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Associate Research Fellow

Research Center for Environmental Changes (RCEC), Academic Sinica, Taiwan

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EDUCATION

Ph.D., 2002.3, Biomedical Engineering and Environmental Sciences, National Tsing Hua University

EMPLOYMENT

Adjunct Associate Professor, Department of Atmospheric Sciences, National Central University
(2010~)

Associate Research Fellow, Research Center for Environmental Changes (RCEC), Academic Sinica
(2010~)

Assistant Research Fellow, Research Center for Environmental Changes (RCEC), Academic Sinica
(2006~2010)

HONORS & AWARDS

2010, 2013, 2016, 2017, and 2018 Awarded Merit Bonus Program for Recruitment and Retention of Exceptional Talent, Ministry of Science and Technology (MOST)

The 2004 Outstanding Paper Award of *Terrestrial, Atmospheric and Oceanic Sciences* (TAO) (SCI)

RESEARCH INTERESTS

- (1) High performance VOC and greenhouse gas measurement techniques (on-line and in-lab)
- (2) Characterization of key precursors and their impact on secondary air pollutant formation (O₃, PM_{2.5}) in urban, suburban, and rural environments
- (3) Hazardous/toxic VOCs in science parks and industrial complexes
- (4) 3-D Multicopter UAV Sounding Technique (MUST) Platform for probing comprehensive atmospheric variables
- (5) Intelligent aerial monitoring network for air pollution, meteorological variables, and images

PUBLICATIONS

(SCIE Publication = 80); (WOS H-Index = 34)

1. Yen-Chen Chen, Jia-Lin Wang, Chih-Yuan Chang, Ming-Tung Chuang, Charles C.-K. Chou,

- Xiang-Xu Pan, Yu-Jui Ho, Chang-Feng Ou-Yang, Wen-Tzu Liu, **Chih-Chung Chang***, 2023. Using drone soundings to study the impacts and compositions of plumes from a gigantic coal-fired power plant. *Science of The Total Environment* 893, 164709.
2. Ou-Yang, C.F., **Chih-Chung Chang***, Sheng-Hsiang Wang, Charles C.-K. Chou, Ming-Tung Chuang, Tang-Huang Lin, Wei-Nai Chen, Ta-Chih Hsiao, Ming-Cheng Yen, Yueh-Chen Wang, Neng-Huei Lin, Jia-Lin Wang*, 2023. Integrated ground and vertical measurement techniques to characterize overhead atmosphere: Case studies of local versus transboundary pollution. *Science of The Total Environment* 887, 163919. <https://doi.org/10.1016/j.scitotenv.2023.163919>.
 3. Ming-Tung Chuang*, Charles C.-K. Chou, Chuan-Yao Lin, Ja-Huai Lee, Wei-Che Lin, Wei-Nai Chen, Chian-Yi Liu, **Chih-Chung Chang**, 2023. Probing air pollution in the Taichung metropolitan area, Taiwan. Part 1: Comprehensive model evaluation and the spatial-temporal evolution of a PM2.5 pollution event. *Atmospheric Research* 287, 106713.
 4. Chih-Yuan Chang, Jia-Lin Wang, Yen-Chen Chen, Xiang-Xu Pan, Wei-Nai Chen, Ming-Ren Lin, Yu-Jui Ho, Ming-Tung, Chuang, Wen-Tzu Liu, **Chih-Chung Chang***, 2022. A study of vertical homogeneity of trace gases in East Asian continental outflow. *Chemosphere* 297, 134165.
 5. Wen-Tzu Liu, Wei-Cheng Liao, Stephen M. Griffith, **Chih-Chung Chang***, Yue-Chuen Wu, Chieh-Heng Wang, Jia-Lin Wang*, 2022. Characterization of odorous industrial plumes by coupling fast and slow mass spectrometry techniques for volatile organic compounds. *Chemosphere* 304, 135304.
 6. Chuang, Ming-Tung*, Charles C.-K. Chou, Lin, Chuan-Yao, Lee, Ja-Huai, Lin, Wei-Che, Chen, Yi-Ying, **Chih-Chung Chang**, Lee, Chung-Te, Kong, Steven Soon-Kai, Tang-Huang Lin, 2022. A Numerical Study of Reducing O3 and Pm2.5 Simultaneously in Taiwan. *Journal of Environmental Management* 318, 115614. <http://dx.doi.org/10.2139/ssrn.4074922>
 7. Jhang, Syu-Ruei; Chen, Yi-Ying; Shiau, Yo-Jin; Lee, Chia-Wei; Chen, Wei-Nai; **Chang, Chih-Chung**; Chiang, Chih-Feng; Guo, Horng-Yuh; Wang, Pao-Kuan; Chou, Charles*, 2022. Denitrifiers and Nitrous Oxide Emissions from a Subtropical Vegetable Cropland. *ACS Earth and Space Chemistry* 6, 8, 2024–2031. <https://doi.org/10.1021/acsearthspacechem.2c00106>
 8. **Chang, Chih-Chung***, Chih-Yuan Chang, Jia-Lin Wang, Xiang-Xu Pan, Yen-Chen Chen, Yu-Jui Ho, 2020. An optimized multicopter UAV sounding technique (MUST) for probing comprehensive atmospheric variables. *Chemosphere* 254, 12687.
 9. **Chang, Chih-Chung**, Hwa-Kwang Yak, Jia-Lin Wang*, 2020. Consumption of hydrocarbons and its relationship with ozone formation in two Chinese megacities. *Atmosphere* 11, 326.
 10. Ou-Yang, Chang-Feng, Tien-Li Lin, **Chih-Chung Chang**, Hsin-Cheng Hsieh, Chieh-Heng Wang, Jia-Lin Wang*, 2020. Characterization of industrial plumes of volatile organic compounds by guided sampling. *Chemosphere* 241, 124957.
 11. Chen, Yu-Chieh, **Chih-Chung Chang**, Wei-Nai Chen, Yu-Jen Tsai, Shih-Yu Chang*, 2018. Determination of the vertical profile of aerosol chemical species in the microscale urban environment. *Environmental Pollution* 243, 1360-1367.
 12. **Chang, Chih-Chung***, Chih-Yuan Chang, Jia-Lin Wang, Ming-Ren Lin, Chang-Feng Ou-Yang,

- Xiang-Xu Pan, Yen-Chen Chen, 2018. A study of atmospheric mixing of trace gases by aerial sampling with a multi-rotor drone. *Atmospheric Environment* 184, 254-261. <https://doi.org/10.1016/j.atmosenv.2018.04.032>
13. Ou-Yang, Chang-Feng, Wei-Cheng Liao, **Chih-Chung Chang***, Hsin-Cheng Hsieh, Jia-Lin Wang*, 2018. Guided Episodic Sampling for Capturing and Characterizing Industrial Plumes. *Atmospheric Environment* 174, 188-193.
 14. Ou-Yang, Chang-Feng, **Chih-Chung Chang***, Jia-Lin Wang, Kojiro Shimada, Shiro Hatakeyama, Shungo Kato, Jia-Yang Chiu, Guey-Rong Sheu, Neng-Huei Lin*, 2017. Characteristics of Summertime Volatile Organic Compounds in the Lower Free Troposphere: Background Measurements at Mt. Fuji. *Aerosol and Air Quality Research* 17, 3037–3051.
 15. Chen, W., Shao, M., Wang, M., Lu, S., Liu, Y., Yuan, B., ..**Chih-Chung Chang**, ... & Zhang, Q., 2016. Variation of ambient carbonyl levels in urban Beijing between 2005 and 2012. *Atmospheric environment*, 129, 105-113.
 16. Ou-Yang, Chang-Feng, Wei-Cheng Liao, Pei-Chieh Wang, Gang-Jei Fan, Chien-Cheng Hsiao, Ming-Tung Chuang, **Chih-Chung Chang**, Neng-Huei Lin, Jia-Lin Wang, 2016. Construction of a cryogen-free thermal desorption gas chromatographic system with off-the-shelf components for monitoring ambient volatile organic compounds. *J. Sep. Sci.* 2016, 39, 1489–1499.
 17. **Chang, Chih-Chung***, Jia-Lin Wang, Chih-Yuan Chang, Mao-Chang Liang, Ming-Ren Lin, 2016. Development of a multicopter-carried whole air sampling apparatus and its applications in environmental studies. *Chemosphere* 144, 484-492.
 18. Chen, Sheng-Po, Yuan-Chang Su, Ching-Jui Chiu, Ching-Ho Lin, Julius Chang, **Chih-Chung Chang***, Jia-Lin Wang*, 2015. Inter-comparison of network measurements of non-methane organic compounds with model simulations. *Atmospheric Environment* 122, 94-102. doi:10.1016/j.atmosenv.2015.09.033
 19. Ou-Yang, Chang-Feng, **Chih-Chung Chang***, Shen-Po Chen, Clock Chew, Bo-Ru Lee, Chih-Yuan Chang, Geoffrey S. Dutton, Stephen A. Montzka, James H. Butler, James W. Elkins, Jia-Lin Wang*, 2015. Changes in the Levels and Variability of Halocarbons and the Compliance with the Montreal Protocol from an Urban View. *Chemosphere* 138, 438-446.
 20. Tsai, I-C., J.-P. Chen, C. S.-C. Lung, N. Li, W.-N. Chen, T.-M. Fu, **Chih-Chung Chang**, and G.-D. Hwang, 2015: Sources and formation pathways of organic aerosol in a subtropical metropolis during summer. *Atmospheric Environment* 117, 51-60.
 21. Liu, Y., Yuan, B., Li, X., Shao, M., Lu, S., Li, Y., **Chih-Chung Chang**, Wang, Z., Hu, W., Huang, X., He, L., Zeng, L., Hu, M., and Zhu, T., 2015. Impact of pollution controls in Beijing on atmospheric oxygenated volatile organic compounds (OVOCs) during the 2008 Olympic Games: observation and modeling implications, *Atmospheric Chemistry and Physics* 15, 3045-3062, doi:10.5194/acp-15-3045-2015.
 22. Wang, M., Shao, M., Chen, W., Lu, S., Liu, Y., Yuan, B., Zhang, Q., Zhang, Q., **Chih-Chung Chang**, Wang, B., Zeng, L., Hu, M., Yang, Y., and Li, Y., 2015. Trends of non-methane hydrocarbons (NMHC) emissions in Beijing during 2002–2013, *Atmospheric Chemistry and Physics* 15, 1489-1502, doi:10.5194/acp-15-1489-2015. (SCI: 5.52)

23. **Chang, Chih-Chung***, Jia-Lin Wang, Shih-Chun Candice Lung, Chih-Yuan Chang, Po-Ju Lee, Clock Chew, Wei-Cheng Liao, Wei-Nai Chen, Chang-Feng Ou-Yang, 2014. Seasonal characteristics of biogenic and anthropogenic isoprene in tropical-subtropical urban environments. *Atmospheric Environment* 99, 298-308. (SCI: 3.23).
24. Liu, Wen-Tzu, Sheng-Po Cheng, **Chih-Chung Chang***, Chang-Feng Ou-Yang, Wei-Cheng Liao, Yuan-Chang Su, Yue-Chuen Wu, Jia-Lin Wang*, 2014. Assessment of carbon monoxide (CO) adjusted non-methane hydrocarbon (NMHC) emissions of a motor fleet – A long tunnel study. *Atmospheric Environment* 89, 403-414.
25. Chen, Sheng-Po, **Chih-Chung Chang**, Jyh-Jian Liu, Charles C.-K. Chou, Julius S. Chang, Jia-Lin Wang, 2014. Recent Improvement in Air Quality - Evidenced by the Island-wide Monitoring Network in Taiwan. *Atmospheric Environment* 96, 70-77.
26. Zhang, Q., B. Yuan, M. Shao, X. Wang, S. Lu, K. Lu, M. Wang, L. Chen, **Chih-Chung Chang**, and S. C. Liu, 2014. Variations of ground-level O₃ and its precursors in Beijing in summertime between 2005 and 2011. *Atmospheric Chemistry and Physics* 14, 6089-6101. doi:10.5194/acp-14-6089-2014.
27. Chen, Sheng-Po, Wei-Cheng Liao, **Chih-Chung Chang**, Yuan-Chang Su, Yu-Huei Tong, Julius S. Chang, Jia-Lin Wang, 2014. Network monitoring of speciated vs. total non-methane hydrocarbon measurements. *Atmospheric Environment* 90, 33-42.
28. Rohrer, F.*, K. Lu, A. Hofzumahaus, B. Bohn, T. Brauers, **Chih-Chung Chang**, H. Fuchs, F. Holland, K. Kita, Y. Kondo, X. Li, S. Lou, Min Shao, Limin Zeng, Yuanhang Zhang, A. Wahner, 2014. Maximum efficiency in the hydroxyl-radical-based self-cleansing of the troposphere. *Nature Geoscience* 7, 559–563. doi:10.1038/ngeo2199.
29. Hung, Hui-Ming, Wan-Jung Lu, Wei-Nai Chen, **Chih-Chung Chang**, Charles C.-K. Chou, Po-Hsiung Lin, 2014. Enhancement of the hygroscopicity parameter kappa of rural aerosols in northern Taiwan by anthropogenic emissions. *Atmospheric Environment* 84, 78-87.
30. Liao, Wei-Chen, Cheng-Feng Ou-Yang, Chieh-Heng Wang, **Chih-Chung Chang**, Jia-Lin Wang, 2013. Two-dimensional gas chromatographic analysis of ambient light hydrocarbons. *Journal of Chromatography A* 1294, 122-129.
31. Wang, Jia-Lin, Clock Chew, Chih-Yuan Chang, Wei-Cheng Liao, Shih-Chun Candice Lung, Wei-Nai Chen, Po-Ju Lee, Po-Hsiung Lin, **Chih-Chung Chang***, 2013. Biogenic isoprene in subtropical urban settings and implications for air quality, *Atmospheric Environment* 79, 369-379.
32. Wang, Jia-Lin, **Chih-Chung Chang***, Kun-Zhang Lee, 2012. In-line Sampling with Gas Chromatography-Mass Spectrometry to Monitor Ambient Volatile Organic Compounds. *Journal of Chromatography A* 1248, 161-168.
33. Liu, Z., Wang, Y., Gu, D., Zhao, C., Huey, L. G., Stickel, R., Liao, J., Shao, M., Zhu, T., Zeng, L., Amoroso, A., Costabile, F., **Chih-Chung Chang**, and Liu, S.-C., 2012. Summertime photochemistry during CAREBeijing-2007: RO_x budgets and O₃ formation, *Atmospheric Chemistry and Physics* 12, 7737-7752, doi:10.5194/acp-12-7737-2012.
34. Song, Guo, Min Hu, Qingfeng Guo, Xin Zhang, Mei Zheng, Jun Zheng, **Chih-Chung Chang**, James J. Schauer, Renyi Zhang, 2012. Primary Sources and Secondary Formation of Organic

- Aerosols in Beijing, China. *Environmental Science & Technology*. 04/2012; 46(18):9846-53. DOI:10.1021/es2042564.
35. Liu, Zhen, Yuhang Wang, Mihalis Vrekoussis, Andreas Richter, Folkard Wittrock, John P. Burrows, Min Shao, **Chih-Chung Chang**, Shaw-Chen Liu, Hongli Wang, Changhong Chen, 2012. Exploring the Missing Source of CHOCHO over China. *Geophysical Research Letters*, VOL. 39, L10812, doi:10.1029/2012GL051645
 36. Liu, Wen-Tzu, Hsin-Cheng Hsieh, Sheng-Po Chen, Julius S. Chang, Neng-Huei Lin, **Chih-Chung Chang**, Jia-Lin Wang, 2012. Diagnosis of Air Quality through Observation and Modeling of Volatile Organic Compounds (VOCs) as Pollution Tracers. *Atmospheric Environment* 55, 56-63.
 37. Lu, K.D., F. Rohrer, F. Holland, H. Fuchs, B. Bohn, T. Brauers, **Chih-Chung Chang**, R. Häseler, M. Hu, K. Kita, Y. Kondo, X. Li, S. R. Lou*, S. Nehr, M. Shao, L. M. Zeng, A. Wahner, Y. H. Zhang, and A. Hofzumahaus, 2012. Observation and modelling of OH and HO₂ concentrations in the Pearl River Delta 2006: a missing OH source in a VOC rich atmosphere. *Atmospheric Chemistry and Physics* 12, 1541-1569. doi:10.5194/acp-12-1541-2012.
 38. Yuan, Bin, Wentai Chen, Min Shao, Ming Wang, Sihua Lu, Bin Wang, Ying Liu, **Chih-Chung Chang**, Boguang Wang, 2012. Measurements of ambient hydrocarbons and carbonyls in the Pearl River Delta (PRD), China. *Atmospheric Research* 116, 93-104. <http://dx.doi.org/10.1016/j.atmosres.2012.03.006>. (SCI: 1.60)
 39. Shao, Min, Daikuan Huang, Dasa Gu, Sihua Lu, **Chih-Chung Chang**, Jia-Lin Wang, 2011. Estimate of anthropogenic halocarbon emissions based on measured ratios relative to CO in the Pearl River Delta region, China. *Atmospheric Chemistry and Physics*, 11, 5011–5025, 2011.
 40. Chou, C. C.-K., C.-Y. Tsai, **Chih-Chung Chang**, P.-H. Lin, S. C. Liu, and T. Zhu. Photochemical production of ozone in Beijing during the 2008 Olympic Games, 2011. *Atmospheric Chemistry and Physics* 11, 9825–9837.
 41. Lou, S., Holland, F., Rohrer, F., Lu, K., Bohn, B., Brauers, T., **Chih-Chung Chang**, Fuchs, H., Häseler, R., Kita, K., Kondo, Y., Li, X., Shao, M., Zeng, L., Wahner, A., Zhang, Y., Wang, W., Hofzumahaus, A., 2010. Atmospheric OH reactivities in the Pearl River Delta- China in summer 2006: Measurement and model results. *Atmospheric Chemistry and Physics* doi:10.5194/acp-10-11243-2010.
 42. Liu, Zhen, Yuhang Wang, Dasa Gu, Chun Zhao, L. Gregory Huey, Robert Stickel, Jin Liao, Min Shao, Tong Zhu, Limin Zeng, Shaw-Chen Liu, **Chih-Chung Chang**, Antonio Amoroso and Francesca Costabile, 2010. Evidence of Reactive Aromatics As a Major Source of Peroxy Acetyl Nitrate over China. *Environmental Science & Technology* 44, 7017-7022.
 43. Li, Yang, Min Shao, Sihua Lu, **Chih-Chung Chang**, Purnendu K. Dasgupta, 2010. Variation and source of ambient formaldehyde measured in Beijing in the summer of 2008. *Atmospheric Environment* 44, 2632-2639.
 44. Lu, KeDing, YuanHang Zhang, Hang Su, Min Shao, LiMin Zeng, LiuJu Zhong, YunRong Xiang, **Chih-Chung Chang**, C. K. Charles Chou, Andreas Wahner, 2010. Regional ozone pollution and key controlling factors of photochemical ozone production in Pearl River Delta during summer time. *Science China-Chemistry*, 53(3):651-663. DOI:10.1007/s11426-010-0055-6 pp.651-663.

45. Lin, Chuan-Yao, **Chih-Chung Chang**, Chuen-Yu Chan, Win-Chin Chen, Allen Chu and Shaw Chen Liu, 2010. Characteristics of springtime profiles and sources of ozone in the lower troposphere over northern Taiwan. *Atmospheric Environment* 44, 182-193.
46. Lu K. D., Zhang, Y. H., Su, H., Shao, M., Zeng, L. M., Zhong, L.J., Xiang, Y.R., **Chih-Chung Chang**, Chou, C. K. Charles, Andreas, W., 2009. Regional ozone pollution and key controlling factors of photochemical ozone production in Pearl River Delta during summer time, 2010. *Science China Chem*, 53(3) 651–663.
47. **Chang, Chih-Chung**, Chang-Feng OuYang, Chieh-Heng Wang, Sen-Wei, Chiang, Jia-Lin Wang*, 2010. Validation of in-situ Measurements of Volatile Organic Compounds through Flask Sampling and Gas Chromatography/Mass Spectrometry Analysis. *Atmospheric Environment* 44, 1301-1307. doi:10.1016/j.atmosenv.2009.12.016.
48. **Chang, Chih-Chung***, Jia-Lin Wang, Shih-Chun Candice Lung, Shaw-Chen Liu, Chein-Jung Shiu, 2009. Source characterization of ozone precursors by complementary approaches of vehicular indicator and principal component analysis. *Atmospheric Environment* 43, 1771-1778.
49. Shao, Min, Sihua Lu, Ying Liu, Xin Xie, **Chih-Chung Chang**, Shan Huang, and Zhongmin Chen, 2009. Volatile organic compounds measured in summer in Beijing and their role in ground-level ozone formation. *Journal of Geophysical Research* 114, D00G06. doi:10.1029/2008JD010863
50. Hofzumahaus, A., F. Rohrer*, K. Lu, B. Bohn, T. Brauers, **Chih-Chung Chang**, H. Fuchs, F. Holland, K. Kita, Y. Kondo, X. Li, S. Lou, Min Shao, Limin Zeng, A. Wahner, Yuanhang Zhang, 2009. Amplified trace Gas Removal in the Troposphere. *Science* 324, 1702-1704.
51. Lai, Cheng-Hsun, **Chih-Chung Chang**, Min Shao, Yuanhang Zhang, Jia-Lin Wang, 2009. Emissions of Liquefied Petroleum Gas (LPG) from Motor Vehicles. *Atmospheric Environment* 43,1456-1463.
52. Tang, J. H., L. Y. Chan, **Chih-Chung Chang**, S. C. Liu, Y. S. Li, 2009. Characteristics and Sources of Non-methane Hydrocarbons in Background Atmospheres of Eastern, Southwestern and Southern China. *Journal of Geophysical Research* 114, D103304.
53. Liu, Ying, Min Shao, Sihua Lu, **Chih-Chung Chang**, Jia-Lin Wang, Linlin Fu, 2008. Source apportionment of ambient volatile organic compounds in the Pearl River Delta, China: Part II. *Atmospheric Environment* 42, 6261-6274.
54. **Chang, Chih-Chung**, Cheng-Hsun Lai, Chieh-Heng Wang, Ying Liu, Min Shao, Yuanhang Zhang, Jia-Lin Wang*, 2008. Variability of ozone depleting substances as an indication of emissions in the Pearl River Delta, China. *Atmospheric Environment* 42, 6973-6981.
55. Xie, Xin, Min Shao, Ying Liu, Sihua Lu, **Chih-Chung Chang**, Zhong-ming Chen. Estimate of initial isoprene contributions to ozone formation potential in Beijing, China, 2008. *Atmospheric Environment* 42, 6000-6010.
56. Su, Yuan-Chang, **Chih-Chung Chang**, Jia-LinWang. Construction of an automated gas chromatography/mass spectrometry system for the analysis of ambient volatile organic compounds with on-line internal standard calibration, 2008. *Journal of Chromatography A* 1201, 134-140.
57. Hua, W., Z. M. Chen, C. Y. Jie, Y. Kondo, A. Hofzumahaus, N. Takegawa, **Chih-Chung Chang**, K.

- D. Lu¹, Y. Miyazaki, K. Kita, H. L. Wang, Y. H. Zhang, and M. Hu, 2008. Atmospheric hydrogen peroxide and organic hydroperoxides during PRIDE-PRD 06, China: their concentration, formation mechanism and contribution to secondary aerosols. *Atmospheric Chemistry and Physics* 8, 6755-6773.
58. Wang, Jia-Lin, Chieh-Heng Wang, Cheng-Hsun Lai, **Chih-Chung Chang**, Ying Liu, Yuanhang Zhang, Shaw Liu, Min Shao, 2008. Characterization of ozone precursors in the Pearl River Delta by time series observation of non-methane hydrocarbons. *Atmospheric Environment* 42, 6233-6246.
59. Liu, Ying, Min Shao, Sihua Lu, **Chih-Chung Chang**, Jia-Lin Wang, Gao Chen, 2008. Volatile Organic Compounds (VOCs) Measurement in Pearl River Delta (PRD), China. *Atmospheric Chemistry and Physics* 8, 1531-1545. (SCI: 4.927)
60. Tang, J. H., L. Y. Chan, C. Y. Chan, Y. S. Li, **Chih-Chung Chang**, S. C. Zou, B. Barletta, D. R. Blake, and D. Wu, 2008. Implications of changing urban and rural emissions on non-methane hydrocarbons in the Pearl River Delta region of China. *Atmospheric Environment* 42, 3780-3794.
61. Nian, Hung-Chi, Hsin-Wang Liu, Ben-Zen Wu, **Chih-Chung Chang**, Kong-Hwa Chiu, Jiunn-Guang Lo, 2008. Impact of inclement weather on the characteristics of volatile organic compounds in ambient air at the Hsinchu Science Park in Taiwan. *Science of the total environment*, 399, 41~ 49.
62. Jei-Hun Wang, **Chih-Chung Chang**, and Jia-Lin Wang, 2007. "Devising an Adjustable Splitter for Dual-column Gas Chromatography." *Journal of Chromatography A* 1163, 298-303.
63. Chein-Jung Shiu, Shaw Chen Liu, **Chih-Chung Chang**, Jen-Ping Chen, Charles C. K. Chou, and Chuan-Yao Lin, 2007. Photochemical production of ozone and control strategy for southern Taiwan. *Atmospheric Environment* 41, 9324-9340.
64. Tang, J. H., L. Y. Chan, C. Y. Chan, Y. S. Li, **Chih-Chung Chang**, S. C. Liu, D. Wu, and Y. D. Li, 2007. Characteristics and diurnal variations of NMHCs in urban, suburban, and rural sites of the Pearl River Delta and a remote site in South China. *Atmospheric Environment* 41, 8620-8632.
65. Tang, J.H., L.Y. Chan, C.Y. Chan, Y.S. Li, **Chih-Chung Chang**, Shaw-Chen Liu, Yi-De Li, 2007. Nonmethane hydrocarbons in the transported and local air masses at a clean remote site on Hainan Island, south China. *Journal of Geophysical Research* 112, D14312.
66. Lin, C-Y., Zifa wang, C. C. Chou., **Chih-Chung Chang**, Shaw-C. Liu, 2007. A Numerical Study of an Autumn High Ozone Episode over Southwestern Taiwan. *Atmospheric Environment* 41, 3684-3701.
67. Chan C.Y., Li Y.S., Chan L.Y., Leung Y.K., Wu M.C., **Chih-Chung Chang**, and Liu S.C., 2007. An analysis on abnormally low ozone in the upper troposphere over subtropical East Asia in spring 2004, *Atmospheric Environment* 41, 3556-3564.
68. Wu, Ben-Zen, **Chih-Chung Chang**, Usha Sree, KongHwa Chiu, Jiunn-Guang Lo, 2006. Measurement of non-methane hydrocarbons in Taipei city and their impact on ozone formation in relation to air quality. *Analytica Chimica Acta*, vol.576, p91-99.
69. Hsieh, Ling-Ling, **Chih-Chung Chang**, Usha Sree, Jiunn-Guang Lo, 2006. Determination of

volatile organic compounds in indoor air of buildings in nuclear power plants, Taiwan. *Water Air and Soil Pollution* 170, 107-121.

70. **Chang, Chih-Chung***, Jia-Lin Wang, Shaw-Chen Liu, Shih-Chun Candice Lung, 2006 “Assessment of vehicular and non-vehicular contributions to hydrocarbons using exclusive vehicular indicators” *Atmospheric Environment* 40, 6349-6361.
71. **Chang, Chih-Chung***, Tai-Yih Chen, Chuan-Yao Lin, Chung-Shin Yuan, Shaw-Chen Liu, 2005. “Effects of reactive hydrocarbons on ozone formation in southern Taiwan” *Atmospheric Environment* 39, 2867-2878.
72. **Chang, Chih-Chung**, Usha Sree, Yu-Sung Lin, Jiunn-Guang Lo, 2005. An examination of 7:00 – 9:00PM ambient air volatile organics in different seasons of Kaohsiung city, southern Taiwan. *Atmospheric Environment* 39, 867-884.
73. Chiu, Kong Hwa, Ben Zen Wu, **Chih-Chung Chang**, Usha Sree, Chien-Hou Wu and Jiunn-Guang Lo, 2005. Distribution of volatile organic compounds over a Semiconductor Industrial Park in Taiwan. *Environmental Science & Technology* 39, 973-983.
74. Wang, Jei-Hun, **Chih-Chung Chang**, and Jia-Lin Wang, 2005. “Peak tailoring concept in GC analysis of volatile organic pollutants in the atmosphere.” *Journal of Chromatography A*, 1087, 150-157.
75. **Chang, Chih-Chung***, Tai-Yih Chen, Clock Chou, Shaw-Chen Liu, 2004. Assessment of traffic contribution of hydrocarbons by using 2,2-dimethylbutane as a vehicular indicator. *Terrestrial, Atmospheric and Oceanic Sciences* 15, 697-711.
76. **Chang, Chih-Chung**, Shun-Jin Lo, Jiunn-Guang Lo, and Jia-Lin Wang*, 2003. Analysis of Methyl *tert*-butyl ether (MTBE) in the atmosphere and implications as an exclusive indicator of automobile exhaust. *Atmospheric Environment* 37, 4747-4755.
77. **Chang, Chih-Chung**, Jiunn-Guang Lo, Cheng-Hsiung Tasi and Jia-Lin Wang, 2001. Concentration variation of halocarbons over an electrical industrial park and its implication in compliance with the Montreal Protocol. *Environmental Science & Technology*, Vol. 35, No 16, pp.3273-3279. doi.org/10.1021/es001894q
78. **Chang, Chih-Chung**, Jiunn-Guang Lo and Jia-Lin Wang, 2001. Assessment of reducing ozone forming potential for vehicles using liquefied petroleum gas as an alternate fuel. *Atmospheric Environment* 35, 6201-6211.
79. Wang, Jia-Lin, **Chih-Chung Chang**, and Wen-Dur Chang, Clock Chew, Shin-Wei Chen, 1999. “Construction and evaluation of automated gas chromatography for the measurement of anthropogenic halocarbons in the atmosphere”, *Journal of Chromatography A* 844, 259-269.
80. Wang, Jia-Lin, **Chih-Chung Chang**, and Yun-Huin Lin, 1998. “Concentration distributions of anthropogenic halocarbons over a metropolitan area”, *Chemosphere*, Vol. 36, No 10, pp.2391-2400.

Non-SCI Journal paper:

1. Wang, Jia-Lin, Gloria Jacobson, Chris W. Rella, Chih-Yuan Chang, Ivan Liu, Wen-Tzu Liu, Clock

- Chew, Chang-Feng Ou-Yang, Wei-Cheng Liao, **Chih-Chung Chang***, 2013. Flask Sample Measurements for CO₂, CH₄ and CO Using Cavity Ring-Down Spectrometry. *Atmos. Meas. Tech. Discuss.*, 6, 7633–7657.
2. Lo, J.-G., **Chih-Chung Chang**, Ke, S.-S., Kuang, J.-D, 2000. Assessment of the environmental air in a semiconductor industrial area by FTIR and GC/MS. *Advances in Air Pollution* (2000), 8 (Air Pollution VIII), 601-610.

Newsletters:

1. Min, Shao, Wang Bin, Lu Sihua, Liu Shaw Chen, **Chih-Chung Chang**, 2009. Trends in summertime non-methane hydrocarbons in Beijing city, 2004-2009. International Global Atmospheric Chemistry (IGAC) Newsletter 42.

Seminar/Conference/Invited Talk:

- **Chang, Chih-Chung***. UAV for monitoring environmental pollution. 2020 National Environmental Law Enforcement Convention (**Invited speaker**), Environmental Protection Administration and Ministry of Justice, Taoyuan City, 9/22-23. (in Chinese)
- **Chang, Chih-Chung***. UAV for plume tracking and aerial sampling. 2020 Seminar on Application of Telemetry Techniques and Tools in Environmental Monitoring (**Invited talk**), Environmental Protection Administration, Center for Space and Remote Sensing Research, NCU, 8/28. (in Chinese)
- **Chang, Chih-Chung***, Chih-Yuan Chang, Jia-Lin Wang, Ming-Ren Lin, Xiang-Xu Pan, Chieh-Hen Wang, Neng-Huei Lin, Chang-Feng Ou-Yang, Yen-Chen Chen, Yu-Jui Ho. A study of vertical homogeneity of trace gases in Asian continental outflow. AGU Fall Meeting 2019 (12/9-13), No. A31I-2667, San Francisco, US.
- **Chang, Chih-Chung***, Chih-Yuan Chang, Jia-Lin Wang, Xiang-Xu Pan, Yen-Chen Chen, Yu-Jui Ho, Chang-Feng Ou-Yang, Neng-Huei Lin, Mao-Chang Liang, Wei-Nai Chen. 3-Dimensional sampling and observation platforms for probing near-ground atmosphere. EGU General Assembly 2019(4/7-12), AS3.18- X5.307 (EGU2019-2335), Vienna, Austria.
- **Chang, Chih-Chung**, Sheng-Hsiang Wang, Shih-Yu Chang, Chih-Yuan Chang, Yu-Chieh Chen, Xiang-Xu Pan, Yen-Chen Chen, Li-Jin Ke, Ru-Shan Kao, Chang-Feng Ou-Yang, Mao-Chang Liang, Ta-Chih Hsiao, Wei-Nai Chen, Neng-Huei Lin, Jia-Lin Wang. Multicopter-based aerial sampling and observation platforms for air quality studies. 2018 International Society for Atmospheric Research using Remotely piloted Aircraft (ISARRA), 9-12 July 2018, Boulder, Colorado.
- Hsiao, T. C.*, W. N. Chen, C. C.-K. Chou, **Chih-Chung Chang**, Numerical simulation and analysis for flow field and particle trajectory of aerosol sampling tube on unmanned aerial vehicle. 2018 Environmental Analytical Chemistry Conference, Environmental Analysis Laboratory, EPA, 5/3-4, F-4. (in Chinese)
- **Chang, Chih-Chung***, Jia-Lin Wang, Chih-Yuan Chang, Xiang-Xu Pan, Yen-Chen Chen. Aerial

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- **Chang, Chih-Chung***, Jia-Lin Wang, Chih-Yuan Chang, Ming-Ren Lin, Chang-Feng Ou-Yang, Xiang-Xu Pan, Neng-Huei Lin. Aerial sampling using drones for measuring trace gases. EGU General Assembly 2017(4/23-28), AS3.18- X5.469 (EGU2017-11068), Vienna, Austria.
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- **Chang, Chih-Chung**, Min Shao, Charles C. K. Chou, Jia-Lin Wang, Shaw-Chen Liu, Kun-Zhang Lee, Cheng-Hsun Lai, Tong Zhu, Po-Hsiung Lin. Biogenic isoprene and implications for oxidant levels in Beijing during the 2008 Olympic Games. EGU General Assembly 2014 (4/27-5/2), AS3.1- Z85 (EGU2014-1266), Vienna, Austria.
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PEER REVIEW ACTIVITIES:

Atmospheric Environment

Atmospheric Chemistry and Physics

Atmosphere (Reviewer, Guest Editor)

Aerosol and Air Quality Research

Environmental Science and Pollution Research

Environmental Science & Technology

Journal of Environmental Quality

Terr. Atmos. Ocean. Sci. Journal

Water Air and Soil Pollution

ADMINISTRATIVE SERVICE

Co-chair, Environmental Safety and Health Committee, RCEC (2020~)

Personnel Management Committee, RCEC (2020~)

Dormitory Management Committee, Academia Sinica (2015~2017)

Radiation Protection and Management Committee, Academia Sinica (2007~2009)

RESEARCH PROJECTS:

- Ministry of Science and Technology (2016-2020), Development of a 3-D sampling and observation platform and its applications in environmental and climate studies. (PI)
- Ministry of Science and Technology (2016-2019), Early Warning and Monitoring of Long-Range Transported Air Pollution Caused by the Asian Continental Outflow. (co-PI)
- Ministry of Science and Technology/Environmental Protection Administration (2016-2018), Develop a lightweight aerosol sampler that can be installed on drones to measure the vertical characteristics of PM_{2.5} chemical species. (co-PI)
- Ministry of Science and Technology (2013-2016), The relationship between biogenic VOCs, secondary air pollutants, and meteorological factors in subtropical urban environments (PI)
- Ministry of Science and Technology (2014-2017), Influences of aerosol physico-chemistry upon the haze in Taiwan Strait and surrounding areas (co-PI)
- National Science Council (2010-2013), Study of secondary organic aerosol (SOA) precursors and analysis of correlation between SOA and the degree of photochemical processing (PI)
- Environmental Protection Administration (2010-2012), Integration of monitoring and sampling technology in a mobile laboratory to investigate air pollution events
- National Science Council (2007-2010), Assessment of vehicular contributions to ozone precursors- hydrocarbons by using exclusive vehicular in several metropolises of eastern Asia (PI)
- Peking University (2008), Plan for CAREBEIJING (2008 Campaigns of Air Quality Research in Beijing)
- Peking University (2007), Plan for CAREBEIJING (2007 Campaigns of Air Quality Research in Beijing)
- Peking University (2006), Program of Regional Integrated Experiments of Air Quality over the Pearl River Delta (PRIDE-2006)

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- National Science Counsel (2006), Assessment of vehicular and non-vehicular contributions to hydrocarbons using exclusive vehicular indicators (PI)
- Environmental Protection Administration (2005), The long-term changes of ozone and its precursors in Taiwan (co-PI)
- Hong Kong Polytechnic University (2005), Transport of Air Pollutants and Tropospheric Ozone over China 2005 Field Study Plan
- Peking University (2004), Scientific Plan for October Intensive Campaign in Pearl River Delta, China
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