic mesoscale model. Proc., 28th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Orlando FL. 3A.5.
89. Lin, I-I, C.-C. Wu, and I.-F. Pun, 2008: A fresh look at ocean's part of necessary conditions in supertyphoon's intensification. Proc., 28th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Orlando FL. 2D.7.
88. Wu, C.-C., and coauthors, 2008: Inter-comparison of targeted observation guidances for tropical cyclones in the western North Pacific. Proc., 28th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Orlando FL. 7C.3.
87. Wu, C.-C., and coauthors, 2008: Inter-comparison of targeted observation guidances for tropical cyclones in the western North Pacific . Proc., Tropical Meteorology Special Symposium, 88th AMS annual meeting, New Orleans, LA.
86. Lin, I-I, C.-C. Wu, S.-N. Hui, and I.-F. Pun, 2007: Supertyphoons in the North western Pacific Part-Ⅱ: Rapid intensification and atmospheric features. Proc., 1st International Summit on Hurricanes and Climate Change, Aegean Confereces, Crete, Greece, May 27-June 1.

85. Wu , C.-C., 2007: DOTSTAR, and its collaboration with TH08 and TCS08 in T-PARC. Proc., T-PARC planning meeting, Kaui, Hawaii, Nov. 4-6.
84. Wu, C.-C., I.-I. Lin and I.-F. Pun, 2007: Supertyphoons in the North western Pacific Part Ⅰ: warm ocean features as boosters to Supertyphoons. Proc., 1st International Summit on Hurricanes and Climate Change, Aegean Confereces, Crete, Greece, May 27-Jun1
83. Wu, C.-C., J.-H. Chen, K.H. Chou, and P.-H. Lin, 2007: Targeted observations for typhoons in the North western Pacific - DOTSTAR. Proc., East Asian Field Observation Workshop, August 30-31, Yonsei University, Seoul, Korea.
82. Wu, C.-C., 2007: Targeted observations for typhoons in the North western Pacific. Committee meeting of the Asian Regional Committee of T-PARC, July 25-26, Tsukuba, Japan.
81. Wu, C.-C., J.-H. Chen, K.H. Chou, and P.-H. Lin, 2007: Targeted observations for typhoons in DOTSTAR - ADSSV. Proc., International Symposium on Global Change, Asian Monsoon and Extreme Weather and Climate, Pre-conference of the PSA Congress, June 11-12, Taipei, Taiwan.
80. Wu, C.-C., J.-H. Chen, K.H. Chou, and P.-H. Lin, 2007: Targeted observations for Typhoons in DOTSTAR - ADSSV. Proc., International Symposium on Global Change, Asian Monsoon and Extreme Weather and Climate, PSA Congress, June 11-12, Okinawa, Japan.
79. Wu, C.-C.,2007:: An overview of the typhoon research programs in Taiwan. Proc., International Typhoon and Disaster Prevention Expert Workshop. Jeju, Korea, April 20.
78. Wu , C.-C., 2007,: The impact of the dropwindsonde data from DOTSTAR on the track prediction of Typhoon Conson (2004). Proc., T-PARC planning meeting workshop, Monterey, CA, April 3-4.
77. Chou, K.-H., C.-C. Wu, P.-H. Lin, S. D. Aberson, M. Peng, and T. Nakazawa, 2006: The impact of dropwindsonde data from DOTSTAR in tropical cyclone track forecasting. Proc., 27th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Monterey, CA.
76. Etherton, B. J., C.-C. Wu, S. J. Majumdar, and S. D. Aberson, 2006: A comparison of targeting techniques for 2005 Atlantic tropical cyclones. Proc., 27th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Monterey, CA.
75. Hsu, H.-H., A.-K. Lo, C.-H. Hung, and C.-C. Wu, 2006: Possible feedback of tropical cyclone to climate variability. Proc., 27th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Monterey, CA.
74. Huang, W.-P., C.-C. Wu, P.-H. Lin, and K.-H. Chou, 2006: The impact of the dropwindsounde data from DOTSTAR on the track prediction of Typhoon Conson (2004). Proc., 27th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Monterey, CA.
73. Lee, C.-Y., and C.-C. Wu, 2006: The effect of the ocean eddy on tropical cyclone intensity. Proc., 27th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Monterey, CA.

72 . Lin, I-I, C.-C. Wu, and I.-F. Pun, 2006: Supercyclone boosters in the North western Pacific Ocean. Proc., 27th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Monterey, CA.

71. Wu, C.-C., 2006: Targeted observations in DOTSTAR. Proc.,Korea-Japan-China Second Joint Conference on Meteorology, Korea Meteorological Society, Meteorological Society of Japan, Chinese Meteorological Society, Seoul, Korea, Oct 11-13.

70. Wu, C.-C., 2006: Targeted observations and the impact evaluation in DOTSTAR. Proc., The 27th Conference on Hurricanes and Tropical Meteorology, The National Center for Atmospheric Research, Denver, CO, Oct 31-Nov 3.

69. Wu, C.-C., 2006: Targeted observation and data assimilation in tropical cyclone track prediction. Proc., The Sixth WMO International Workshop on Tropical Cyclones (IWTC-VI). World Meteorological Organization, San Jose, Costa Rica, Nov 21-30. 409-423.

68. Wu, C.-C., J.-H. Che n, P.-H. Lin, and H.-H. Chou, 2006: Targeted observations of tropical cyclone movement based on the adjoint-derived sensitivity steering vector (ADSSV). Proc., Special session on Severe Weather Systems, Western Pacific Geophysics Meeting, AGU, Beijing, PRC.

67. Wu, C.-C., J.-H. Che n, P.-H. Lin, and H.-H. Chou, 2006: Targeted observations of tropical cyclone movement based on the adjoint-derived sensitivity steering vector (ADSSV). Proc., 27th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Monterey, CA.

66. Wu, C.-C., and H.-J. Cheng, 2006: The dynamics of the eyewall evolution in a landing typhoon. Proc., 27th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Monterey, CA.

65. Zhang, X., T. Li, F. Weng, and C.-C. Wu, 2006: Reanalysis of western pacific typhoons in 2004 using 4DVAR data assimilation technique. Proc., 27th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Monterey, CA.

64. Zeng, Z., Y. Wang, G. J. Holland, C.-C. Wu, and Y. Duan, 2006: Environmental dynamical control if tropical cyclone intensity – An Observational Study. Proc., 27th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Monterey, CA.

63. Zeng, Z. Y., Y.-Q. Wang and C.-C. Wu, 2006: An observational study on environmental dynamical control of tropical cyclone intensity. Proc., Korea-Japan-China Second Joint Conference on Meteorology, Korea Meteorological Society, Meteorological Society of Japan, Chinese Meteorological Society, Seoul, Korea, Oct 11-13.

62. Cheng, H.-J., C.-C. Wu, and Y. Wang, 2004: The eyewall evolution and intensity change in a landfalling typhoon. Proc., 26th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Boston MA. 451-452.

61. Chou, K.-H., C.-C. Wu, and Y. Wang, 2004: The relative role of wind vs. pressure in the initialization of tropical cyclones-observing-systems simulation experiments. Proc., 26th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Boston MA. 594-595.

60. Huang, T.-S., C.-C. Wu, and I-I Lin, 2004: The impact of SST cold wake induced by Typhoon Rusa (2002) on the intensity evolution of Typhoon Sinlaku (2002). Proc., 26th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Boston MA. 657-658.
59. Huang, W.-P., C.-C. Wu, P. H. Lin, S. Aberson, and K.-C. Hsu, 2004: The preliminary analysis of the dropsonde data from DOTSTAR and their impact on the typhoon track forecasts. Proc., 26th Conf. on Hurricanes and Tropical Meteorology. American Meteorological Society, Boston MA. 188-189.
58. Lin, I-I, C.-C. Wu, K. A. Emanuel, I-H. Lee, C. Wu, and F. Pan, 2004: The interaction of Supertyphoon Maemi (2003) with a warm ocean eddy. Proc., Challenging Issues in Tropical Cyclone Research and Forecasts in the Western Pacific, Western Pacific Geophysics Meeting, American Geophysical Union, Honolulu, Hawaii.
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Biographical Research Sketch

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I have been devoting my full efforts to typhoon-related scientific research over the past 18 years. My thesis work at MIT (Wu and Emanuel 1993, 1994, 1995a, b) involved the understanding of hurricane movement from the potential vorticity perspective, which I believe is the very pioneering achievement in proposing and identifying the baroclinic effect on hurricane motion, and quantitatively evaluating the typhoon steering flow and its relation with the large-scale dynamical systems. During my post-doctor tenure at Geophysical Fluid Dynamics Laboratory (GFDL) in Princeton University, my attention was drawn to the development of the GFDL hurricane model, especially its initialization. Based on the GFDL hurricane model simulation, a hurricane-environment interaction problem was demonstrated (Wu and Kurihara 1996).

After joining the faculty position in National Taiwan University (NTU) in 1995, I started to build up the research laboratory, Typhoon Dynamics Research Center (see http://typhoon.as.ntu.edu.tw), with a strong will to conduct top-notched typhoon researches, through which I hope to improve our understanding of the dynamics and physics of typhoon, as well as the forecast of typhoons. Currently I am leading the "Priorioty Typhoon Research Project", specially funded by the Division of Natural Science, National Science Council (NSC) of Taiwan from 2002-2008. The research team is making steady progress in the observing, modeling and theoretical aspects of typhoon researches.

The following is a sketch of my current research foci and the proposed research issues, primarily funded by the National Science Council (NSC) and Central Weather Bureau (CWB) of Taiwan, NTU, and the Office of Naval Research (ONR) of U.S. Navy.

1. **The dynamics of typhoon-terrain interaction:**
   Understanding how the Taiwan terrain affects the track, intensity, wind structure, and precipitation distribution is one of my key research thrusts. Both observational and numerical studies have been conducted to address this problem (Wu and Kuo 1999, BAMS; Wu 2001, MWR; Wu et al. 2002, Wea. & Forecating; Jian and Wu 2007, MWR; Galewsky et al. 2006, JGR). Work is underway to understand the effect of the terrain on the eyewall dynamics and Vortex-Rossby waves in landfalling typhoons (Wu et al. 2003, GRL). The paper has been reported in the "news and views in brief" in "Nature Magazine" in September 2003. A detailed study on the role of the diabatic process in affecting the eyewall evolution has also been conducted (Wu and Cheng 2008, MWR).

2. **The dynamics of typhoon intensity change:**

One of the most difficult and unsolved problems in typhoon research is what the physical mechanisms that control the intensity change of typhoons are. We conducted an observational analysis (Wu and Cheng 1999, MWR) to show the role of the eddy momentum flux and vertical shear in affecting the intensity change of two different types of typhoons. Both idealized and real-case numerical simulations are being set up to address this critical issue. A review paper on this problem has been published in MAP (Wang and Wu 2004). An observational study has been conducted to assess the role of the environmental factors on the typhoon intensity (Zeng et al. 2007, MWR). I am currently proposing to use an idealized flow field in a full-physics model to investigate the impact of the environment and the vertical wind shear on the intensity change of typhoons.

3. **The dynamics of typhoon-ocean interaction:**
This part of work is conducted with the collaboration with Dr. I-I Lin. The cooling of the ocean due to the passage of typhoons has been documented from satellite-retrieved SST data. The response to the wind change has also been demonstrated (Lin et al. 2003a, GRL). Meanwhile, a striking interdisciplinary issue on the dramatic bio-response and ocean primary production due to typhoons has also been raised (Lin et al. 2003b, GRL). The above two papers have been reported in the "news and views in brief" in "Nature Magazine" in March and August issues, 2003, respectively. We have also combined the Sea Surface Height Anomaly data with a simple coupled model (CHIPS) to investigate the role of the warm ocean eddy on the intensity change of Typhoon Maemi (2003) (Lin. et al. 2005, MWR). It is shown the the warm eddy play a critical role in acting as an efficient insulator and preventing the storm-induced SST cooling, thus enabling Maemi to sustain its intensity as a Supertyphoon. This work has received very notable attention in the typhoon research community. The intensification of Hurricane Katrina (2005) is a case in point to highlight the role of warm ocean eddy and the warm current as depicted in our paper. Inspired by our recent observations, I have been working on a simple typhoon-ocean coupled model to understand the role of the ocean mixed-layer structure and the warm current on such feedback problems (Wu et al. 2007, JAS), and the impact of the typhoon-induced SST cooling to the regional climate. Further work has been ongoing to study the role of warm and deep ocean gyre and warm eddies as "Super-typhoon Boosters" in the NW Pacific (Lin et al. 2008a, b, MWR, Lin et al. 200bc, GRL).

4. **Numerical simulation and data assimilation of typhoons**
As described in Wu and Kuo (1999, BAMS), the improvement of our understanding of typhoon dynamics and typhoon forecasting in the Taiwan area hinges very much on our ability to incorporate the available data into high-resolution numerical models through advanced data assimilation techniques. Therefore, I have made considerable efforts with data assimilation research. We have conducted observing systems simulation

experiments based on the 4-dimensional variational data assimilation to help understand the key variables affecting the initialization and simulation of typhoons (Wu et al. 2006, JAS). The follow-up adjoint sensitivity study can play an important role in identifying important areas and parameters, which should be helpful to construct the strategy for adaptive observations. Work is undergoing to evaluate how to best incorporate the dropwindsonde data and the bogused vortex based on the 3D-VAR and 4D-VAR method to improve the simulation of the track and intensity of typhoons (Chou and Wu, 2008, MWR).

5. **Potential vorticity diagnostics of typhoons**
   The potential vorticity diagnostics have been designed to understand the controlling factors affecting the motion of typhoons. A newly proposed centroid-relative track, with the position weighting based on the steering flow induced by the PV anomaly associated with the other storm, has been plotted to highlight the binary interaction processes (Wu et al. 2003, MWR). More detailed works have been continued to evaluate and to quantify the physical factors leading to the uncertainty of the typhoon movement, such as Typhoons Nari (2001) and Sinlaku (2002) (Wu et al. 2004, MWR). Further work is proposed to get more insight into the physics of the statistical behavior of typhoon tracks in the whole North western Pacific region. The role from the ITCZ and other large scale circulation to the typhoon tracks will also be quantified.

6. **Ensemble forecasting of typhoons**
   Specific numerical forecast experiments were run (Wu, Bender and Kurihara 2000, JMSJ) to understand the systematic bias and error statistics of the hurricane model, and the use of ensemble forecasts to minimize these biases. The relationship between the ensemble spread and the ensemble errors was also highlighted. More recent model forecast data have been collected to construct a more meaningful ensemble forecast for typhoons, which should provide a new ensemble technique other than the so-called super-ensemble.

7. **DOTSTAR** (Dropsonde Observation for Typhoon Surveillance near the TAiwan Region) and targeted observation research

In light of the heavy damage done by typhoons to Taiwan year by year, the National Science Council (NSC) of Taiwan places a great premium on typhoon research, and therefore provides ample funding for the "National Priority Typhoon Research" project each of the recent three years (from August 1, 2002 to July 31, 2005), especially including the field experiment, “Dropsonde Observations for Typhoon Surveillance near the Taiwan Region (DOTSTAR)”. The DOTSTAR is an international research program conducted by meteorologists in Taiwan [led by myself, along with Prof. Po-Hsiung Lin of NTU and Dr. Tien-Chiang Yeh of Central Weather Bureau (CWB) as CO-PI’s], partnered with scientists at the Hurricane Research

Division (HRD) and the National Centers for Environmental Prediction (NCEP) of the National Oceanic and Atmospheric Administration (NOAA). This project marks the beginning of a new era for the aircraft surveillance of typhoons in the western North Pacific.

Built upon work pioneered at NOAA's Hurricane Research Division (HRD), the key to the project is the use of airborne sensors -- dropwindsondes, which are released from jet aircraft flying above 42,000 feet in the environment of a tropical cyclone. These sensors gather temperature, humidity, pressure, and wind velocity information as they fall to the surface. Information from the surveillance flights is transmitted in near real-time to the CWB of Taiwan, as well as to the NCEP, FNMOC, and JMA. The data are immediately assimilated into the numerical models of CWB, NCEP (AVN/GFDL), FNMOC (NOGAPS/COAMPS/GFDN), UKMET, and JMA. The DOTSTAR are expected to provide valuable data which can help increase the accuracy of TC analysis and track forecasts, to assess the impact of the data on numerical models, to evaluate the strategies for adaptive/targeted observations, to validate/calibrate the remote-sensing data, and to improve our understanding on the TC dynamics, especially over the TC's boundary layer (Wu et al. 2005, BAMS).

On September 1, 2003, the first DOTSTAR mission was successfully completed around Typhoon Dujuan. NOAA remarked upon the successful collaboration in a press release. On November 2, the second mission was launched while the aircraft flew over the center of Typhoon Melor. Ten more flights have been conducted for Typhoons Nida, Conson, Mindulle, Megi, Aere, Meari, Nock-Ten and Namadel in 2004, with 193 dropsondes released. An average 20% improvement for the 12-72h track forecasts over the NCEP-GFS, FNMOC-NOGAPS, JMA-GSM, their ensembles, and the WRF model has been demonstrated (Wu et al. 2007a, Wea. Fcsting). Seven flights have been conducted for Typhoons Haitang, Matsa, Sanvu, Khanun, and Longwang in 2005, five flights for Bilis, Kaemi, Bopha, Saomai, and Shanshan in 2006, five flights for Pabuk, Sepat, Wipha, and Krosa in 2007, and 10 flights for Fengshen, Kalmaegi, Fungwong,Nuri, Sinlaku, Hagupit, Jangmi. In total, the DOTSTAR have conducted 38 surveillance flight missions for 31 typhoons, with 200 flight hours and 630 dropsondes released.

Multiple techniques have been used to help design the flight path for the targeted observations in DOTSTAR: (1) the area with the largest forecast deep-layer-mean wind bred vectors from the NCEP Global Ensemble Forecasting System at the observation time, (2) the Ensemble Transform Kalman Filter, which predicts the reduction in forecast error variance for all feasible deployments of targeted observations, and (3) the NOGAPS singular vectors that identify sensitive regions. Recently we have proposed a new theory (Wu et al. 2007b, JAS) to identify the sensitive area for the targeted observations of tropical cyclones based on the adjoint model. By appropriately defining the response functions to represent typhoon's steering flow at the verifying time, a unique new parameter, the Adjoint-Derived Sensitivity Steering Vector (ADSSV) has been designed to clearly demonstrate the

sensitivity locations at the observing time. The ADSSV are being implemented and examined in DOTSTAR, as well as the hurricane surveillance program of NOAA's Hurricane Research Division in the Atlantic in 2005 (Etherton et al. 2006, 27th Conf. on Hurr.). An inter-comparison study (Wu 2006, IWTC-VI; Wu et al. 2009, MWR) has being conducted to examine the common feature and difference among all the different targeting techniques. Meanwhile, some better methods to combine the dropwindsonde data with the bogused vortex has also been examined in Chou and Wu (2007, MWR). Overall, the DOTSTAR has made significant impact to the typhoon research and operation community in the international arena.

With strong support from both CWB and NSC, we are planning to continue undertaking surveillance missions in 2006-2008. In particular, DOTSTAR has been recommended as a strong program, and is included as a component in the international THORPEX/PARC initiative under World Meteorological Organization (especially on the collaboration with the Japanese program, Typhoon Hunting 2008, TH08, led by Dr. T. Nakazawa; and Tropical Cyclone structure 2008, TCS-08 of US Navy). As the DOTSTAR research team continues to harvest important data and gain valuable experience, we believe that future typhoon observations will reach full maturity, enabling significant progress in both academic research and typhoon forecasting. It is hoped that DOTSTAR will shed light on typhoon dynamics, improve the understanding and predictability of typhoon track through the targeted observations, place the team at the forefront of international typhoon research, and make a significant contribution to the study of typhoons in the northwestern Pacific and East Asia region.

Some detailed information on DOTSTAR is available at http://typhoon.as.ntu.edu.tw/DOTSTAR/English/home2_english.htm.