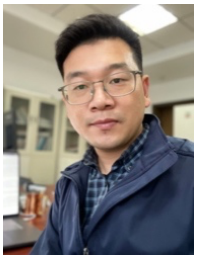
Guangdong DUAN

Ph.D. City University of Hong Kong



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RESEARCH INTERESTS

- **Air pollution and built environment**: Outdoor ventilation; Mixing and dispersion; Pollutant exposure.
- **Urban micrometeorology**: Adaptation to climate change (wind hazards); Boundary-layer turbulence; Environmental fluid dynamics; Large-eddy simulation (LES) and micro-mesoscale coupling.
- **Engineering thermal physics and CFD**.

PROFESSIONAL APPOINTMENT

2021.10 – Present
Associate Professor, Dalian Maritime University ("Double First-Class" and Project 211 university in P.R.China)

2019.06 – 2021.10
Research Assistant Professor, Disaster Prevention Research Institute (DPRI), Kyoto University, Japan

2018.03 – 2019.05
Postdoctoral Fellow, City University of Hong Kong, Hong Kong SAR (with Dr. Keith Ngan, Prof. Peter Brimblecombe)

2017.09 – 2018.02
Research Assistant, City University of Hong Kong, Hong Kong SAR

EDUCATION

2014.08 – 2018.02
PhD (Environmental Science, Energy and Built Environment)
City University of Hong Kong, Hong Kong SAR (Supervisor: Dr. Keith NGAN)

2009.08 – 2011.07
MEng (Engineering Thermophysics)
Northeastern University ("Double First-Class", Project 211 and Project 985 university in P.R.China)

2005.09 – 2009.07
BEng (Thermal Energy and Dynamics Engineering)
Shenyang Aerospace University, China

INDUSTRY EXPERIENCE AND QUALIFICATION

2011.07 – 2014.05
Research Engineer, R&D Center of WISDRI (Wuhan) Thermal Engineering Co., Ltd., China
(Responsible for the model development for industrial heat transfer and application)

TA COURSES (at CityU)

Term	*Course*
2021-22 I, 2022-23, 2023-24	Introduction to Astronomy (Elective): Introduction; Coordinate and Time Systems; Earch System-Atmosphere and Ocean
2016.09	Thermosciences for Energy Conversion II

2016.06	Experimental Techniques in Energy and Environment
2016.02	Introduction to Computing for Energy and Environment
2015.09	Atmospheric and Climate Science

RECENT HONORS AND AWARDS

2023	**Xing-Liao Talent Award** of Liaoning Province, P.R.China
2022	**High-Level Yong Talent Award** of Dalian City, Liaoning Province, P.R.China
2017.01	**Excellent Poster Presentation Award** *American Meteorological Society, The 97th Annual Meeting*, Seattle, United States

(CO-)SUPERVISED STUDENTS 【Three-year research programme】

Student	Year	Major	Research topic
R. GAO	2nd	*Engineering Thermophysics*	Flow and pollutant dispersion over petrochemical cylindrical obstacles: LES and parameterisation. (Published in *Phys. Fluids*)
J. CHEN (Graduated)	3rd	*Engineering Thermophysics*	Turbulent flow in an I-L junction: Impacts of pipe diameter ratio. (Published in *Phys. Fluids*)
Z. BI	2nd	*Refrigeration and Low-Temperature Engineering*	Vegetation effects on boundary-layer turbulence and scalar dynamics around a cubic gas holder. (Published in *Phys. Fluids*)
Z. LIU	2nd	*Power Engineering*	Impacts of discrete heating on urban microclimates: Building-resolving LES.
Z. SHUI (Graduated)	3rd	*Refrigeration and Low-Temperature Engineering*	Multiphysics coupling of thermal mechanisms between indoor-outdoor environments of a solar greenhouse. (Published in *Case Stud. Therm. Eng.* IF 6.8)
X. FENG (Graduated)	3rd	*Thermal Engineering*	Heat and mass transfer inside a scrubber tower: RANS of effects of tray misalignment. (Published in *Case Stud. Therm. Eng.* IF 6.8)
X. MING (Graduated)	2nd	*Clean Energy and Technology*	Microwave heating of oil shale based on multi-physics field coupling: Optimization of waveguide positioning. (Published in *Int. J. Heat Mass Transf.*)
Y. YANG	1st	*Thermal Engineering*	Boundary-layer stability on turbulent flow and air pollution dispersion in urban canyons with viaduct geometries

PROJECTS

1. Scientific and Technological Innovation Project, Fundamental Research Funds for the Central Universities (3132023155): *High-resolution numerical simulation of boundary-layer turbulence and pollution dispersion over typical petrochemical farms*, 2023.01-2023.12, **PI**

2. Natural Science Foundation of Liaoning Province of China (2022-KF-18-07) Key Program for Science and Technology Innovation: *Wind hazards in urban harbor areas driven by strong mesoscale perturbations*, 2022.09-2024.08, 100,000 RMB, **PI**

3. Scientific and Technological Innovation Project, Fundamental Research Funds for the Central Universities (3132022135): *Timescales of pollutant migration in turbulent boundary-layer flows developed over port cities*, 2022.01-2022.12, **PI**

4. Start-up funding of Dalian Maritime University, 2021.10-2024.09, 500,000 RMB, **PI**

5. Japan Society for the Promotion of Science (**JSPS**) of Japan, Grants-in-Aid for Scientific Research: "*Risk Assessment Of Severe Wind Disasters In Urban Districts Under Climate Change*", 2018.04–2021.03, JP¥17,290,000**,** [PI: Prof. Tetsuya Takemi, Kyoto University]

6. Environmental Restoration and Conservation Agency (**ERCA**) of Japan, Environment Research and Technology Development Fund: "*Climate Change Adaptation To Disasters In Urban Environments*", 2019–2021, JP¥39,000,000, [PI: Prof. Masaru Inatsu, Hokkaido University; Co-I: Hiroyuki Kusaka, University of Tsukuba; Co-I: Tetsuya Takemi, Kyoto University]

7. Research Grants Council of Hong Kong (**RGC**), General Research Fund (*11334116*): "*Air Pollution In Elevated Walkway Microenvironments In Urban Street Canyons*", 2016–2018.09, HK$540,052, [PI: Chair Prof. Peter Brimblecombe, City University of Hong Kong]

8. Research Grants Council of Hong Kong (**RGC**), Early Career Scheme (21304515): "*Ventilation And Mixing Timescales For Urban Air Quality*", 2015–2018.09, HK$591,200, [PI: Prof. Keith Ngan, City University of Hong Kong]

PUBLICATION 【full-length】

-. **G. Duan***; R. Gao; L. Zhao; T. Yang; T. Takemi: *Identification of Flow Regimes and Dispersion Pathways within Cylinder-Delimited Canyons. Journal of Wind Engineering and Industrial Aerodynamics*. (**under review**)

1. L. Zhao; Z. Shui; T. Yang; **G. Duan*** (2024) *Computer-Aiding Evaluation of North Wall Effects of a Solar Greenhouse: Multiphysics Modelling of the Indoor Environment. Case Studies in Thermal Engineering*. *DOI:* https://doi.org/10.1016/j.csite.2024.105361

2. **G. Duan***; Z. Bi; L. Zhao; T. Yang; T. Takemi (2024): *Modulating Local Winds and Turbulence Around a Single Building Obstacle With the Obstruction of Tall Vegetation*. *Physics of Fluids. DOI:* https://doi.org/10.1063/5.0227565

3. **G. Duan***; R. Gao; L. Zhao; T. Yang; K. Ngan (2024): *Turbulent Flow Over Aligned Cylindrical Obstacles. Physics of Fluids. DOI:* https://doi.org/10.1063/5.0211112

4. L. Zhao; X. Ming; **G. Duan*** (2024): *Microwave Heating of Oil Shale Based on Multiphysics Field Coupling: Positioning of the Waveguide. International Journal of Heat and Mass Transfer*. *DOI:* https://doi.org/10.1016/j.ijheatmasstransfer.2024.125470

5. L. Zhao; X. Feng; J. Chen; Z. Shui; T. Yang; **G. Duan*** (2024): *Gas Purification in a Scrubber Tower: Effects of Multi-Layer Tray Misalignments on the Multiphase Flow. Case Studies in Thermal Engineering*. *DOI*: https://doi.org/10.1016/j.csite.2024.104130

6. L. Zhao; J. Chen; **G. Duan*** (2024): *Turbulent Flow in an I-L Junction: Impacts of the Pipe Diameter Ratio. Physics of Fluids*. *DOI*: https://doi.org/10.1063/5.0189282

7. **G. Duan***; T. Takemi; K. Ngan (2023): *Evaluation of Pollutant Exposure Using Virtual Walkers and Large-Eddy Simulation: Application to an Idealised Urban Neighbourhood*. *Science of the Total Environment. DOI*: https://doi.org/10.1016/j.scitotenv.2023.162640

8. **G. Duan***; T. Takemi; K. Ngan (2023): *Measuring Pollutant Exposure Using Large-Eddy Simulation and Virtual Walkers: Analysis of Tracer Age Statistics of Idealised Urban Boundary-Layer Flows*. *Sustainable Cities and Society. DOI*: https://doi.org/10.1016/j.scs.2023.104501

9. **G. Duan***; K. Nakamae; T. Takemi (2022): *Impact of Urban Morphometric Indices on Ventilation*. *Building and Environment. DOI: https://doi.org/10.1016/j.buildenv.2022.109907*

10. **G. Duan***, T. Takemi (2021): *Predicting Urban Surface Roughness Aerodynamic Parameters Using Random Forest*. *Journal of Applied Meteorology and Climatology. DOI:* https://doi.org/10.1175/JAMC-D-20-0266.1

11. **G. Duan***; T. Takemi (2021): *Gustiness in Thermally-Stratified Urban Turbulent Boundary-Layer Flows and the Influence of Surface Roughness*. *Journal of Wind Engineering and Industrial Aerodynamics. DOI:* https://doi.org/10.1016/j.jweia.2020.104442

12. **G. Duan***; K. Ngan (2020): *Influence of Thermal Stability on the Ventilation of a 3-D Building Array*. *Building and Environment. DOI:* https://doi.org/10.1016/j.buildenv.2020.106969

13. **G. Duan***; P. Brimblecombe; Y.L. Liu; K. Ngan (2020): *Turbulent Flow and Dispersion Inside and Around Elevated Walkways*. *Building and Environment. DOI:* https://doi.org/10.1016/j.buildenv.2020.106711

14. **G. Duan**; K. Ngan (2019): *Sensitivity of Turbulent Flow Around a 3-D Building Array to Urban Boundary-Layer Stability*. *Journal of Wind Engineering and Industrial Aerodynamics*. *DOI:* https://doi.org/10.1016/j.jweia.2019.103958

15. **G. Duan**; J.G. Jackson; K. Ngan (2019): *Scalar Mixing in an Urban Canyon*. *Environmental Fluid Mechanics*. *DOI:* https://doi.org/10.1007/s10652-019-09690-0

16. **G. Duan**, K. Ngan (2018): *Effects of Time-Dependent Inflow Perturbations on Turbulent Flow in a Street Canyon*. *Boundary-Layer Meteorology*. *DOI:* https://doi.org/10.1007/s10546-017-0327-1

17. R. Liang†; **G. Duan** et al. (2011): *Flow Structure and Surface Deformation of High Prandtl Number Fluid Under Reduced Gravity and Microgravity*. *Microgravity Science and Technology*. *DOI:* https://doi.org/10.1007/s12217-011-9278-1

18. R. Liang†; Z. Liao; W. Jiang; **G. Duan** et al. (2011): *Numerical Simulation of Water Droplets Falling Near a Wall: Existence of Wall Repulsion*. *Microgravity Science and Technology*. *DOI:* https://doi.org/10.1007/s12217-010-9230-9

19. R. Liang†; D. Linag; F. Yan; Z. Liao; **G. Duan** (2011): *Bubble Motion near a Wall Under Microgravity: Existence of Attractive and Repulsive Forces*. *Microgravity Science and Technology*. *DOI:* https://doi.org/10.1007/s12217-010-9238-1

PROCEEDINGS

1. R. Liang†; **G. Duan** (2012): Investigation of Thermocapillary Convection of High Prandtl Number Fluid Under Microgravity. *Materials Research in Microgravity* (NASA/CP-2012-217466), 2012, 177-184

GRANTED FIRST-INVENTOR INVENTION PATENT

National Intellectual Property Administration PRC (CNIPA):
（1）ZL 2013 1 0384565.X;（2）ZL 2013 1 0386530.X;（3）ZL 2012 1 0506380.7;（4）ZL 2012 1 0507387.0;
（5）ZL 2012 1 0507501.X;（6）ZL 2012 1 0267095.4;（7）ZL 2012 1 0393369.4;（8）ZL 2012 1 0508486.0;
（9）ZL 2012 1 0088394.1

JOURNAL REVIEWER

《Building and Environment》，《Physics of Fluids》

《Journal of Wind Engineering and Industrial Aerodynamics》

《Scientific Reports》，《Applied Sciences》，《Energies》，《Mathematics》

《Aeolian Research》

《Journal of Marine Science and Engineering》，《Theoretical and Applied Climatology》

《Journal of Cleaner Production》，《Sustainable Cities and Society》

《Journal of Applied Fluid Mechanics》

TALKS

1. **G. Duan**, T. Takemi & K. Ngan. Measuring Pollutant Exposure of Virtual Walkers in an Idealised Urban Boundary-layer Flow Using Large-eddy Simulation. *Asia Oceania Geosciences Society (AOGS) 21st Annual Meeting (AOGS2024),*, Pyeongchange, Korea. 23-28 June 2024 (Oral)

2. **G. Duan** & T. Takemi. Evaluation of urban wind gusts for thermally-stratified turbulent boundary-layer flows using large-eddy simulation. *Japan Geoscience Union Meeting (JpGU2024)*, Chiba, Japan. 26-31 May 2024 (poster & oral)

3. **G. Duan**, T. Takemi, K. Ngan. National Natural Science Foundation Joint Fund Project of China Meteorological Administration - Shanghai Typhoon Institute: *'Fine Structure Evolution and Prediction of East China Typhoon Wind Field - Research on the Impact of Complex Underlying Surfaces', Urbanization Effect Impact Special Seminar*. 14 Jun 2023, Asia-Pacific Typhoon Research Center, Shanghai (Invited)

4. **G. Duan**, T. Takemi, K. Ngan. Paramterisation of exposure timescale to air pollution in an idealised urban district. *The 9th National Conference on Urban Meteorology*, 11-13 May 2023, Hebei·XiongAn

5. T. Takemi. **G. Duan**, K. Nakamae. Combining Mesoscale Meteorological Simulation and Building-Resolving Large-Eddy Simulation to Assess the Impacts of Global Warming on Wind Hazard in Urban Districts. *American Geophysical Union (AGU) Fall Meeting (AGU2022)*, USA. 12-16 December 2022, Chicago & Online

6.竹見 哲也, **G. Duan**, 中前 久美. 地球温暖化時の市街地における風災害リスクの評価 RISK ASSESSMENT OF WIND DISASTERS IN URBAN DISTRICTS UNDER GLOBAL WARMING. 風工学シンポジウム講演梗概集

7. **G. Duan**, K. Nakamae, T. Takemi. Influence of urban topographical indices on ventilation timescales. *Asia Oceania Geosciences Society (AOGS) 19th Annual Meeting (AOGS2022)*, 01-06 August 2022 (Oral Online)

8. **G. Duan**, T. Takemi. Estimating Urban Surface Roughness Aerodynamic Parameters Using Random Forest. *Asia Oceania Geosciences Society (AOGS) 18th Annual Meeting (AOGS2021)*, 01-06 August 2021 (Oral Online)

9. **G. Duan**, T. Takemi. Gustiness in thermally-stratified turbulent boundary-layer flows and the influence of surface roughness. *DPRI Annual Meeting 2021, Kyoto University*, Japan, 22-24 February 2021 (Oral)

10. **G. Duan**, T. Takemi. Wind gusts in Thermally-Stratified Urban Turbulent Boundary-Layer Flows and the Influence of Surface Roughness. *American Geophysical Union (AGU) Fall Meeting (AGU2020)*, USA. 01-17 December 2020 (Online)

11. **G. Duan**, T. Takemi. Large-eddy simulations of turbulent flow over urban areas of Osaka, Japan. *JpGU-AGU Joint Meeting 2020*, Japan. 12-16 July 2020 (Online)

12. **G. Duan**, T. Takemi. Turbulent Flow Over Urban Areas of Osaka, Japan–From Building-Resolving Large-Eddy Simulation Towards the Downscaling of Mesoscale Perturbations. *DPRI Annual Meeting 2020, Kyoto University*, Japan, 20-21 February 2020 (Oral)

13. **G. Duan**, T. Takemi, K. Ngan. Sensitivity of Turbulent Flow and Dispersion Around a 3-D Regular Building Array to Urban Boundary-Layer Stability. *Boundary Layer Processes and Turbulence - American Geophysical Union (AGU) Fall Meeting (AGU2019),* San Francisco, CA, USA, 09-13 December 2019 (poster)

14. **G. Duan**, K. Ngan. Turbulent Flow and Ventilation Around a 3D Regular Building Array for Different Surface Boundary-Layer Stability. *JFM Symposia: From Fundamentals to Applied Fluid Mechanics*, 5-6 November 2018, Southern University of Science and Technology, Shenzhen, China (poster)

15. **G. Duan**, K. Ngan, J. G. Jackson. Mixing of a Passive Scalar in an Urban Street Canyon. *JFM Symposia: From Fundamentals to Applied Fluid Mechanics*, 5-6 November 2018, Southern University of Science and Technology, Shenzhen, China (poster)

16. **G. Duan**, K. Ngan. Sensitivity of Turbulent Flow Around a 3-D Regular Building Array to Boundary-Layer Stability. *Mini-Workshop on Urban Flow, Dispersion and Ventilation II*, 05 October 2018, The University of Hong Kong, Hong Kong SAR (Oral)

17. K. Ngan, **G. Duan**. Mixing and Ventilation in an Urban Street Canyon. *The 23rd Symposium on Boundary Layers & Turbulence/21st Conference on Air-Sea Interaction*, 11-15 June 2018, Oklahoma City, OK, USA

18. **G. Duan**, K. Ngan. Effects of Thermal Stability on the Flow and Ventilation over a Regular Building Array. *School of Energy and Environment Seminar*, 12 October 2017, City University of Hong Kong (Oral)

19. K. Ngan, **G. Duan**. Effects of Time Dependent Inflow Perturbations on Urban Flow. *EMS Annual Meeting: European Conference for Applied Meteorology and Climatology*, 4-8 September 2017, Dublin, Ireland

20. **G. Duan**, K. Ngan, K. W. Lo. On the Sensitivity of Urban Flow and Ventilation to Time-Dependent Inflow Perturbations. *13th Symposium on the Urban Environment, The American Meteorological Society's 97th Annual Meeting*, 22-26 January 2017, Seattle, Washington, USA (poster)

21. **G. Duan**, K. Ngan, J. G. Jackson. Mixing of a Passive Scalar in an Urban Street Canyon. *13th Symposium on the Urban Environment, The American Meteorological Society's 97th Annual Meeting*, 22-26 January 2017, Seattle, Washington, USA (*American Meteorological Society Excellent Poster Presentation Award*)

22. **G. Duan**, K. Ngan, K. W. Lo. On the Sensitivity of Urban Flow and Pollutant Dispersion to Time-Dependent Inflow Perturbations. *8th European Postgraduate Fluid Dynamics Conference*, 06-09 July 2016, Warsaw, Poland (Oral)

23. K. Ngan, K. W. Lo, **G. Duan**. Characterising Urban Pollutant Ventilation with the Tracer Age and Age Spectrum, *19th Joint Conference on the Applications of Air Pollution Meteorology with the A&WMA, 96th American Meteorological Society Annual Meeting*, 10-14 January 2016, New Orleans, LA, USA

24. **G. Duan**, K. W. Lo, K. Ngan, W.-K. Chiu. Towards Exposure-Based Health Impact Indicators: Application to Hong Kong. *CPCE Health Conference*, 11 January 2016, The Hong Kong Polytechnic University, Hong Kong SAR (Oral)

ACADEMIC MEMBERSHIP

Asia Oceania Geosciences Society (AOGS)	2021, 2022, 2024
Japan Geoscience Union (JpGU)	2020, 2024
American Geophysical Union (AGU)	2019
American Meteorological Society (AMS)	2016