

# Shupeng Zhu

Senior Scientist

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## Research Interests

Air quality impact analysis of decarbonization 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	<b>Ph.D.</b>	Environmental Sciences	University of Paris-Est, France
2012.09	<b>M.S.</b>	Urban and Environmental Planning	École centrale de Nantes, France
2012.09	<b>B.S.</b>	Urban Studies and Planning	École centrale de Nantes, France
2010.06	<b>B.S.</b>	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

**Editorial Service**

Guest Associate Editor, Frontiers in Public Health, 2022-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/>

Member of The Royal Society of Chemistry Researcher Grants Peer Review Group.

Reviewer Board Member, Atmosphere, 2019-present

*Geoscientific Model Development*

*Environmental Science & Technology*

*Environment International*

*Atmospheric Environment*

*Aerosol Science and Technology*

*Environmental Technology*

*Atmospheric Chemistry and Physics*

*Atmospheric Science Letters*

*Communication Earth & Environment*

*Atmospheric Research*

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

**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) **Zhu S.\***, Yu H., Zhang Y., Zhang Y., Mac Kinnon M., "Editorial: Air Pollution and Climate Change: Interactions and Co-mitigation", **Frontiers in Environmental Science**, 2022, <https://doi.org/10.3389/fenvs.2022.1105656>
- 13) 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>
- 14) 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>
- 15) 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>
- 16) Mac Kinnon M., **Zhu S.**, Carreras-Sospedra M., Soukup J. V., Dabdub D., Samuelsen G. S., and Brouwer J.\*, "Considering future regional air quality impacts of the transportation sector", **Energy Policy**, 2019, 124, 63-80. <https://doi.org/10.1016/j.enpol.2018.09.011>
- 17) 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>
- 18) 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>
- 19) 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>
- 20) 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". Accepted by **Nature Communication**.
- 21) 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>
- 22) 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

- 23) Sun Y.<sup>†</sup>, **Zhu S.**<sup>†</sup>, Wang D.\*, Duan J., Yin H., Tan C., Zhang L., Zhao M., Cai W., Wang

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- Y., Guan D.\*, “*Assessment of the economic impacts of heat stress under climate warming*”. Under review by **Nature**.
- 24) 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*”. Under review by **Science of the Total Environment**.
- 25) Wu K., **Zhu S.**, Mac Kinnon M. and Samuelsen G. S.\*, “*Unexpected deterioration of O<sub>3</sub> pollution in the South Coast Air Basin of California: The role of meteorology and emissions*”. Under review by **Environmental Pollution**.

## In Preparations

- 26) **Zhu S.**, Jiang X., Mac Kinnon M., Hernandez A., Wu K. and Samuelsen G. S., “*Improved air quality with deteriorated equality in the US between 2002-2019*”
- 27) Mastropasqua L.\*, Mac Kinnon M., **Zhu S.** and Samuelsen G. S., “*Reducing the air pollution impact of petroleum refineries via high temperature electrochemical energy systems*”
- 28) **Zhu S.**, Wu K., Mac Kinnon M., Wu J. and Samuelsen G. S., “*Modeling polycyclic aromatic hydrocarbon (PAH) emissions from wildfires in California*”
- 29) Carreras-Sospedra M., **Zhu S.**, Mac Kinnon M., Lassman W., Mirocha J. D., Barbato M., Dabdub D., “*Air Quality and Health Impacts of the 2020 wildfires in California*”
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## 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 19<sup>th</sup> Community Modeling and Analysis System conference (2020), Zhu S. et al: *Economic footprint of California wildfires in 2018*. Online.
- 5) Presentation at 18<sup>th</sup> Community Modeling and Analysis System conference (2019), Zhu S. et al: *Vehicle Emission Regulations Save Lives in California*. Chapel Hill, USA.
- 6) Presentation at 18<sup>th</sup> 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 17<sup>th</sup> 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 10<sup>th</sup> International Aerosol Conference (2018), Zhu S. et al: *Comprehensively Assessing the Drivers of Future Air Quality in California*. Saint Louis, USA.

- 9) Presentation at 16<sup>th</sup> 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 22<sup>nd</sup> 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 34<sup>th</sup> 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.

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## Book and Conference Proceedings

- 1) Montoya-Aguilera J., Hinks M., Aiona P., Wingen L., Horne J. R., **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](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](https://doi.org/10.1007/978-3-659-82388-6).
  - 4) **Zhu S.**, Morin L., Pressigout M., Moreau G., Servièrès 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., Servièrès 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>
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## 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.



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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 Grant 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.

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## 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;  
1 lecture: Aerosol Formation and Control Strategies

### Teaching Certificate

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

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- 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.
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## Social Activities

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

Member of "Royal Society of Chemistry (UK)"

Member of "European Geosciences Union"

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)"