

## **Xiaoming SHI**

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Division of Environment and Sustainability (ENVR)  
Hong Kong University of Science and Technology (HKUST)  
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### **Education**

- 2015 Ph.D. Atmospheric Sciences University of Washington - Seattle, USA  
Dissertation: *Studies of Climate Dynamics with Innovative Global Model Simulations*  
Advisor: Dale R. Durran
- 2013 M.S. Atmospheric Sciences University of Washington - Seattle, USA  
Thesis: *Estimating the Response of Mid-latitude Orographic Precipitation to Global Warming*  
Advisor: Dale R. Durran
- 2009 B.S. Atmospheric Sciences Lanzhou University, China

### **Academic Positions**

- 2018 Sep – present Assistant Professor  
Division of Environment and Sustainability  
Hong Kong University of Science and Technology, HKSAR
- 2015 Sep – 2018 Aug Postdoctoral Scholar  
Department of Civil and Environmental Engineering  
University of California, Berkeley, USA

### **Teaching**

#### **Teaching Award**

- 2020 HKUST Common Core Teaching Excellence Award  
(For the teaching of SUST 1000 - *Introduction to Sustainability*)

#### **List of Program Abbreviations**

AES: Atmospheric Environmental Science  
ESPM: Environmental Science, Policy and Management  
EOAS: Earth, Ocean, and Atmospheric Sciences  
EVMT: Environmental Management and Technology  
ENVS: Environmental Science  
UROP: Undergraduate Research Opportunities Program

**Taught Courses**

<u>Course Code</u>	<u>Course Title</u>	<u>Program</u>
SUST 1000	<i>Introduction to Sustainability /Sustainability Fundamentals</i>	Common Core (Undergraduate)
ENVR 3002	<i>Introduction to Atmospheric Science</i>	ENVS (Undergraduate)
ENVR 5290	<i>Climate Change: Science, Policy, and Management (ESPM Core Course)</i>	ESPM (Postgraduate)
ENVR 5350	<i>Climate Dynamics (AES Core Course)</i>	AES (Postgraduate)

**Student Supervision**

## POSTGRADUATE STUDENTS

<u>Name</u>	<u>Degree</u>	<u>Program</u>	<u>Period of Study</u>
VALENTINA, I Gusti Ayu Diah*	PhD	AES	2019 – 2023
WANG, Yueya* <sup>1</sup>	PhD	AES	2019 – 2023
QU, Yongquan*	MPhil	AES	2019 – 2021
FAN, Yiyuan*	MPhil	AES	2019 – 2021
LAM, Sze Lok Rachel* <sup>2</sup>	MPhil	ESPM	2020 – 2022
HUANG, Yuanyuan*	MPhil	EOAS	2021 – 2023
CHEN, Jianan <sup>†</sup>	PhD	AES	2021 –
CHEN, Haoming <sup>†</sup>	PhD	EOAS	2021 –
ZHU, Xingyu	PhD	AES	2022 –
NIE, Xiuwen	MPhil	AES	2022 –
YU, Ge <sup>3</sup>	PhD	EOAS	2023 –
ZHOU, Zixuan <sup>2</sup>	PhD	ESPM	2023 –

## UNDERGRADUATE STUDENTS

<u>Name</u>	<u>Program</u>	<u>Year</u>
CHAN, Cho Kwan Josephine, CHENG, Kit Yi Vicky, and FAN, Xingyi Kirsi	EVMT Capstone Project	2021/2022
TAN, Hanzhi	UROD 1000, 1100, 2100, and 3100	2020/2021 and 2021/2022
WONG, Hau Man	ENVS Final Year Project	2020/2021
CHUNG, Yu To	ENVS Final Year Project	2020/2021

<sup>1</sup> Co-supervised with Prof. Jimmy FUNG<sup>2</sup> Co-supervised with Prof. Eun Soon IM.<sup>†</sup> Passed PhD Qualifying Exam.<sup>3</sup> Co-supervised with Prof. Zhe WANG.

## Research

### Research Award

2022 Heywood Young Scientists Award (by Hong Kong Meteorological Society)

### Funding Sources

RGC: Research Grants Council of Hong Kong

WMO: World Meteorological Organization

QNLN: Pilot Qingdao National Laboratory for Marine Science and Technology

GDST: Department of Science and Technology of Guangdong Province

### Awarded Research Grants

- RGC-General Research Fund *Estimating Tropical Cyclone Changes Due to Global Warming with Smart Dynamical Downscaling and Convection-Permitting Simulations*  
- Role: PI Period: 2024 Jan – 2026 Dec
- RGC-General Research Fund *Large Eddy Simulation Code in JAX: An Accelerated and Differentiable Atmospheric Model for Turbulence Parameterization Development*  
- Role: PI Period: 2023 Jan – 2025 Dec
- RGC-General Research Fund *The Representation of Turbulence and Convection in the Gray Zones of Orographic Precipitation*  
- Role: PI Period: 2022 Jan – 2024 Dec
- RGC-Early Career Scheme *Quantifying and Understanding the Response of Extreme Convective Rainfall to Global Warming*  
- Role: PI Period: 2020 Jul – 2023 Dec
- QNLN-Center for Ocean Research in Hong Kong and Macau Project  
*Impact of Wave-State Dependent Sea-Surface Flux on the Regional Climate of East Asia in Climate System Simulations*  
- Role: PI Period: 2022 Apr – 2024 Mar
- WMO-Aviation Research and Development Project Phase 2  
*Short-Term Prediction of Convection-Induced Turbulence*  
- Role: PI Period: 2021 Nov – 2023 Oct
- RGC-Area of Excellence Scheme  
*Study of the Regional Earth System for Sustainable Development Under Climate Change in the Greater Bay Area*  
- Role: Co-I Period: 2024 Jan – 2028 Dec
- RGC-Theme-based Research Scheme  
*Developing Hong Kong as a Global Green Finance Centre*

- Role: Co-I Period: 2022 Jan – 2026 Dec
- GDST-Enhancing Youth Fund *Green Infrastructure Analysis for Co-mitigating Urban Flooding and Heat Island*
  - Role: Co-I Period: 2023 Jan – 2025 Dec
- GDST-Guangdong-Hong Kong-Macau Joint Laboratory  
*Guangdong-Hong Kong Joint Laboratory for Water Security*
  - Role: Co-I Period: 2021 Jan – 2023 Dec
- RGC-Area of Excellence Scheme *Centre for Slope Safety*
  - Role: Collaborator Period: 2019 – 2027

#### **Journal Publications<sup>4</sup>**

- Chen<sup>†</sup>, J. and **X. Shi\***, 2023: Quantifying Global-Warming Response of the Orographic Precipitation in a Typhoon Environment with Large-Eddy Simulations. ***Journal of Climate***, <https://doi.org/10.1175/JCLI-D-23-0018.1>, in press.
- Wang<sup>†</sup>, Y., Z. Zhang, W.S. Chow, Z. Wang, J.Z. Yu, J. C.-H. Fung, and **X. Shi\***, 2023: Investigating the Effect of Aerosol Uncertainty on Convective Precipitation Forecasting in South China's Coastal Area. ***Journal of Geophysical Research: Atmospheres***, 128, e2023JD038694. <https://doi.org/10.1029/2023JD038694>.
- Qu<sup>\*†</sup>, Y. and **X. Shi**, 2023: Can a Machine-Learning-Enabled Numerical Model Help Extend Effective Forecast Range through Consistently Trained Subgrid-Scale Models? ***Artificial Intelligence for the Earth Systems***, 2(1), e220050. <https://doi.org/10.1175/AIES-D-22-0050.1>.
- Shi\***, **X.** and Y. Wang<sup>†</sup>, 2022: Impacts of Cumulus Convection and Turbulence Parameterizations on the Convective-Permitting Simulation of Typhoon Precipitation, ***Monthly Weather Review.***, 150(11). 2977-2997. <https://doi.org/10.1175/MWR-D-22-0057.1>
- Wang<sup>†</sup>, Y., **X. Shi\***, L. Lei, and J. C. Fung, 2022: Deep-Learning Augmented Data Assimilation: Reconstructing Missing Information with Convolutional Autoencoders, ***Monthly Weather Review***, 150(8), 1977-1991. <https://doi.org/10.1175/MWR-D-21-0288.1>.
- Fan<sup>†</sup>, Y., Y. T. Cheung<sup>†</sup>, **X. Shi\***, 2021: The Essential Role of Cloud-Radiation Interaction in Nonrotating Convective Self-Aggregation, ***Geophysical Research Letters***, 48, e2021GL095102. <https://doi.org/10.1029/2021GL095102>.
- Shi\***, **X.**, and Y. Fan<sup>†</sup>, 2021: Modulation of the Bifurcation in Radiative-Convective Equilibrium by Gray-Zone Cloud and Turbulence Parameterizations, ***Journal of Advances in Modeling Earth Systems***, 13, e2021MS002632.

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<sup>4</sup> Publications since 2019 are affiliated with HKUST.

\* Corresponding author

<sup>†</sup> Students supervised by me at HKUST

<https://doi.org/10.1029/2021MS002632>.

- Lestari<sup>†</sup>, D. V., and **X. Shi\***, 2021: Sensitivity of the Short-Range Precipitation Forecast in South China Region to Sea Surface Temperature Variations, **Atmosphere**, 12(9), 1138. <https://doi.org/10.3390/atmos12091138>.
- Shi\***, **X.**, 2020: Enabling Smart Dynamical Downscaling of Extreme Precipitation Events With Machine Learning, **Geophysical Research Letters**, 47, e2020GL090309. <https://doi.org/10.1029/2020GL090309>.
- Shi\***, **X.**, R. M. Enriquez, R. L. Street, G. H. Bryan, and F. K. Chow, 2019: An Implicit Algebraic Turbulence Closure Scheme for Atmospheric Boundary Layer Simulation, **Journal of the Atmospheric Sciences**, 76, 3367–3386. <https://doi.org/10.1175/JAS-D-18-0375.1>.
- Su\*, L., J. Li, **X. Shi**, and J. C. H. Fung, 2019: Spatiotemporal Variation in Pre-summer Precipitation Over South China From 1979 to 2015 and Its Relationship With Urbanization, **Journal of Geophysical Research: Atmospheres**, 124, 6737–6749. <https://doi.org/10.1029/2019JD030751>.
- Chow\*, F. K., C. Schar, N. Ban, K. Lundquist, L. Schlemmer, and **X. Shi**, 2019: Crossing Multiple Gray Zones in the Transition From Mesoscale to Microscale Simulation Over Complex Terrain, **Atmosphere**, 10, 274; <https://doi.org/10.3390/atmos10050274>.
- Shi\***, **X.**, F. K. Chow, R. L. Street, and G. H. Bryan, 2019: Key Elements of Turbulence Closures for Simulating Deep Convection at Kilometer-Scale Resolution, **Journal of Advances in Modeling Earth Systems**, 11, 818–838. <https://doi.org/10.1029/2018MS001446>.
- Shi\***, **X.**, D. Kim, Á. F. Adames, J. Sukhatme, 2018: WISHE-Moisture Mode in an Aquaplanet Simulation, **Journal of Advances in Modeling Earth Systems**, 10, 2393–2407. <https://doi.org/10.1029/2018MS001441>.
- Shi\***, **X.**, F. K. Chow, R. L. Street and G. H. Bryan, 2018: An Evaluation of LES Turbulence Models for Scalar Mixing in the Stratocumulus-Capped Boundary Layer, **Journal of the Atmospheric Sciences**, 75, 1499–1507. <https://doi.org/10.1175/JAS-D-17-0392.1>.
- Shi\***, **X.**, H. L. Hagen, F. K. Chow, G. H. Bryan and R. L. Street, 2018: Large-Eddy Simulation of the Stratocumulus-Capped Boundary Layer with Explicit Filtering and Reconstruction Turbulence Modeling, **Journal of the Atmospheric Sciences**, 75, 611–637. <https://doi.org/10.1175/JAS-D-17-0162.1>.
- Shi\***, **X.** and D. R. Durran, 2016: Sensitivities of Extreme Precipitation to Global Warming Are Lower over Mountains than over Oceans and Plains, **Journal of Climate**, 29, 4779–4791. <https://doi.org/10.1175/JCLI-D-15-0576.1>.
- Shi\***, **X.** and D. R. Durran, 2015: Estimating the Response of Extreme Precipitation over Mid-latitude Mountains to Global Warming, **Journal of Climate**, 28, 4246–4262. <https://doi.org/10.1175/JCLI-D-14-00750.1>.
- Shi\***, **X.** and C. S. Bretherton, 2014: Large Scale Character of an Atmosphere in Rotating Radiative–Convective Equilibrium. **Journal of Advances in Modeling Earth Systems**, 6, 616–629, <https://doi.org/10.1002/2014MS000342>.
- Shi\***, **X.** and D. R. Durran, 2014: The Response of Orographic Precipitation over Idealized

Mid-Latitude Mountains Due to Global Increases in CO<sub>2</sub>. *Journal of Climate*, 27, 3938-3956. <https://doi.org/10.1175/JCLI-D-13-00460.1>.

### Conference Presentations

- Shi, X.**, Q. Li, and D. V. Lestari, 2023: The Impact of Wave-State Dependent Surface Fluxes on the Climate in an Earth System Model. *The 2nd Hong Kong and Macau Ocean Forum*, Hong Kong, China.
- Shi, X.**, 2023: Super-Clausius-Capeyron Scaling of Tropical Cyclone Rainfall at Urban Scales. *20th Annual Meeting of Asia Oceania Geosciences Society (AOGS2023)*, Singapore.
- Chen, J. and **X. Shi**, 2023: Pseudo Seeder-feeder Mechanism in Orographic Precipitation in a Typhoon Environment and its Response to Global Warming. *20th Annual Meeting of Asia Oceania Geosciences Society (AOGS2023)*, Singapore.
- Chen, H., **X. Shi**, C. Y. Leung, P. Cheung, and S. Chan, 2023: Using MPAS model to forecast the Convectively Induced Turbulence. *European Geosciences Union General Assembly 2023*, Vienna, Austria.
- Chen, J. and **X. Shi**, 2022: LES Study of the Interaction between Mountain Waves and Typhoon Outer Region Rainfall under Global Warming. *American Geophysical Union 2022 Fall Meeting*, Chicago, IL, USA.
- Lestari, D. V. and **X. Shi**, 2022: The Changing Northern Annular Mode and its Connection to Reduced North American Winter Variability. *American Geophysical Union 2022 Fall Meeting*, Chicago, IL, USA.
- Huang, Yuanyuan and **X. Shi**, 2022: The Role of Cloud-Radiation Interaction in the Aquaplanet Simulation of MJO-Like Oscillations. *American Geophysical Union 2022 Fall Meeting*, Chicago, IL, USA. [**Outstanding Student Presentation Award (Oral)**]
- Chen, H. and **X. Shi**, 2022: Using MPAS to Forecast Convectively Induced Turbulence for Aviation. *American Geophysical Union 2022 Fall Meeting*, Chicago, IL, USA.
- Chen, J. and **X. Shi**, 2022: Quantifying the Global-Warming Response of the Orographic Precipitation in a Typhoon Environment with Large-Eddy Simulations. *The 20th Conference on Mountain Meteorology*, Park City, Utah, USA.
- Shi, X.**, 2021: Enabling Smart Dynamical Downscaling of Extreme Precipitation Events with Machine Learning. *American Meteorology Society 101st Annual Meeting*, Virtual.
- QU, Y. and **X. Shi**, 2020: Data-Driven Turbulence Modelling for Two-Dimensional Barotropic Flow Using Neural Networks. *American Geophysical Union 2020 Fall Meeting*, Virtual; New Orlean, USA.
- Shi, X.**, 2019: Towards Robust Computation of Convective Clouds: Developing Advanced Turbulence Parameterizations. *16th Annual Meeting of Asia Oceania Geosciences Society (AOGS2019)*, Singapore.
- Shi, X.** and Y. Fan, 2019: The Interaction between Cloud, Radiation and Turbulence and the Self-Aggregation of Convection. *American Geophysical Union 2019 Fall Meeting*, San Francisco, USA.
- Shi, X.**, 2019: Turbulence Closures for the Simulating Deep Convection at Kilometerscale Resolution. *3rd International Workshop of the Severe Weather International*

Consortium (SWIC). Peking University, Beijing, China. **(Invited)**

**Shi, X.**, 2017: Simulation of Deep Convective Clouds with the Dynamic Reconstruction Turbulence Closure. *American Geophysical Union 2017 Fall Meeting*, New Orleans, LA, USA.

**Shi, X.**, 2017: Simulation of Stratocumulus and Deep Convective Clouds with the Dynamic Reconstruction Turbulence Closure. *17th Conference on Mesoscale Processes*, San Diego, CA, USA.

**Shi, X.**, 2016: Subfilter-Scale Processes and the Simulation of Convective Clouds in the Terra Incognita. *22nd Symposium on Boundary Layers and Turbulence*, Salt Lake City, UT, USA.

**Shi, X.**, 2015: Global-warming-induced Increases in Extreme Precipitation are Smaller over Mountains. *American Geophysical Union 2015 Fall Meeting*, San Francisco, USA.

**Shi, X.**, 2014: The Response of Extreme Precipitation over Idealized Mid-latitude Mountains to Global Warming. *16th Conference on Mountain Meteorology*, San Diego, CA, USA.

**Shi, X.**, 2013: Changes in Mid-latitude Orographic Precipitation due to Global Warming. *15th Conference on Mesoscale Processes*, Portland, OR, USA.

### **Invited Seminars and Lectures**

**Shi, X.**, Predicting South China Precipitation at Different Temporal-Spatial Scales. *Chengdu University of Information Technology*, Chengdu, China, Apr 2023.

**Shi, X.**, Predicting South China Precipitation at Different Temporal-Spatial Scales. *China Meteorological Administration Guangzhou Institute of Tropical and Marine Meteorology*, Guangzhou, China, Apr 2023.

**Shi, X.**, Improving Gray-Zone Turbulence Parameterization for Predicting Tropical Cyclones. *Sun Yat-Sen University*, Zhuhai, China, Feb 2023.

**Shi, X.**, Modulation of the Bifurcation in RCE by Gray-Zone Cloud and Turbulence Parameterizations. *Hong Kong Observatory*, Hong Kong, China, Dec 2022.

**Shi, X.**, Lecture on Orographic Precipitation. *Mountain Meteorology Summer School at Nanjing University*, Virtual, Aug 2022.

**Shi, X.**, Turbulence Parameterizations for Simulating Deep Convection at Gray Zone Resolutions. *Sun Yat-Sen University*, Zhuhai, China, Nov 2019.

**Shi, X.**, Towards Robust Computation of Clouds: Developing Advanced Turbulence Parameterizations. *Peking University*, Beijing, China. Nov 2018.

## **Service**

### **Professional Service**

- Main Convener at the 20th Annual Meeting of Asia Oceania Geosciences Society (AOGS2023) (2023)
- Member of the Scientific Steering Committee, World Meteorological Organization

- (WMO) Aviation Research and Development Project Phase2 (AvRDP2)  
(2021 – present)
- Member of the Executive Committee, Hong Kong Meteorology Society  
(2021 – present)
- Academic Editor for the journal *Atmosphere*  
(2021 – present)
- Co-Organizer for the Climate Adaptation and Resilience 2018 (CARE2018) Conference  
(2018)
- Reviewer for
  - *Journal of the Atmospheric Sciences*
  - *Monthly Weather Review*
  - *Geophysical Research Letters*
  - *Journal of Advances in Modeling Earth Systems*
  - *Science Advances*
  - *Nature Climate Change*
  - *Atmosphere*
- Proposal Reviewer for *National Science Foundation, USA.*

### **University Service**

- Member of Science + Technology (S + T) Common Core Course Review Panel  
(2023 – present)
- Member of Interdisciplinary Programs Office (IPO) Best Research Award Selection  
Committee  
(2023)
- Member of Senate Committee on Teaching and Learning Quality  
(2021 – present)
- Member of Undergraduate Committee, Division of Environment and Sustainability  
(2021 – present)
- Member of Interview Panel for Division Undergraduate Admission through Joint  
University Programmes Admissions System (JUPAS) and Major Selection  
(2021 – present)