

Prof. ZHANG Xiaoye



Member of Chinese Academy of Engineering (CAE)

Candidate for Co-Chair of IPCC Working Group I

IPCC Lead Author (WGI AR4 & 5), Review Editor for the Synthesis Report (AR5), involved in IPCC and WMO since 2001;

Professor, dedicated to the study of impact of anthropogenic activities on climate change and weather prediction;

Chair, WMO Sand and Dust Storm Warning Advisory System (2018-2021)

Professional Experience and Achievements

- Professor of Atmospheric Chemistry & Physics in the Institute of Atmospheric Composition at Chinese Academy of Meteorological Sciences (CAMS)
- Director of State Key Laboratory of Severe Weather (2023-present); Director of Greenhouse Gas and Carbon Neutral Monitoring and Assessment Centre, CMA (2021-present); Vice President of Chinese Academy of Meteorological Sciences (2004-2012); Director of the Centre for Atmospheric Composition Observation and Service, CMA (2004-2008); Deputy Director of the Institute of Earth Environment, Chinese Academy of Sciences (1999-2004)
- Established four national operational systems: China Atmospheric Watch Network (CAWNET), numerical forecast system of the Asian Sand and Dust Storm (CUACE/Dust), Chinese fog-haze numerical forecast system (CUACE/Haze-fog), and CMA Carbon Monitoring Verification and Support system (CCMVS)
- More than 400 peer-reviewed articles published related to anthropogenic drivers of climate change and weather, with over 15,000 SCI citations and H-index of 87
- Ranked on the top 1% of the Web of Science in terms of citations in his discipline in the past decade

Engagement in IPCC and other international scientific committees

- Lead author of Chapter 8, “Clouds and Aerosols” in IPCC WGI AR5 since 2008 and review editor for the synthesis report of IPCC AR5
- Participated in IPCC WGI AR5 scoping meeting as a Chinese expert and the IPCC AR6 WGI, WGII, WGIII government review
- Lead author of Chapter 7, “Couplings between Changes in the Climate System and Biogeochemistry” in IPCC AR4 WGI since 2001

- Served on WMO Sand & Dust Storm Warning Advisory System/WWRP/GAW (SDS-WAS SC chair, 2018-2021; SC member 2015-present; Asia Node RSG chair, 2015-2018) and WMO SDS Research Demonstration Project/WWRP (SDS RDP SSC chair, 2004-2011)
- Served on Global Atmospheric Watch (GAW SC member, 2014-2021; GAW Focal Point of China, 2003-present), GAW/Aerosol (SAG member, 2003-2013), and WMO Open Programme Area Group on Environmental Pollution and Atmospheric Chemistry (OPAG-EPAC JSSC member, 2003-2013)
- Served on the editorial board of international SCI journals “Engineering”, “Tellus B”, “J. Meteorological Research” and as associated editor of “Atmosphere Research” and “Advance in Climate change”

Main Awards and Honours

- Twice recipient of National Natural Science Prize (ranked second in 2012 and third in 1999)
- Four-time recipient of the Provincial Science and Technology Award (ranked first in 1999, 2001, 2006, and 2017)
- National Outstanding Professional and Technical Talent Award, 2021
- Excellent paper in the selection plan for outstanding scientific and technological papers of 6th China Association for Science and Technology, 2021
- Cover paper in Chinese Science Bulletin won the only gold award at the 4th Qian Xuesen Urban Studies “Ecological Environment” Platform, 2014
- First batch of leading talents in the national “Ten Thousand Talents Program”, 2012
- Recipients of 1st National Top 100 Excellent Doctoral Dissertation Award, 1999
- Winner of National Science Fund for Distinguished Young Scholars, 1998

Education

- PhD in Aerosol Chemistry and Climate Change from Nanjing University, China, 1992-1995
- BSc conferred by Department of Chemistry at Northwestern University, China, 1982-1986

Main Publications

• 2023

Guo, L.F., Zhang, X.Y., Zhong, J.T., Wang, D.Y., Miao, C.H., Zhao L.C., Zhou Z.J., Liao, J., Hu, B., Zhu, L.Y., Chen, Y. Construction and application of regional kilometer-level carbon source and sink assimilation inversion system (CCMVS-R). *Engineering* (in press).

Wu, C.Y., Zhang, X.Y., Guo, L.F., Zhong, J.T., Wang, D.Y., Miao, C.H., Gao, X. and Zhang, X.L., 2023. An inversion model based on GEOS-Chem for estimating global and China's terrestrial carbon fluxes in 2019. *Advances in Climate Change Research*.

Li, L., Che, H., Su, X., Zhang, X., Gui, K., Zheng, Y., Zhao, H., Zhao, H., Liang, Y. and Lei, Y., 2023. Quantitative Evaluation of Dust and Black Carbon Column Concentration in the MERRA-2 Reanalysis Dataset Using Satellite-Based Component Retrievals. *Remote Sensing*, 15(2): 388.

• 2022

Zhong, J., Zhang, X., Gui, K., Liao, J., Fei, Y., Jiang, L., Guo, L., Liu, L., Che, H. and Wang, Y., 2022. Reconstructing 6-hourly PM 2.5 datasets from 1960 to 2020 in China. *Earth System Science Data*, 14(7): 3197-3211.

Lei, Y., Wang, Z., Zhang, X., Che, H., Yue, X., Tian, C., Zhong, J., Guo, L., Li, L. and Zhou, H., 2022. Avoided population exposure to extreme heat under two scenarios of global carbon neutrality by 2050 and 2060. *Environmental Research Letters*, 17(9): 094041.

Gong, S., Liu, Y., He, J., Zhang, L., Lu, S. and Zhang, X., 2022. Multi-scale analysis of the impacts of meteorology and emissions on PM_{2.5} and O₃ trends at various regions in China from 2013 to 2020 1: Synoptic circulation patterns and pollution. *Science of The Total Environment*, 815: 152770.

Gui, K., Che, H., Li, L., Zheng, Y., Zhang, L., Zhao, H., Zhong, J., Yao, W., Liang, Y. and Wang, Y., 2022. The significant contribution of small-sized and spherical aerosol particles to the decreasing trend in total aerosol optical depth over land from 2003 to 2018. *Engineering*, 16: 82-92.

Li, L., Derimian, Y., Chen, C., Zhang, X., Che, H., Schuster, G.L., Fuertes, D., Litvinov, P., Lapyonok, T. and Lopatin, A., 2022. Climatology of aerosol component concentrations derived from multi-angular polarimetric POLDER-3 observations using GRASP algorithm. *Earth System Science Data*, 14(7): 34393469.

Liang, Y., Che, H., Wang, H., Zhang, W., Li, L., Zheng, Y., Gui, K., Zhang, P. and Zhang, X., 2022. Aerosols direct radiative effects combined ground-based lidar and sun-photometer observations: cases comparison between haze and dust events in Beijing. *Remote Sensing*, 14(2): 266.

Liu, L., Wang, D., Wang, Z., Zhong, J., Zhang, Y., Wu, R. and Zhang, X., 2022. Implications of North Atlantic warming for a possible increase of dust activity in northern East Asia. *Atmospheric Research*, 271: 106092.

Peng, Y., Wang, H., Zhang, X., Zheng, Y., Zhang, X., Zhang, W., Liu, Z., Gui, K., Liu, H. and Wang, Y., 2022. Aerosol-radiation interaction in the operational atmospheric chemistry model GRAPES_Meso5.1/CUACE and its impacts on mesoscale NWP in Beijing-Tianjin-Hebei, China. *Atmospheric Research*, 280: 106402.

Shen, X., Sun, J., Ma, Q., Zhang, Y., Zhong, J., Yue, Y., Xia, C., Hu, X., Zhang, S. and Zhang, X., 2022. Longterm trend of new particle formation events in the Yangtze River Delta, China and its influencing factors: 7-year dataset analysis. *Science of The Total Environment*, 807: 150783.

Zheng, Y., Che, H., Wang, Y., Xia, X., Hu, X., Zhang, X., Zhu, J., Zhu, J., Zhao, H. and Li, L., 2022. Evaluation of aerosol microphysical, optical, and radiative properties measured with a multiwavelength photometer. *Atmospheric Measurement Techniques*, 15(7): 2139-2158.

• 2021

- Zhong, J., Zhang, X., Gui, K., Wang, Y., Che, H., Shen, X., Zhang, L., Zhang, Y., Sun, J., and Zhang, W.: Robust prediction of hourly PM_{2.5} from meteorological data using LightGBM, *National Science Review*, 8, 10.1093/nsr/nwaa307, 2021.
- Cheng, J., Tong, D., Zhang, Q., Liu, Y., Lei, Y., Yan, G., Yan, L., Yu, S., Cui, R.Y. and Clarke, L., 2021. Pathways of China's PM_{2.5} air quality 2015–2060 in the context of carbon neutrality. *National Science Review*, 8(12): nwab078.
- Wang, Z., Lin, L., Xu, Y., Che, H., Zhang, X., Zhang, H., Dong, W., Wang, C., Gui, K. and Xie, B., 2021. Incorrect Asian aerosols affecting the attribution and projection of regional climate change in CMIP6 models. *npj Climate and Atmospheric Science*, 4(1): 2.
- Zhao, H., Gui, K., Ma, Y., Wang, Y., Wang, Y., Wang, H., Zheng, Y., Li, L., Zhang, L. and Che, H., 2021. Climatology and trends of aerosol optical depth with different particle size and shape in northeast China from 2001 to 2018. *Science of the Total Environment*, 763: 142979.
- Gui, K., Che, H., Wang, Y., Xia, X., Holben, B.N., Goloub, P., Cuevas-Agulló, E., Yao, W., Zheng, Y. and Zhao, H., 2021. A global-scale analysis of the MISR Level-3 aerosol optical depth (AOD) product: Comparison with multi-platform AOD data sources. *Atmospheric Pollution Research*, 12(12): 101238.
- Wang, Y., Pang, Y., Huang, J., Bi, L., Che, H., Zhang, X. and Li, W., 2021. Constructing shapes and mixing structures of black carbon particles with applications to optical calculations. *Journal of Geophysical Research: Atmospheres*, 126(10): e2021JD034620.
- Gui, K., Che, H., Zheng, Y., Wang, Y., Zhang, L., Zhao, H., Li, L., Zhong, J., Yao, W. and Zhang, X., 2021. Seasonal variability and trends in global type-segregated aerosol optical depth as revealed by MISR satellite observations. *Science of The Total Environment*, 787: 147543.
- Xiao, Q., Zheng, Y., Geng, G., Chen, C., Huang, X., Che, H., Zhang, X., He, K. and Zhang, Q., 2021. Separating emission and meteorological contributions to long-term PM 2.5 trends over eastern China during 2000–2018. *Atmospheric Chemistry and Physics*, 21(12): 9475-9496.
- Gui, K., Che, H., Zheng, Y., Zhao, H., Yao, W., Li, L., Zhang, L., Wang, H., Wang, Y. and Zhang, X., 2021. Three-dimensional climatology, trends, and meteorological drivers of global and regional tropospheric type-dependent aerosols: insights from 13 years (2007–2019) of CALIOP observations. *Atmospheric Chemistry and Physics*, 21(19): 15309-15336.
- Xia, X., Che, H., Shi, H., Chen, H., Zhang, X., Wang, P., Goloub, P. and Holben, B., 2021. Advances in sunphotometer-measured aerosol optical properties and related topics in China: Impetus and perspectives. *Atmospheric research*, 249: 105286.
- Zhang, X., Li, L., Chen, C., Chen, X., Dubovik, O., Derimian, Y., Gui, K., Zheng, Y., Zhao, H. and Zhang, L., 2021. Validation of the aerosol optical property products derived by the GRASP/Component approach from multi-angular polarimetric observations. *Atmospheric Research*, 263: 105802.
- Zheng, Y., Che, H., Xia, X., Wang, Y., Yang, L., Chen, J., Wang, H., Zhao, H., Li, L. and Zhang, L., 2021. Aerosol optical properties and its type classification based on multiyear joint observation campaign in north China plain megalopolis. *Chemosphere*, 273: 128560.

• 2020

Zhao, C., Yang, Y., Fan, H., Huang, J., Fu, Y., Zhang, X., Kang, S., Cong, Z., Letu, H. and Menenti, M., 2020. Aerosol characteristics and impacts on weather and climate over the Tibetan Plateau. *National Science Review*, 7(3): 492-495.

Li, L., Che, H., Derimian, Y., Dubovik, O., Schuster, G.L., Chen, C., Li, Q., Wang, Y., Guo, B. and Zhang, X., 2020. Retrievals of fine mode light-absorbing carbonaceous aerosols from POLDER/PARASOL observations over East and South Asia. *Remote Sensing of Environment*, 247: 111913.

Zhao, H., Che, H., Gui, K., Ma, Y., Wang, Y., Wang, H., Zheng, Y. and Zhang, X., 2020. Interdecadal variation in aerosol optical properties and their relationships to meteorological parameters over northeast China from 1980 to 2017. *Chemosphere*, 247: 125737.

Gui, K., Che, H., Zeng, Z., Wang, Y., Zhai, S., Wang, Z., Luo, M., Zhang, L., Liao, T. and Zhao, H., 2020. Construction of a virtual PM_{2.5} observation network in China based on high-density surface meteorological observations using the Extreme Gradient Boosting model. *Environment International*, 141: 105801.

Zhang, W., Wang, H., Zhang, X., Peng, Y., Zhong, J., Wang, Y. and Zhao, Y., 2020. Evaluating the contributions of changed meteorological conditions and emission to substantial reductions of PM_{2.5} concentration from winter 2016 to 2017 in Central and Eastern China. *Science of the Total Environment*, 716: 136892.

• 2019

Zhang, X., Xu, X., Ding, Y., Liu, Y., Zhang, H., Wang, Y. and Zhong, J., 2019. The impact of meteorological changes from 2013 to 2017 on PM_{2.5} mass reduction in key regions in China. *Science China Earth Sciences*, 62: 1885-1902.

Zhong, J., Zhang, X., Wang, Y., Wang, J., Shen, X., Zhang, H., Wang, T., Xie, Z., Liu, C. and Zhang, H., 2019. The two-way feedback mechanism between unfavorable meteorological conditions and cumulative aerosol pollution in various haze regions of China. *Atmospheric Chemistry and Physics*, 19(5): 3287-3306.

Zhang, Q., Zheng, Y., Tong, D., Shao, M., Wang, S., Zhang, Y., Xu, X., Wang, J., He, H. and Liu, W., 2019. Drivers of improved PM_{2.5} air quality in China from 2013 to 2017. *Proceedings of the National Academy of Sciences*, 116(49): 24463-24469.

Che, H., Gui, K., Xia, X., Wang, Y., Holben, B.N., Goloub, P., Cuevas-Agulló, E., Wang, H., Zheng, Y. and Zhao, H., 2019. Large contribution of meteorological factors to inter-decadal changes in regional aerosol optical depth. *Atmospheric Chemistry and Physics*, 19(16): 10497-10523.

Liu, S., Xing, J., Zhao, B., Wang, J., Wang, S., Zhang, X. and Ding, A., 2019. Understanding of aerosol–climate interactions in China: Aerosol impacts on solar radiation, temperature, cloud, and precipitation and its changes under future climate and emission scenarios. *Current pollution reports*, 5: 36-51.

Che, H., Xia, X., Zhao, H., Dubovik, O., Holben, B.N., Goloub, P., Cuevas-Agulló, E., Estelles, V., Wang, Y. and Zhu, J., 2019. Spatial distribution of aerosol microphysical and optical properties and direct

- radiative effect from the China Aerosol Remote Sensing Network. *Atmospheric Chemistry and Physics*, 19(18): 11843-11864.
- Zhao, H., Che, H., Xia, X., Wang, Y., Wang, H., Wang, P., Ma, Y., Yang, H., Liu, Y. and Wang, Y., 2019. Climatology of mixing layer height in China based on multi-year meteorological data from 2000 to 2013. *Atmospheric environment*, 213: 90-103.
- Che, H., Yang, L., Liu, C., Xia, X., Wang, Y., Wang, H., Wang, H., Lu, X. and Zhang, X., 2019. Long-term validation of MODIS C6 and C6. 1 Dark Target aerosol products over China using CARSNET and AERONET. *Chemosphere*, 236: 124268.
- Gui, K., Che, H., Wang, Y., Wang, H., Zhang, L., Zhao, H., Zheng, Y., Sun, T. and Zhang, X., 2019. Satellitederived PM_{2.5} concentration trends over Eastern China from 1998 to 2016: Relationships to emissions and meteorological parameters. *Environmental pollution*, 247: 1125-1133.
- Liu, C., Yang, L., Che, H., Xia, X., Zhao, H., Wang, H., Gui, K., Zheng, Y., Sun, T. and Li, X., 2019. Aerosol optical properties over an urban site in Central China determined using ground-based sun photometer measurements. *Aerosol and Air Quality Research*, 19(3): 620-638.
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- Shen, X., Sun, J., Zhang, X., Zhang, Y., Zhong, J., Wang, X., Wang, Y. and Xia, C., 2019. Variations in submicron aerosol liquid water content and the contribution of chemical components during heavy aerosol pollution episodes in winter in Beijing. *Science of The Total Environment*, 693: 133521.
- Sun, E., Che, H., Xu, X., Wang, Z., Lu, C., Gui, K., Zhao, H., Zheng, Y., Wang, Y. and Wang, H., 2019. Variation in MERRA-2 aerosol optical depth over the Yangtze River Delta from 1980 to 2016. *Theoretical and Applied Climatology*, 136: 363-375.
- Sun, T., Che, H., Qi, B., Wang, Y., Dong, Y., Xia, X., Wang, H., Gui, K., Zheng, Y. and Zhao, H., 2019. Characterization of vertical distribution and radiative forcing of ambient aerosol over the Yangtze River Delta during 2013–2015. *Science of The Total Environment*, 650: 1846-1857.
- **2018**
- Zhang, X., Zhong, J., Wang, J., Wang, Y. and Liu, Y., 2018. The interdecadal worsening of weather conditions affecting aerosol pollution in the Beijing area in relation to climate warming. *Atmospheric Chemistry and Physics*, 18(8): 5991-5999.
- Zhong, J., Zhang, X., Dong, Y., Wang, Y., Liu, C., Wang, J., Zhang, Y. and Che, H., 2018. Feedback effects of boundary-layer meteorological factors on cumulative explosive growth of PM_{2.5} during winter

- heavy pollution episodes in Beijing from 2013 to 2016. *Atmospheric Chemistry and Physics*, 18(1): 247258.
- Zhong, J., Zhang, X., Wang, Y., Liu, C. and Dong, Y., 2018. Heavy aerosol pollution episodes in winter Beijing enhanced by radiative cooling effects of aerosols. *Atmospheric Research*, 209: 59-64.
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- An, L., Che, H., Xue, M., Zhang, T., Wang, H., Wang, Y., Zhou, C., Zhao, H., Gui, K. and Zheng, Y., 2018. Temporal and spatial variations in sand and dust storm events in East Asia from 2007 to 2016: Relationships with surface conditions and climate change. *Science of The Total Environment*, 633: 452462.
- Sun, J., Liu, L., Xu, L., Wang, Y., Wu, Z., Hu, M., Shi, Z., Li, Y., Zhang, X. and Chen, J., 2018. Key role of nitrate in phase transitions of urban particles: implications of important reactive surfaces for secondary aerosol formation. *Journal of Geophysical Research: Atmospheres*, 123(2): 1234-1243.
- Che, H., Qi, B., Zhao, H., Xia, X., Eck, T.F., Goloub, P., Dubovik, O., Estelles, V., Cuevas-Agulló, E. and Blarel, L., 2018. Aerosol optical properties and direct radiative forcing based on measurements from the China Aerosol Remote Sensing Network (CARSNET) in eastern China. *Atmospheric Chemistry and Physics*, 18(1): 405-425.
- Sun, T., Che, H., Qi, B., Wang, Y., Dong, Y., Xia, X., Wang, H., Gui, K., Zheng, Y. and Zhao, H., 2018. Aerosol optical characteristics and their vertical distributions under enhanced haze pollution events: effect of the regional transport of different aerosol types over eastern China. *Atmospheric Chemistry and Physics*, 18(4): 2949-2971.
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- Sun, T., Che, H., Wu, J., Wang, H., Wang, Y. and Zhang, X., 2018. The variation in visibility and its relationship with surface wind speed in China from 1960 to 2009. *Theoretical and applied climatology*, 131: 335-347.
- Wang, J., Zhang, X., Li, D., Yang, Y., Zhong, J., Wang, Y., Che, H., Che, H. and Zhang, Y., 2018. Interdecadal changes of summer aerosol pollution in the Yangtze River Basin of China, the relative influence of meteorological conditions and the relation to climate change. *Science of the Total Environment*, 630: 46-52.
- Zhang, X., Zhang, Q., Hong, C., Zheng, Y., Geng, G., Tong, D., Zhang, Y. and Zhang, X., 2018. Enhancement of PM2.5 concentrations by aerosol-meteorology interactions over China. *Journal of Geophysical Research: Atmospheres*, 123(2): 1179-1194.
- Zhang, Y., Yuan, Q., Huang, D., Kong, S., Zhang, J., Wang, X., Lu, C., Shi, Z., Zhang, X. and Sun, Y., 2018c. Direct observations of fine primary particles from residential coal burning: insights into their

morphology, composition, and hygroscopicity. *Journal of Geophysical Research: Atmospheres*, 123(22): 12,964-12,979.

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• 2017

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Zhong, J., Zhang, X., Wang, Y., Sun, J., Zhang, Y., Wang, J., Tan, K., Shen, X., Che, H. and Zhang, L., 2017. Relative contributions of boundary-layer meteorological factors to the explosive growth of PM 2.5 during the red-alert heavy pollution episodes in Beijing in December 2016. *Journal of Meteorological Research*, 31: 809-819.

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Fu, X., Wang, S., Xing, J., Zhang, X., Wang, T. and Hao, J., 2017. Increasing ammonia concentrations reduce the effectiveness of particle pollution control achieved via SO₂ and NO_x emissions reduction in east China. *Environmental Science & Technology Letters*, 4(6): 221-227.

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• 2016-1993

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