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LiDAR wind measurement and initial findings: A pilot Study in Hong Kong

日時：2023年2月10日（金）
13:30~15:30

場所：東京工芸大学 厚木キャンパス
915教室

ZOOM : <https://us06web.zoom.us/j/81412076217?pwd=RWo2T0xPMzISQVIBcUhOWEQxOG1MQT09>

Meeting ID:
814 1207 6217
Passcode :
S75yZB



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LiDAR wind measurement and initial findings: A pilot Study in Hong Kong

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Abstract:

Assessing urban ventilation plays an increasingly important role in supporting urban planning/design, especially for high-density cities suffering from weak wind conditions. The assessment of microscale urban ventilation requires vertical wind speed profiles as essential boundary conditions in both physical (i.e. boundary layer wind tunnel (BLWT)) and numerical (i.e. computational fluid dynamics (CFD)) models. However, reproducing vertical wind speed profiles is challenging, mainly due to the practical difficulties in observing upper-air wind conditions especially over urban terrain.

Focusing on wind LiDAR observation and data analysis, in Hong Kong the speaker and local researchers have conducted two studies. The first study aims to address the limitations of lack of validation, by evaluating the accuracy of wind profiles estimated by conventional methods and the sensitivity of CFD-based urban ventilation assessment results to the deviations of these wind profiles. Compared with the first study, in which CFD simulations are conducted in neutral thermal conditions (i.e. heat transfer is ignored), the second study aims to address the limitation of lack of consideration on extreme heat in summer, by including buoyancy effects in both the measurement and modelling work. The new and valuable understandings to improve urban ventilation assessment in high-density cities will be provided.

Dr. Chao REN's short bio

She specializes in applied climatology and climate design, who uses GIS, and spatial modelling methods and remote sensing techniques to study urban environmental performance and develop climate response design strategies and guidelines.

Chao serves as an Associate Editor for Urban Climate (2018-) and an Editorial Advisor for Cities & Health (2018-) and Advances in Climate Change Research (2020-), and is a member of urban expert team of the WMO. She has also been elected as a Board Member of the International Association for Urban Climate (2017-2021).

She has been involved in several international collaborative research reports, including the IPCC AR6 (Contributing Author of Chapter 6 Cities, Settlements and Key Infrastructure), Climate Change and Cities ARC3.3 (Lead Author of Chapter 2), and the China report of the Lancet Countdown on Health and Climate Change (Lead Author of WGII).