Shupeng Zhu

Senior Scientist

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Research Interests

Air quality impact analysis of advanced energy technologies, air quality related health and economic cost/benefits analysis, air quality modeling, aerosol dynamics, atmospheric chemistry, pollution mitigation strategy, environmental justice, emission inventory, energy policy and climate change.

Education

2016.01	**Ph.D.**	Environmental Sciences	University of Paris-Est, France
2012.09	**M.S.**	Urban and Environmental Planning	École centrale de Nantes, France
2012.09	**B.S.**	Urban Studies and Planning	École centrale de Nantes, France
2010.06	**B.S.**	Marine Sciences	Ocean University of China, China

Research Experience

University of California, Irvine — Irvine, CA, USA

Senior Scientist (Specialist) — **2019.10 - Present**

- Lead and conduct activities associated with research into the air quality impacts of advanced energy technologies.
- Responsible for developing and maintaining the advanced computer modeling capabilities required to support air quality research, including modeling of criteria pollutant emissions, atmospheric chemistry, health impacts, and others.
- Responsible for developing and writing proposals associated with the pursuit of funding opportunities to support air quality research.
- Manage research projects and oversee graduate and undergraduate student research in support of funded research projects.

Postdoctoral Scholar — **2016.10 - 2019.10**

(Advisor: Prof. Donald Dabdub)

- Investigating the effect of ammonia on secondary organic aerosol formation in a changing climate over the continental US.
- Studying air pollution mitigation strategies in California and assessing the drivers of future air quality in California.

CEREA (Joint Lab ENPC-EDF) **Champs-sur-Marne, France**

Associate Researcher **2015.12 - 2016.07**

- Study the influence of semi-volatile organic compound from different traffic emissions (Diesel or Gasoline) on secondary organic aerosol concentration over Greater Paris.

Assistant Researcher **2012.11 – 2015.11**

(Advisor: Dr. Karine N. Sartelet & Prof. Chirstian Seigneur)

- Developed and published a size-composition resolved aerosol model (SCRAM) which can simulate mixing processes of multiple aerosol populations, and investigated the influence of mixing state on particle properties through simulations over Greater Paris.
- This work is awarded by French Association for Studies and Research on Aerosols with the The Bricard Award 2016.

Honor and Awards

The Bricard Award 2016 -French Association for Studies and Research on Aerosols 2016
TANDEM - Erasmus Mundus Scholarship - European Commission 2010-2012

Publications (*Corresponding author, †Co-First Author)

1) ***Zhu S.***, Mac Kinnon M., Carlos-Carlos A., Davis J. S., and Samuelsen G. S.*, "*Decarbonization will lead to more equitable air quality in California*". **Nature Communications**, 13: 5738, 2022. https://doi.org/10.1038/s41467-022-33295-9
2) ***Zhu S.***, Paradise A., Soukup J., Mac Kinnon M., and Samuelsen G. S.*, "*Assessment of the Air Quality and Health Impacts of Fuel Cell Electrification of Port Activities at the San Pedro Bay Port Complex*". **Atmospheric Environment**, 275: 118996, 2022. https://doi.org/10.1016/j.atmosenv.2022.118996
3) ***Zhu S.****, Wu K., Nizkorodov S., and Dabdub D.*, "*Modeling Reactive Ammonia Uptake by Secondary Organic Aerosol in a Changing Climate: A WRF-CMAQ Evaluation*", **Frontiers of Environmental Science**,10: 867908, 2022. https://doi.org/10.3389/fenvs.2022.867908
4) ***Zhu S.***, Paradise A., Mac Kinnon M., Dabdub D., and Samuelsen G. S*, "*Health Benefits in California of Strengthening the Fine Particulate Matter Standards*", **Environmental Science & Technology**, 55, 18, 12223-12232, 2021. https://doi.org/10.1021/acs.est.1c03177
5) Kai W., ***Zhu S.****, Liu Y., Wang H., Dabdub D., and Cappa C.D., " *Modeling ammonia and its uptake by secondary organic aerosol over China*". **Journal of Geophysical Research- Atmospheres**, 126 (7), e2020JD034109, 2021 https://doi.org/10.1029/2020JD034109.
6) ***Zhu S.***, Horne J. R., Mac Kinnon M., Samuelsen G. S., and Dabdub D.*, "*Comprehensively Assessing the Drivers of Future Air Quality in California*", **Environment International**,125：386-398, 2019. https://doi.org/10.1016/j.envint.2019.02.007.
7) ***Zhu* S.**, Mac Kinnon, M., Shaffer B. P., Samuelsen G. S., Brouwer J.and Dabdub D.*, "*An Uncertainty for Clean Air: Air Quality Modeling Implications of Underestimating*

VOC Emissions in Urban Inventories", **Atmospheric Environment**, 211: 256-267, 2019. https://doi.org/10.1016/j.atmosenv.2019.05.019

8) ***Zhu S.***, Horne J. R., Montoya-Aguilera J., Hinks M. L., Nizkorodov S., and Dabdub D.*, "*Modeling reactive ammonia uptake by secondary organic aerosol in CMAQ: application to the continental US*", **Atmospheric Chemistry and Physics**, 8: 3641-3657, 2018. https://doi.org/10.5194/acp-18-3641-2018
9) ***Zhu S.****, Sartelet K. N., Zhang Y. and Nenes A., "*Three-dimensional modelling of the mixing state of particles over Greater Paris*", **Journal of Geophysical Research-Atmospheres**, 121, 5930-5947, 2016. https://doi.org/10.1002/2015JD024241
10) ***Zhu S.***, Sartelet K. N.*, Healy R. and Wenge J., "*Simulation of particle diversity and mixing state over Greater Paris: A model-measurement intercomparison*", **Faraday Discussion**, 189:547-566, 2016. https://doi.org/10.1039/C5FD00175G
11) ***Zhu S.****, Sartelet K. N., and Seigneur C., "*A size-composition resolved aerosol model for simulating the dynamics of externally-mixed particles: SCRAM (v 1.0)*", **Geoscientific Model Development**, 8 (6):1595--1612, 2015. https://doi.org/10.5194/gmd-8-1595-2015
12) Samuelsen G.S.*, ***Zhu, S.***, Mac Kinnon M., Yang O. K., Dabdub D., and Brouwer J., "*Vehicle Emission Regulations Save Lives in California*", **Environmental Science & Technology**, 55 (1), 547–552, 2020. https://dx.doi.org/10.1021/acs.est.0c04060
13) Mac Kinnon M.*, ***Zhu S***, Cervantes A., Samuelsen G.S. and Dabdub D., "*Benefits of Near-Zero Freight: The Air Quality and Human Health Impacts of Low-NOx Compressed Natural Gas Trucks*", **Journal of the Air & Waste Management Association**, 71 (11), 1428-1444, 2021. *https://doi.org/10.1080/10962247.2021.1957727*
14) Wang D., Guan D*., ***Zhu S***, Mac Kinnon M., Geng G., Zhang Q., Zheng H., Lei T., Shao S., Gong P., Davis S. J., "*Economic footprint of California wildfires in 2018*", **Nature Sustainability**, 4 (3), 252-260, 2021. https://doi.org/10.1038/s41893-020-00646-7
15) Mac Kinnon M., ***Zhu S.***, Carreras-Sospedra M., Soukap J. V., Dabdub D., Samuelsen G. S., and Brouwer J.*, "*Considering future regional air quality impacts of the transportation sector*", **Energy Policy**, 2018, 124, 63-80. https://doi.org/10.1016/j.enpol.2018.09.011
16) Benosa G., ***Zhu S.***, Mac Kinnon M., and Dabdub D.*, "*The air quality impacts of implementing emission reduction strategies at southern California airports*", **Atmospheric Environment**, 185:121-127, 2018. https://doi.org/10.1016/j.atmosenv.2018.04.048
17) Horne J. R., ***Zhu S.***, Montoya-Aguilera J., Hinks M. L., Wingen, L., Nizkorodov S., and Dabdub D.*, "*Reactive Uptake of Ammonia by Secondary Organic Aerosols: Implications for Air Quality*", **Atmospheric Environment**, 189:1-8, 2018. https://doi.org/10.1016/j.atmosenv.2018.06.021
18) Sartelet K. N.*, ***Zhu S.***, Moukhtar S., André M., André J.M., Brasseur A., and Redaelli M., "*Emissions of semi-volatile organic compounds from traffic and their impact on air quality*", **Atmospheric Environment**, 180: 126-137, 2018. https://doi.org/10.1016/j.atmosenv.2018.02.031
19) Dawson M., Cuzman C., Acosta M., Curtis J. H., West M., Conley A., Riemer N.*,

Jorba O., ***Zhu S.,*** and Dabdub D., "Chemistry Across Multiple Phases (CAMP) version 1.0: An integrated multi-phase chemistry model". **Geoscientific Model Development**, 15 (9), 3663-3689, 2022. https://doi.org/10.5194/gmd-15-3663-2022

20) MacKenzie R., Tomlin A., Kleffmann J., Karl K., Hewitt C. N., Heard D., Sartelet K., Sommariva R., Baltensperger U., Harrison Roy., Madronich S., McFiggans G., Pandis S., Wenger J., Kiendler-Scharr A., Donahue N. M., Dunmore R., Doherty R., Moller S., Kilbane-Dawe I., McDonald B., Wahner A., ***Zhu S.***, Presto A., Kalberer M., Hort M., Lee J., Nikolova I., Jimenez J. L., Whalley L., Alam M. S. and Skouloudis A. "*Numerical modelling strategies for the urban atmosphere: general discussion*", **Faraday Discussion**, 189: 635-660, 2016. https://doi.org/10.1039/C6FD90022D

Under Review

21) Sun Y.†, ***Zhu S.†***, Wang D.*, Duan J., Yin H., Tan C., Zhang L., Zhao M., Cai W., Wang Y., Guan D.*, "Assessment of the economic impacts of heat stress under climate warming". Under review by **Nature**.

22) Wang D., Li R., Sun Y., Huo J., Hao Q., ***Zhu S.***, Hallegatte S., Guan D., Stenseth N. C., "The global benefit through different vaccine-distribution strategies". Under review by **Nature Communication**.

23) Mac Kinnon M.*, **Zhu S.**, Yan Zhao, Vince McDonell and Samuelsen G. S., "Emissions and Air Quality Implications of Decarbonizing the Natural Gas System with Renewable Hydrogen". Submitted to **Applied Energy**

In Preparations

24) ***Zhu S.***, Jiang X., Mac Kinnon M., Samuelsen G. S., "Assessment of air quality-related health burden distribution in the US between 2002-2017 and impacts on environmental justice"

25) Wu K., ***Zhu S.***, Mac Kinnon M. and Samuelsen G. S., "Unexpected deterioration of O3 pollution in the South Coast Air Basin of California: The role of meteorology and emissions"

Conference Presentations

1) Presentation at GEOMED 2022 conference, Zhu S. et al.: The inequality of air pollution-associated mortality burdens increased despite significant air quality improvement between 2002 and 2018 in the US. Irvine, USA.
2) Presentation at iFireNet Summer School (2022), Zhu S. et al.: Modeling polycyclic aromatic hydrocarbon (PAH) emissions from wildfires in California. Irvine, USA.
3) Presentation at Meteorology and Climate - Modeling for Air Quality Conference (2021), Zhu S. et al: Modeling reactive ammonia uptake by secondary organic aerosol in a changing climate: a WRF-CMAQ evaluation. Online.
4) Presentation at 19th Community Modeling and Analysis System conference (2020), Zhu S. et al: *Economic footprint of California wildfires in 2018*. Online.
5) Presentation at 18th Community Modeling and Analysis System conference (2019),

Zhu S. et al: *Vehicle Emission Regulations Save Lives in California*. Chapel Hill, USA.

6) Presentation at 18th Community Modeling and Analysis System conference (2019), Zhu S. et al: *Quantifying the air quality and human health benefits of GHG mitigation Pathways in California*. Chapel Hill, USA.
7) Presentation at 17th Community Modeling and Analysis System conference (2018), Zhu S. et al: *An Uncertainty for Clean Air: Air Quality Modeling Implications of Underestimating VOC Emissions in Urban Inventories*. Chapel Hill, USA.
8) Presentation at 10th International Aerosol Conference (2018), Zhu S. et al: *Comprehensively Assessing the Drivers of Future Air Quality in California*. Saint Louis, USA.
9) Presentation at 16th Community Modeling and Analysis System conference (2017), Zhu S. et al: *Modeling of reactive ammonia uptake by secondary organic aerosol in CMAQ: application to continental US*. Chapel Hill, USA.
10) Presentation at 22nd European Aerosol Conference (2016), Zhu S. et al: *Simulation of seasonal influence on particle diversity and mixing state over Greater Paris*. Tour, France.
11) Presentation at Faraday Discussion: Chemistry in the Urban Atmosphere (2016), Zhu S. et al: *Simulation of particle diversity and mixing state over Greater Paris: A model-measurement intercomparison*. London, UK.
12) Presentation at 34th International Technical Meeting on Air Pollution Modelling and its Application (2015), Zhu S. et al: *Modelling of externally mixed particles in the atmosphere (3-D application)*. Montpellier, France.
13) Presentation at European Geosciences Union General Assembly (2014), Zhu S. et al: *Modelling of externally mixed particles in the atmosphere (box model)*. Vienna, Austria.
14) Presentation at 3U3D European COST Action TU0801 (2012), Zhu S. et al: *Skyline matching: A robust registration method between Video and GIS*. Nantes, France.

Book and Conference Proceedings

1) Montoya-Aguilera J., Hinks M., Aiona P., Wingen L., Horne J., ***Zhu S.***, Dabdub D., Laskin A., Laskin J., Lin P., Nizkorodov S.: *Reactive Uptake of Ammonia by Biogenic and Anthropogenic Organic Aerosols*, **ACS Symposium Series: Multiphase Environmental Chemistry in the Atmosphere**, Volume 1299, Chapter 7, 127-147, 2018. ISBN13: 9780841233638. https://doi.org/10.1021/bk-2018-1299.ch007
2) ***Zhu S.****, and Sartelet K.N.,: *Modelling of externally-mixed particles in the atmosphere*. **Air Pollution Modeling and its Application XXIV** (pp. 43-48). Springer International Publishing, 2016. ISBN: 978-3-319-24478-5. https://doi.org/10.1007/978-3-319-24478-5_7
3) ***Zhu S.****,: *Modelling of externally mixed particles in the atmosphere*, LAP LAMBERT Academic Publishing, 2016. ISBN: 978-3-659-82388-6.
4) ***Zhu S.***, Morin L., Pressigout M., Moreau G., Servières M.: *Video/GIS registration system based on skyline matching method*, **2013 IEEE International Conference on Image Processing**, 3632-3636, IEEE Publishing, 2013. https://doi.org/10.1109/ICIP.2013.6738749
5) ***Zhu S.***, Morin L., Pressigout M., Moreau G., Servières M.: *Skyline Matching: A robust*

registration method between Video and GIS, **Usage, Usability, and Utility of 3D City Models–European COST Action TU0801**, 03007, EDP Sciences Publishing, 2012. https://doi.org/10.1051/3u3d/201203007

Editorial Service

Guest Associate Editor, Frontiers in Environmental Science, 2021-present
Review Editor, Frontiers in Environmental Science, 2022-present
https://loop.frontiersin.org/people/1602677/overview

Peer-Review Service

Publons (Web of Science) profile: https://publons.com/researcher/1325455/shupeng-zhu/

Reviewer Board Member, Atmosphere, 2019-present

Geoscientific Model Development	*Environmental Science & Technology*
Environment International	*Atmospheric Environment*
Aerosol Science and Technology	*Environmental Technology*
Frontiers in Environmental Science	*Atmospheric Science Letters*
Communication Earth & Environment	*Atmospheric Research*

Invited Reviewer for the *ISGT 2022 : IEEE Power & Energy Society Innovative Smart Grid Technologies Conference*

Research Grants

2022/01-2025/01, **California Air Resources Board**, 21RD003, Updating the Science to Better Inform the Public on the Impacts and Mitigation of Short-Term Exposure Including Wildfire Smoke Events, 500000$, co-investigator.

2021/04-2022/09, **California Air Resources Board**, 20ISD005, Scoping Plan Update Scenario Modeling and Evaluation, 109500$, co-investigator.

2019/10-2020/06, **California Public Utilities Commission**, R.14-10-003, Integrated Distributed Energy Resources (IDER) Air Quality, 260314$, co-investigator,

2020/05-2020/06, **California Public Utilities Commission**, R.16-02-007, Integrated Resource Plan (IRP) Air Quality, 14976$, co-investigator.

2020/06-2021/03, **California Environmental Protection Agency**, UC-ITS-2020-65, Heavy Duty Vehicle Carbon Neutral Research, 90000$, co-investigator.

2018/05-2020/04, **South Coast Air Quality Management District**, C18206, Assessment of the Air Quality and Greenhouse Gas Impacts of a Microgrid-Based Electricity System in Southern California, 660000$，co-investigator.

2016/10-2021/12, **United States Environmental Protection Agency**, EPA STAR Grant R835881, Effects of Ammonia on Secondary Organic Aerosol Formation in a Changing Climate, 701000$, co-investigator.

2016/01-2017/01, **French Agency for Food, Environmental and Occupational Health & Safety**, ANSES Grent n°2016-CRD-04, Study of the impact on air pollution of technologies and the composition of the vehicle fleet circulating in France, 24000 €， co-investigator.

Teaching Experiences

Guest Lecturer

1. ENGRMAE 164 — Air Pollution and Control (Undergraduate level)
   The Henry Samueli School of Engineering, University of California, Irvine; Spring 2018;
   I lecture: Aerosol Formation and Control Strategies

Teaching Certificate

1. CIRTL (Center for the Integration of Research, Teaching and Learning) Associate Certificate

Mentoring Experiences

1) Amaya Joy Hernandez, Graduate Research (2022-present), Advanced Power and Energy Program, Department of Civil and Environmental Engineering, UCI.
2) Kai Wu, Graduate Research (2020-present), Advanced Power and Energy Program, Department of Civil and Environmental Engineering, UCI.
3) Andre Paradise, Undergraduate Research (2019-2020), Computational Environmental Science Lab, Department of Mechanical and Aerospace Engineering, UCI.
4) Owen Yang, Undergraduate Research (2018-2020), Advanced Power and Energy Program, Department of Electrical Engineering and Computer Science, UCI.
5) Shaurya Johari, Graduate Research (2019-2020), Computational Environmental Science Lab, Department of Civil and Environmental Engineering, UCI.
6) Yeseul Lyn Lee, Graduate Research (2019-2020), Computational Environmental Science Lab, Department of Civil and Environmental Engineering, UCI.
7) James V. Soukup, Graduate Research (2017-2019), Advanced Power and Energy Program, Department of Civil and Environmental Engineering, UCI.
8) Fabian Muresan, Graduate Research (2018-2019), Computational Environmental Science Lab, Department of Mechanical and Aerospace Engineering, UCI.
9) Paul Paubalat, Graduate Research (2017-2018), Computational Environmental Science Lab, Department of Mechanical and Aerospace Engineering, UCI.
10) Guillem Benosa, Graduate Research (2017-2018), Computational Environmental Science Lab, Department of Mechanical and Aerospace Engineering, UCI.

Social Activities

1) Served as a member of the judge committee at the Orange County Science & Engineering Fair, Mar. 24-28, 2020, California, USA.

Skills

1. Certificate of Completion: Machine Learning and Big Data Analytics in Smart Grid, Electric Power Research Institute (EPRI).
2. MODELING: Expert in running both global and regional Chemical Transport Models (CTMs) — CMAQ, WRF, WRF-CMAQ, SMOKE, POLYPHEMUS, UCI-CIT-Airshed.
3. ANALYSIS: Big data management and analysis (tens of TB), AMET model performance analysis, BenMAP for human health analysis, Verdi & GrADS visualization, ArcGIS, MySQL.
4. COMPUTER: Fortran, NCL, Python, R, C++, OpenGL/CL, Machine Learning(PyTorch), Linux, MPI&HPC
5. LANGUAGE: Chinses, English, French.

Membership

Member of "Royal Society of Chemistry (UK)"
Member of "French Association for Studies and Research on Aerosols”
Member of "The American Association for Aerosol Research"
Member of "AirUCI (Atmospheric Integrated Research at University of California, Irvine)"