



THE HONG KONG  
POLYTECHNIC UNIVERSITY  
香港理工大學



RILS 土地及空間研究院  
Research Institute for Land and Space

**The Hong Kong Polytechnic University  
Research Institute for Land and Space (RILS)  
RILS Public Lecture Series  
Reactive Organics and Secondary Air Pollution  
across a range of Geographical Settings in China**

**Date & time:** Wednesday 24 August 2022  
3:00pm – 4:00pm

**Speakers:** **Ir Prof. Hai GUO**  
*Department of Civil and Environmental Engineering  
The Hong Kong Polytechnic University*

**Dr Xiaopu LYU**  
*Department of Civil and Environmental Engineering  
The Hong Kong Polytechnic University*

**Location:** Online via Zoom

**Registration link:** [https://polyu.zoom.us/webinar/register/WN\\_dyXAsViORVKnClxy-bp1wg](https://polyu.zoom.us/webinar/register/WN_dyXAsViORVKnClxy-bp1wg)

All are welcome to attend.  
An e-certificate of participation will be sent to participants upon request.

**Contact us:** Ms Cathy KWOK (RILS Secretary)  
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**Co-organisers:**



Department of  
Building Environment and Energy Engineering  
建築環境及能源工程學系



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# RILS Public Lecture Series

## Reactive Organics and Secondary Air Pollution across a range of Geographical Settings in China



Ir Prof. Hai GUO

### Presentation Title

Characteristics and Sources of Volatile Organic Compounds (VOCs) and Their Impacts on O<sub>3</sub> Formation in China

### Abstract

Air pollution chemistry is closely related to land use. Urban core with densely interleaved residential, commercial and transportation lands hosts intensive air pollutants emission and reaction. In recent years, photochemical ozone (O<sub>3</sub>) pollution significantly intensifies in Chinese cities. To investigate the responsible in-situ chemistry, O<sub>3</sub> and its precursors and meteorological parameters were simultaneously measured in 10 megacities in China and at 10 sites in the Pearl River Delta region in summer 2018. Moderate wind speeds, strong solar radiation and high temperature were observed in all cities, indicating favorable meteorological conditions for local O<sub>3</sub> formation. The highest O<sub>3</sub> level was found in Beijing, followed by Lanzhou and Wuhan, while relatively lower O<sub>3</sub> value was recorded in Chengdu and Shanghai. Photochemical box model simulations revealed that net O<sub>3</sub> production rate in Lanzhou was the largest, followed by Beijing, Wuhan and Chengdu, while it was the lowest in Shanghai. Besides, the O<sub>3</sub> formation was mainly controlled by volatile organic compounds (VOCs) in most cities, but co-limited by VOCs and nitrogen oxides in Lanzhou. Moreover, the dominant VOC groups contributing to O<sub>3</sub> formation were oxygenated VOCs (OVOCs) in Beijing and Wuhan, alkenes in Lanzhou, and aromatics and OVOCs in Shanghai and Chengdu. Source apportionment analysis identified six sources of O<sub>3</sub> precursors in these cities, including liquefied petroleum gas usage, diesel exhaust, gasoline exhaust, industrial emissions, solvent usage, and biogenic emissions. Gasoline exhaust dominated the O<sub>3</sub> formation in Beijing, and LPG usage and industrial emissions made comparable contributions in Lanzhou, while LPG usage and solvent usage played a leading role in Wuhan and Chengdu, respectively. The findings are helpful to mitigate O<sub>3</sub> pollution in China.



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### **Biography of Ir Prof. Hai GUO**

Ir Professor Hai GUO completed his Ph.D. study in Air Quality in Australia and conducted his postdoctoral research in USA, Hong Kong and Australia. He is currently a full Professor in the Department of Civil and Environmental Engineering of the Hong Kong Polytechnic University, and an Adjunct Professor at Queensland University of Technology, Australia, and Wuhan University and Tongji University, China. Ir Prof. GUO's major research interests include atmospheric chemistry, ozone formation mechanisms, source apportionment, organic aerosols, acidic ultrafine particles and new particle formation. A unique theme of his research is understanding the formation of ozone and secondary organic aerosols in photochemical smog, which has adverse impacts on human health, air quality and climate change. One of his major foci is to provide new research methods to solve elusive scientific questions through the development and application of novel simulation models and analytical instruments, thereby promoting the forefront of observational and numerical capabilities. Ir Prof. GUO is an investigator of over 60 highly competitive external research projects including two RGC Collaborative Research Fund projects as PC, two Theme-based Research Scheme projects as Co-PI, and one National Key R&D program of China as PI, with grants over 70 million Hong Kong dollars (~9m US dollars). He has published over 170 papers in high-quality international journals with over 10,000 citations and a h-index of 53 (Google scholar) to date. He won the first prize of Guangdong Provincial Government Science and Technology Award in 2014, the second prize of Natural Science of the Ministry of Education Award in 2016, Gold Medal and Special Merit Award at the 71st International Trade Fair for Ideas, Inventions and New Products (iENA) in 2019, and other scientific and technological awards. He is an editor of *Aerosol and Air Quality Research* (IF: 4.530), an associate editor of *Science of the Total Environment* (IF: 10.753), and an editorial Board member of *Atmosphere (Air session)* (IF: 3.11), and *Atmospheric Environment* (IF: 5.755). He is an executive member of Australia-China Centre for Air Quality Science and Management, and the standing committee member of The Ozone Pollution Control Professional Committee of the Chinese Society of Environmental Sciences. He is also the core member of VOC Expert Group of World Meteorological Organization Global Atmosphere Watch, and the Founding member of Tropospheric Ozone Precursors (TOP) Focus Working Group, TOAR-II (Tropospheric Ozone Assessment Report-II).

# RILS Public Lecture Series

## Reactive Organics and Secondary Air Pollution across a range of Geographical Settings in China



**Dr Xiaopu LYU**

### **Presentation Title**

Reactive Organics and Secondary Air Pollution in Marginal Seas and Estuaries

### **Abstract**

Marginal seas and estuaries, connecting land and water areas, were thought to produce less air pollutants than urban cores. However, continental and marine air pollutants are interacted, and the meteorological conditions are ever-changing at these special geographical locations. In fact, marginal seas and estuaries are ideal places for atmospheric reactions. Reactive organics, spanning a wide range of volatilities and chemical structures, also present at considerable levels and fuel secondary air pollution, such as tropospheric ozone ( $O_3$ ) and secondary organic aerosol (SOA), in the concerned spaces. Through combined applications of field observation and modelling, we explored the  $O_3$  pollution in Pearl River Estuary (PRE) and deciphered the sources and formation mechanisms of organic aerosol (OA) at an urban background site adjoining South China Sea. We unraveled the coupled effects of atmospheric dynamics and chemistry on  $O_3$  pollution in PRE and elucidated the formation mechanisms of hydroxyl dicarboxylic acids, a significant OA constituent with climate effect. Overall, marginal seas and estuaries in proximity of cities are capable of amplifying secondary air pollution, and the effects should be taken into account in air quality and climate management.



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### **Biography of Dr Xiaopu LYU**

Dr LYU obtained his BSc in Environmental Engineering at Zhejiang University of Technology in 2012, MPhil at Wuhan University in 2014, and was awarded a PhD by The Hong Kong Polytechnic University (PolyU) in 2018. He has been appointed as a Research Assistant Professor at PolyU since Feb 2020. Dr LYU focuses his research on occurrence, transformation and fate of atmospheric reactive organics, in particular volatile organic compounds, organic aerosols, and ozone. He has published more than 60 journal papers (20 first/corresponding authorships) with a total citation of 1,871 and H-index of 22 (Google Scholar, lastly accessed on 19 Jul 2022), and coauthored two books. He has secured a RGC/GRF, a RGC/CRF (Co-PI), and a few internal grants. Dr LYU won the Outstanding Individual at Wuhan University in 2013, Champion of 2019 Environmental Paper Award issued by The Hong Kong Institution of Engineers, and Gold Medal & Special Merit Award at the 71st International Trade Fair for Ideas, Inventions & New Products (iENA) in 2019. He is a member of the Australia-China Centre for Air Quality Science and Management, Youth Editor in journal *The Innovation*, Editorial Board Member in journal *Frontiers in Sustainable Cities*, and reviewer for more than 10 international renowned journals.



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**Programme**

<b>Time</b>	<b>Title</b>
3:00pm – 3:05pm	<b>Welcome Address</b>  Ir Prof. Hai GUO <i>Department of Civil and Environmental Engineering</i> <i>The Hong Kong Polytechnic University</i>
3:05pm – 3:30pm	<b>Characteristics and Sources of Volatile Organic Compounds (VOCs) and Their Impacts on O<sub>3</sub> Formation in China</b>  Ir Prof. Hai GUO <i>Department of Civil and Environmental Engineering</i> <i>The Hong Kong Polytechnic University</i>
3:30pm – 3:55pm	<b>Reactive Organics and Secondary Air Pollution in Marginal Seas and Estuaries</b>  Dr Xiaopu LYU <i>Department of Civil and Environmental Engineering</i> <i>The Hong Kong Polytechnic University</i>
3:55pm	<b>Q &amp; A Session</b>