

Tianshu Chen

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RESEARCH SUMMARY

Research focuses on the impacts of nitrogen oxides, volatile organic compound emissions from energy extraction and utilization processes on atmospheric photochemistry.

EDUCATION

- 2015–2022 Ph.D. in Environmental Science
Shandong University, Qingdao
- 2010–2014 B.S. in Environmental Engineering
Jimei University, Xiamen

RESEARCH EXPERIENCE

2022.12– Postdoctoral Fellow at Hong Kong Polytechnic University (PolyU)
(Advisor: Prof. Tao Wang)

- Intersecting research on air quality, artificial intelligence, and big data.

2015.9–2022.9 Research Assistant at Shandong University (SDU)
(Advisor: Prof. Likun Xue)

- Characteristics of air quality in the various environment: Conducted field observations in urban areas, rural areas, oilfields, mountains, islands, seas and boundary layer top to study the characteristics of air quality and the impact of anthropogenic emissions.
- Impact of oil extraction on air quality: Uncovered the photochemical pollution in an oil production region in northern China; Uncovered the characteristics of volatile organic compound (VOC) in the oil production region; Evaluated the atmospheric oxidizing capacity, radical budget, and formation mechanisms of ozone and carbonyls in the oil production region; Proposed the emission profile of Chinese oilfield.
- Impact of coal chemical industry (CCI) on air quality: Uncovered the contribution of CCI to VOCs concentration, ozone formation potential and OH reactivity in Chinese city.

2019.9–2020.9 Visiting Scholar at University of Colorado Boulder (CUBoulder)
(Advisor: Prof. Joost de Gouw)

- Impact of Volatile Chemical Product (VCP) emissions on ozone chemistry: Combined observation data, emission inventory and chemical box model to evaluate the implications of VCP emissions for ozone chemistry in Los Angeles.

PROFESSIONAL SKILLS

- Proficient in gas- (e.g., MCM, SAPRC, RACM, and CBM) chemical box model.
- Proficient in designing and conducting field campaigns.
- Proficient in maintaining trace gas analyzers, particle size distribution analyzers.
- Skillful with Matlab, R, Python, Igor Pro, and Origin software.

PUBLICATIONS

#co-first authors

1. **Chen, T.**, Xue, L., Zheng, P., Zhang, Y., Liu, Y., Sun, J., Han, G., Li, H., Zhang, X., Li, Y., Li, H., Dong, C., Xu, F., Zhang, Q., and Wang, W.: Volatile organic compounds and ozone air pollution in an oil production region in northern China. *Atmospheric Chemistry and Physics*, 20, 7069–7086, 2020.
2. **Chen, T.**, Zheng, P., Zhang, Y., Dong, C., Han, G., Li, H., Yang, X., Liu, Y., Sun, J., Li, H., Zhang, X., Li, Y., Wang, W., and Xue, L.: Characteristics and formation mechanisms of atmospheric carbonyls in an oilfield region of northern China. *Atmospheric Environment*, 274, 118958, 2022a.
3. **Chen, T.**, Huang, L., Zhang, X., Gao, R., Li, H., Fan, K., Ma, D., Ma, Z., Xue, L., and Wang, W.: Effects of coal chemical industry on atmospheric volatile organic compounds emission and ozone formation in a northwestern Chinese city. *Science of The Total Environment*, 839, 156149, 2022b.
4. Sun, L., # **Chen, T.**, # Jiang, Y., Zhou, Y., Sheng, L., Lin, J., Li, J., Dong, C., Wang, C., Wang, X., and others: Ship emission of nitrous acid (HONO) and its impacts on the marine atmospheric oxidation chemistry. *Science of the Total Environment*, 735, 139355, 2020.
5. Wen, L., **Chen, T.**, Zheng, P., Wu, L., Wang, X., Mellouki, A., Xue, L., and Wang, W.: Nitrous acid in marine boundary layer over eastern Bohai Sea, China: Characteristics, sources, and implications. *Science of The Total Environment*, 670, 282–291, 2019.
6. Zheng, P., **Chen, T.**, Dong, C., Liu, Y., Li, H., Han, G., Sun, J., Wu, L., Gao, X., Wang, X., and others: Characteristics and sources of halogenated hydrocarbons in the Yellow River Delta region, northern China. *Atmospheric Research*, 225, 70–80, 2019.
7. Gu, R., Zheng, P., **Chen, T.**, Dong, C., Liu, Y., Liu, Y., Luo, Y., Han, G., Wang, X., Zhou, X., and others: Atmospheric nitrous acid (HONO) at a rural coastal site in North China: Seasonal variations and effects of biomass burning. *Atmospheric Environment*, 229, 117429, 2020.
8. Jensen, A., Liu, Z., Tan, W., Dix, B., **Chen, T.**, Koss, A., Zhu, L., Li, L., and de Gouw, J.: Measurements of Volatile Organic Compounds During the COVID-19 Lockdown in Changzhou, China. *Geophysical Research Letters*, 48, e2021GL095560, 2021.
9. Jiang, Y., Xue, L., Gu, R., Jia, M., Zhang, Y., Wen, L., Zheng, P., **Chen, T.**, Li, H., Shan, Y., and others: Sources of nitrous acid (HONO) in the upper boundary layer and lower free troposphere of the North China Plain: insights from the Mount Tai Observatory. *Atmospheric Chemistry and Physics*, 20, 12115–12131, 2020.
10. Li, D., Xue, L., Wen, L., Wang, X., **Chen, T.**, Mellouki, A., Chen, J., and Wang, W.: Characteristics and sources of nitrous acid in an urban atmosphere of northern China: Results from 1-yr continuous observations. *Atmospheric Environment*, 182, 296–306, 2018.
11. Li, H., Zhu, Y., Zhao, Y., **Chen, T.**, Jiang, Y., Shan, Y., Liu, Y., Mu, J., Yin, X., Wu, D., and others: Evaluation of the performance of low-cost air quality sensors at a high mountain station with complex meteorological conditions. *Atmosphere*, 11, 212, 2020.
12. Li, R., Jiang, X., Wang, X., **Chen, T.**, Du, L., Xue, L., Bi, X., Tang, M., and Wang, W.: Determination of semivolatile organic nitrates in ambient atmosphere by gas Chromatography/Electron Ionization–Mass spectrometry. *Atmosphere*, 10, 88, 2019.
13. Liu, L., Wang, X., Chen, J., Xue, L., Wang, W., Wen, L., Li, D., and **Chen, T.**: Understanding unusually high levels of peroxyacetyl nitrate (PAN) in winter in Urban Jinan, China. *Journal of Environmental Sciences*, 71, 249–260, 2018.
14. Liu, Y., Shen, H., Mu, J., Li, H., **Chen, T.**, Yang, J., Jiang, Y., Zhu, Y., Meng, H., Dong, C., and others: Formation of peroxyacetyl nitrate (PAN) and its impact on ozone production in the coastal atmosphere

- of Qingdao, North China. *Science of The Total Environment*, 778, 146265, 2021.
15. Luo, Y., Zhou, X., Zhang, J., Xue, L., **Chen, T.**, Zheng, P., Sun, J., Yan, X., Han, G., and Wang, W.: Characteristics of airborne water-soluble organic carbon (WSOC) at a background site of the North China Plain. *Atmospheric Research*, 231, 104668, 2020.
 16. Shen, H., Liu, Y., Zhao, M., Li, J., Zhang, Y., Yang, J., Jiang, Y., **Chen, T.**, Chen, M., Huang, X., and others: Significance of carbonyl compounds to photochemical ozone formation in a coastal city (Shantou) in eastern China. *Science of The Total Environment*, 764, 144031, 2021.
 17. Sun, L., Xue, L., Wang, T., Gao, J., Ding, A., Cooper, O. R., Lin, M., Xu, P., Wang, Z., Wang, X., Wen, L., Zhu, Y., **Chen, T.**, Yang, L., Wang, Y., Chen, J., and Wang, W.: Significant increase of summertime ozone at Mount Tai in Central Eastern China. *Atmospheric Chemistry and Physics*, 16, 10637–10650, 2016.
 18. Sun, P., Nie, W., Chi, X., Huang, X., Ren, C., Xue, L., Shan, Y., Wen, L., Li, H., **Chen, T.**, Qi, Y., Gao, J., Zhang, Q., and Ding, A.: Aircraft Study of Secondary Aerosols in Long-Range Transported Air Masses From the North China Plain by a Mid-Latitude Cyclone. *Journal of Geophysical Research: Atmospheres*, 127, e2021JD036178, 2022.
 19. Wen, L., Xue, L., Wang, X., Xu, C., **Chen, T.**, Yang, L., Wang, T., Zhang, Q., and Wang, W.: Summertime fine particulate nitrate pollution in the North China Plain: increasing trends, formation mechanisms and implications for control policy. *Atmospheric Chemistry and Physics*, 18, 11261–11275, 2018.
 20. Yang, J., Shen, H., Guo, M.-Z., Zhao, M., Jiang, Y., **Chen, T.**, Liu, Y., Li, H., Zhu, Y., Meng, H., and others: Strong marine-derived nitrous acid (HONO) production observed in the coastal atmosphere of Northern China. *Atmospheric Environment*, 244, 117948, 2021.
 21. Yang, X., Xue, L., Yao, L., Li, Q., Wen, L., Zhu, Y., **Chen, T.**, Wang, X., Yang, L., Wang, T., and others: Carbonyl compounds at Mount Tai in the North China Plain: Characteristics, sources, and effects on ozone formation. *Atmospheric Research*, 196, 53–61, 2017.
 22. Yu, C., Wang, Z., Xia, M., Fu, X., Wang, W., Tham, Y. J., **Chen, T.**, Zheng, P., Li, H., Shan, Y., and others: Heterogeneous N₂O₅ reactions on atmospheric aerosols at four Chinese sites: Improving model representation of uptake parameters. *Atmospheric Chemistry and Physics*, 20, 4367–4378, 2020.
 23. Zhang, J., Wang, X., Li, R., Dong, S., Chen, J., Zhang, Y., Zheng, P., Li, M., **Chen, T.**, Liu, Y., and others: Significant impacts of anthropogenic activities on monoterpene and oleic acid-derived particulate organic nitrates in the North China Plain. *Atmospheric Research*, 256, 105585, 2021a.
 24. Zhang, Y., Wen, L., Chen, J., Wang, X., Xue, L., Yang, L., Wang, L., Li, Z., Yu, C., **Chen, T.**, and others: Trend in fine sulfate concentrations and the associated secondary formation processes at an urban site in North China. *Aerosol and Air Quality Research*, 18, 1519–1530, 2018.
 25. Zhang, Y., Sun, J., Zheng, P., **Chen, T.**, Liu, Y., Han, G., Simpson, I. J., Wang, X., Blake, D. R., Li, Z., and others: Observations of C₁–C₅ alkyl nitrates in the Yellow River Delta, Northern China: Effects of biomass burning and oil field emissions. *Science of the Total Environment*, 656, 129–139, 2019.
 26. Zhang, Y., Xue, L., Carter, W. P., Pei, C., **Chen, T.**, Mu, J., Wang, Y., Zhang, Q., and Wang, W.: Development of ozone reactivity scales for volatile organic compounds in a Chinese megacity. *Atmospheric Chemistry and Physics*, 21, 11053–11068, 2021b.
 27. Zhang, Y., Xue, L., Li, H., **Chen, T.**, Mu, J., Dong, C., Sun, L., Liu, H., Zhao, Y., Wu, D., and others: Source apportionment of regional ozone pollution observed at Mount Tai, North China: application of Lagrangian photochemical trajectory model and implications for control policy. *Journal of Geophysical Research: Atmospheres*, 126, e2020JD033519, 2021c.

28. Zhu, Y., Xue, L., Gao, J., Chen, J., Li, H., Zhao, Y., Guo, Z., **Chen, T.**, Wen, L., Zheng, P., Shan, Y., Wang, X., Wang, T., Yao, X., and Wang, W.: Increased new particle yields with largely decreased probability of survival to CCN size at the summit of Mt. Tai under reduced SO₂ emissions. *Atmospheric Chemistry and Physics*, 21, 1305–1323, 2021.
29. Zong, R., Yang, X., Wen, L., Xu, C., Zhu, Y., **Chen, T.**, Yao, L., Wang, L., Zhang, J., Yang, L., and others: Strong ozone production at a rural site in the North China Plain: Mixed effects of urban plumes and biogenic emissions. *Journal of Environmental Sciences*, 71, 261–270, 2018.

Papers in Preparation

30. **Chen, T.**, Gilman, J., Kim, S. W., Lefer, B., Rappengluck, B., Roberts, J., Stevens, P., Langford, A., Veres, P., Xue, L., and Gouw, J. de. The implications of volatile chemical product emissions for ozone chemistry in Los Angeles.

CONFERENCE PRESENTATIONS

1. **Chen, T.** et al. Characteristics of atmospheric VOCs pollution in a typical coal chemical city and its effect on winter ozone. *The 27th Atmospheric Environmental Science and Technology Conference*. Online, 30 November 2021 (oral).
2. Gouw, de J., & **Chen, T.**. Quantifying the contribution from volatile chemical product emissions to ozone formation in Los Angeles, California. *AGU Fall Meeting*. Online, 16 December 2020 (oral).
3. **Chen, T.** et al. VOC emissions and photochemical pollution in an open oil field in Northern China. *AGU Fall Meeting*. Online, 11 December 2020 (poster).
4. **Chen, T.** et al. Photochemical air pollution in the Yellow River Delta region: impacts from the oil industry and biomass burning. *AGU Fall Meeting*. San Francisco, US, 9–13 December 2019 (poster).
5. **Chen, T.** et al. Vertical distribution of non-methane hydrocarbons and halogenated hydrocarbons in Northeast China in the summer of 2018. *The 11th National Conference on Environmental Chemistry*. Tianjin, China, 17 August 2019 (oral).
6. **Chen, T.** et al. Airborne measurement of air pollution in Northeast China in summer 2018. *The 24th Atmospheric Environmental Science and Technology Conference*. Qingdao, China, 3 November 2018 (oral).

PATENTS

1. Qi, Y., Li, H., Shan, Y., Hu, J., Wang, C., Wang, Q., Cui, L., **Chen, T.**, Wen, L., Wang, X., and Xue, L.. An AC uninterruptible power supply device and aerial survey system for aircraft airborne measurement. Utility Model Patent, China, ZL202022020016.2. 2021.
2. Xue, L., Wang, X., **Chen, T.**, Mou, J., Wen, L., Li, H., and Shan, Y.. A collection device and sampling system for fine particulate matters used for aircraft measurements. Utility Model Patent, China, ZL201920929830.0. 2020.
3. Xue, L., Wang, X., **Chen, T.**, Mou, J., Li, H., Wen, L., and Shan, Y.. Collection device and sampling system for gases pollutants used for aircraft measurements. Utility Model Patent, China, ZL201920929921.4. 2020.
4. Xue, L., Wang, X., Zhao, Y., Li, R., **Chen, T.**, Jiang, Y., Li, Z., and Sun, J.. A type of triplex dehumidifier used for sampling and measurement of trace gaseous pollutants. Utility Model Patent, China, ZL201820114586.8. 2018.

SOFTWARE

2020 FOQAT-An R package to process and analyze air quality and field observation data.
github.com/tianshu129/foqat

HONORS & AWARDS

2022 Science and Technology Award (2nd class) for research "Development of explicit atmospheric chemical box model and its applications in secondary air pollution control", Ministry of Ecology and Environment of China
2019 China Scholarship Council (CSC) Scholarship, China Scholarship Council
2018 Excellent Report Award, The 24th Atmospheric Environmental Science and Technology Conference, China
2018 Excellent Student, Shandong University
2015-2018 Second-prize Graduate Scholarship, Shandong University

ACTIVITIES

Peer-reviewer of scientific journals: Air Quality, Atmosphere & Health

Membership of American Geophysical Union (AGU)

Participant of the third Sino-European School on Atmospheric Chemistry (SESAC)