

RGC Reference HKU9/CRF/12G
<i>please insert ref. above</i>

**The Research Grants Council of Hong Kong  
Collaborative Research Fund Group Research Projects  
Completion Report**  
*(for completed projects only)*

**Part A: The Project and Investigator(s)**

**1. Project Title**

**Ventilation of a High-Rise Compact City**

**2. Investigator(s) and Academic Department/Units Involved** *(please highlight approved changes in the composition of the project team and quote the date when RGC granted approval of such changes)*

Research Team	Name/Post	Unit/Department/Institution	Average number of hours per week spent on this project in the current reporting period
Project Coordinator	Li Yuguo /Professor	Mechanical Engineering, HKU	10
Co-Principal investigator(s)	Nichol Janet E /Professor	Land Surveying and Geo-Informatics, PolyU	5
	Hunt Julian /DVSS Professor	Mechanical Engineering, HKU	2
Collaborators/ Others			

**3. Project Duration**

	Original	Revised	Date of RGC Approval <i>( must be quoted)</i>
Project Start Date	1 May 2013		3 March 2013
Project Completion Date	30 Apr 2016		3 March 2013
Duration <i>(in month)</i>	36		3 March 2013
Deadline for Submission of Completion Report	30 Apr 2017		

## **Part B: The Final Report**

### **5. Project Objectives**

#### 5.1 Objectives as per original application

- To gain a systematic understanding of ventilation mechanisms and driving forces in high-rise compact cities when the synoptic wind is strong or weak, such as penetration of wind and slope winds, buoyancy wall flows, and their complex interactions.
- To identify the major determinants of city ventilation and major urban morphological and major meteorological parameters (building height, lambda parameters, ventilation path, winds, sea-land breeze, etc.) that control the ventilation effectiveness.
- To compare and study the ventilation conditions in Hong Kong and Shenzhen to be able to provide guidelines for future city design.

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5.2 Revised objective

Date of approval from the RGC: 5 March 2013

Reasons for the change: The approved project budget was much below the requested budget. The revision also allows us to focus on the science parts (WP1 and WP2) as recommended by the CRF Panel.

- To gain a systematic understanding of ventilation mechanisms and driving forces in high-rise compact cities when the synoptic wind is strong or weak, such as penetration of wind and slope winds, buoyancy wall flows, and their complex interactions.
- To identify the major determinants of city ventilation and major urban morphological and major meteorological parameters (building height, lambda parameters, ventilation path, winds, sea-land breeze, etc.) that control the ventilation effectiveness.

## **6. Research Outcome**

### 6.1 Major findings and research outcome

*(maximum 1 page; please make reference to Part C where necessary)*

Hong Kong provides a unique world laboratory for studying city ventilation due to its concentration of very high buildings and complex geographical setting. Wind speed in the urban areas has reduced by -0.6 m/s per decade since 1968 and -0.35 m/s per decade since 1995.

First, our work has provided, for the first time a mechanistic explanation of how buoyancy-driven flows work in a city. We measured the wall flow with a very high Rayleigh number along a high-rise building exterior wall, and identified the plume nature of the flow. We found that the shape of a city area impact on the wind flow structure in the city dome, and our study of the dome merging process also suggested an interesting dome cluster merging hypothesis, which seems to explain well the observed phenomenon in the Jing-Jin-Ji (JJJ) region, i.e. the small cities experienced less hazy days in the 1990s while large cities experienced a continuous rise.

Second, we show that the phases of daily temperature cycles differ significantly between urban and surrounding rural areas, while those of annual cycles do not, i.e. the thermal noon delay phenomenon. In urban Hong Kong, the daily phase (thermal noon) has shifted 1.77 hours later over the last 130 years (1.36 hours per century), and similarly significant phase shifts have been observed in most large cities worldwide since the 1940s. We conclude that the distinction between urban and rural has a much stronger influence on the daily temperature cycle than on the annual temperature cycle. Compared with the rural cycle, the urban daily temperature cycle has a smaller amplitude and a larger and delayed phase shift. This is explained by the increase in effective daily thermal storage in cities due to human-made structures; the change in annual thermal storage is much smaller. Both the CMIP5 models and the Twentieth Century Reanalysis data do not capture the thermal noon delay phenomenon. Our findings provide new insights into ways of designing a city's thermal climate like a building.

Lastly, we developed a unique city scale computational fluid dynamics modelling approach which is able to predict wind flows at both local and meso-scale. The new modelling method is able to simulate the urban wind flows when there is inversion. There is a good potential to further develop our proposed approach. Our unique 3D data set of Kowloon buildings in 1945, 1964, 1995, 2005 and 2010 provided us with a unique possibility to studying the effects of morphological parameters on city winds. We also explored the effect of

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penetration of sea breeze, and its interaction with the urban plume, and the surrounding mountain of the Kowloon Peninsula, and its impact on its thermal and wind climate.

### 6.2 Potential for further development of the research and the proposed course of action

*(maximum half a page)*

We like to reiterate that Hong Kong not only provides a unique world laboratory for studying city ventilation, but its city evolution also provides an unique opportunity to study the ideal urban form for future cities in Asia, and future urban planning in Hong Kong. Our work on both wind and thermal environment analyses reveal the importance of urban morphology. The human-made structures including buildings, and street pavement have an important impact on the urban climate. The first two major findings in Section 6.1 leads to two possible major important areas for further studies.

First, our findings of the thermal noon delay phenomenon strongly reveal the potential in designing the urban thermal climate by optimizing urban morphology. Increasing the effective thermal storage of human-made structures not only delays the daily phase but flattens daily temperature variation, i.e. reduces amplitude, which is equivalent to the use of thermal storage in buildings. Further exploration in different local climate zones is needed. This may enable the urban climate to be designed like we design indoor climate in a building by using the basic urban physics principle. Cooling or heating a city by 0.5 or 1°C using such designs would lead to an energy saving of building HVAC energy consumption by more than 5%.

Second, our findings on the city shape effect on heat dome and the dome cluster merging hypothesis provided a rather convincing explanation of the local to regional transition of haze in North China Plain, though no similar data exist in the PRD area. To our knowledge, there has not been similar explanation or any other reasonable explanation on the formation of regional haze in Northern China. Further evidences may be sought by examining the haze development from 1980 to 2010 in the JJJ area with detailed annual urban expansion and 3D morphology data as what we have done for Kowloon. In this project, we developed appropriate lab modelling method using water tank and/or water channel, and city scale CFD modelling, with additional field measurement methods such as Lidar wind profiler, which will enable us to further develop our theory.

These two areas are expected to enable us to design a city climate in future as we design a building today. The PI plans to apply for either extension of the present CRF project or a new TRS project. Numerous discussions with leading research institutes and urban planning experts in Hong Kong, China and elsewhere in Asia have been done, or on its way. New research proposals have already been submitted to RGC (GRF), NSFC and ECF.

### 6.3 Research collaboration achieved *(please give details on the achievement and its relevant impact)*

This CRF project has enabled us to explore the important urban phenomena such as the thermal noon delay and city dome merging, to explore new research potential for tackling the future urban planning both locally and elsewhere, and to recognize the differences between the high-rise dominated cities in Asia and low-rise dominated cities in the US and Europe. The high-rise city design offered not only environmental challenges, but also an opportunity for city climate design while low-rise cities appear not presenting such an opportunity.

This CRF project not only strengthens the existing collaboration among the project team (between HKU engineering and PolyU urban geography, and Prof Lord Julian Hunt), but also extends to other local and international research institutes in urban climate, city environment, urban geography, urban planning and architecture, including Sun Yat Sen University (Dr Hang Jian), Institute of Atmospheric Environment of Chinese Science Academy (Dr Wang Xiquan and Yang Shuai), Tsinghua University (Prof Yin Zhi and Prof Lin Borong), Dalian University of Technology (Prof Zhang Tengfei), Wuhan University (Prof Zhao Fuyun), University of Notre Dame, MIT Smart, University of Bologna, Cambridge University, Chinese University of Hong Kong, City University of Hong Kong, Tongji University etc. These collaboration opportunities and

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interaction will help us to continue this research direction, and hopefully making an impact to the future city design in Hong Kong, China and elsewhere in Asia.

### **7. The Layman's Summary**

*(describe in layman's language the nature, significance and value of the research project, in no more than 200 words)*

The city of Hong Kong provides a unique laboratory for studying city ventilation due to its concentration of very high buildings and complex geographical setting. Wind speed in Kowloon has reduced by -0.6 m/s per decade since 1968 and -0.35 m/s per decade since 1995. This has led to this multi-disciplinary study of physics of wind in a high-rise compact city considering both wind dynamics and urban geography. We find that in urban Hong Kong, the daily phase (thermal noon) has shifted 1.77 hours later over the last 130 years (1.36 hours per century), and similarly significant phase shifts have been observed in most large cities worldwide since the 1940s. We find that a dome cluster merging hypothesis provided a rather convincing explanation of the local to regional transition of haze in North China plain, though no similar data exist in the PRD area. Our findings of the thermal noon delay phenomenon and the dome merging phenomenon suggests the importance of human-made urban structure, i.e. what we built such as building walls, street pavement and bridges all impact on the urban winds and thermal climate. Further studies will enable the urban climate to be designed like a building.

**Part C: Research Output**

**8. Peer-reviewed journal publication(s) arising directly from this research project**

*(Please attach a copy of the publication and/or the letter of acceptance if not yet submitted in the previous progress report(s). All listed publications must acknowledge RGC's funding support by quoting the specific grant reference.)*

The Latest Status of Publications				Author(s) <i>(denote the corresponding author with an asterisk*)</i>	Title and Journal/Book <i>(with the volume, pages and other necessary publishing details specified)</i>	Submitted to RGC <i>(indicate the year ending of the relevant progress report)</i>	Attached to this report <i>(Yes or No)</i>	Acknowledged the support of RGC <i>(Yes or No)</i>	Accessible from the institutional repository <i>(Yes or No)</i>
Year of publication	Year of Acceptance <i>(For paper accepted but not yet published)</i>	Under Review	Under Preparation <i>(optional)</i>						
2015				Wang S and Li Y	Building and Environment, 89(0), 279-294	2017	Yes	Yes	Yes
2015				Yang X and Li Y	Building and Environment, 90: 146-156	2017	Yes	Yes	Yes
2015				Wong MS, Yang JX, Nichol JE, Weng Q, Menenti M, Chan PW	IEEE Geoscience and Remote Sensing Letters	2017	Yes	Yes	Yes
2015				Yang JX, Wong MS, Menenti M, Nichol JE	ISPRS Journal of Photogrammetry and Remote Sensing	2017	Yes	Yes	Yes
2015				Yang JX, Wong M S., Menenti M, Nichol JE	ISPRS Journal of Photogrammetry and Remote Sensing	2017	Yes	Yes	Yes
2016				Peng L, Nielsen PV, Wang X, Sadrizadeh S, Liu L and Li Y	Building and Environment, 99, 130–141	2017	Yes	Yes	Yes
2016				Wang X and Li Y	Building and Environment, 99, 82–97	2017	Yes	Yes	Yes

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2016				Zhang ZY, Wong MS, Nichol JE	International Journal of Climatology, 36(13), 4358-4372	2017	Yes	Yes	Yes
2016				Fan Y, Li Y, Hang J, Wang K and Yang X	Building and Environment, 107, 215-225	2017	Yes	Yes	Yes
2016				Fan Y, Li Y, Wang X and Catalano F	Journal of Applied Meteorology and Climatology, DOI: <a href="http://dx.doi.org/10.1175/JAMC-D-16-0099.1">http://dx.doi.org/10.1175/JAMC-D-16-0099.1</a>	2017	Yes	Yes	Yes
2017				Fan Y, Li Y, Hunt JCR.	Journal of Environmental Sciences. DOI: 10.1016/j.jes.2017.01.009	2017	Yes	Yes	Yes
2017				Yang X, Li Y, Luo Z and Chan PW (2016).	International Journal of Climatology. 37(2), 890-904	2017	Yes	Yes	Yes
2017				Wang X, Li Y and Hang J	Building Simulation, 10, 1, 97-109	2017	Yes	Yes	Yes
2017	2017			Wang Y, Di Sabatino S, Martilli A, Li Y, Wong MS, Gutierrez E and Chan PW.	Journal of Geophysical Research Atmosphere DOI: 10.1002/2017JD026702	2017	Yes	Yes	Yes



**9. Recognized international conference(s) in which paper(s) related to this research project was/were delivered** (Please attach a copy of each conference abstract)

Month /Year/ Place	Title	Conference Name	Submitted to RGC (indicate the year ending of the relevant progress report)	Attached to this report (Yes or No)	Acknowledged the support of RGC (Yes or No)	Accessible from the institutional repository (Yes or No)
2013	Wang X, Li Y, Chan P W, Yang X and Nicho J (2013) 24 hour vehicle traverse study of air temperature profiles in a high-rise compact city.	UEP 2013: Urban Environmental Pollution 2013 Asian Edition, Beijing, 17-20 November 2013. In Conference Proceedings.	2017	Yes	Yes	No
2013	Wang K, Li Y, et al. Daily Cycle of air temperature and surface temperature in stone forest	<a href="#">2013 AGU Fall Meeting Abstracts</a> . Dec 9-13, 2013, USA	2017	Yes	Yes	No
2014	Lin M, Wong DC, Li Y, Hang J. The influence of viaduct and ground heating on pollutant dispersion within street canyons and from outdoor to indoor: gaseous pollutant and particle simulations.	Proceedings of the 14th International Conference on Indoor Air Quality and Climate, July 7-12, 2014, Hong Kong, Editors Yuguo Li and Xinyan Yang, vol V, page 580-587.	2017	Yes	Yes	No
2014	Nichol JE, Wong MS, Guo J. Visualisation of helicopter-borne thermal imagery in a 3-D urban environment.	RSPSoc Annual Conference 2014, Aberystwyth, U.K., Sep 2- 5, 2014 (proceedings).	2017	Yes	Yes	No
2014	Wang K, Li Y, Li YH, Yuan M, Wang X Impact of urban building morphology on air temperature: a case study in the stone forest.	In: Proceedings of the 13th International Conference on Indoor Air Quality and Climate, Hong Kong, 7-12 July 2014, v. 6, p. 273-275.	2017	Yes	Yes	No
2014	Wang S & Li Y. Local wind and thermal environment measurement using three spheres.	In: Proceedings of the 13th International Conference on Indoor Air Quality and Climate. Hong Kong SAR, China.	2017	Yes	Yes	No
2014	Wang X and Li Y Understanding and modelling urban-breeze circulation by up-scaling CFD.	In: Proceedings of the 13th International Conference on Indoor Air Quality and Climate, Hong Kong, 7-12 July 2014, v. 6, p. 276-278.	2017	Yes	Yes	No

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2014	Wang Y, Li Y, Chan PW. Urban moisture balance in Hong Kong.	In Proceedings of the 14th International Conference on Indoor Air Quality and Climate, July 7-12, 2014, Hong Kong, Editors Yuguo Li and Xinyan Yang, vol VI, page 279-281.	2017	Yes	Yes	No
2014	Wong MS, Peng F, Nichol JE. Spatial Characteristics of Urban Heat Island Inequities in Hong Kong	the Third International Workshop on Earth Observation and Remote Sensing Applications (EORSA 2014), Changsha, China, June 11-14, 2014 (proceedings)	2017	Yes	Yes	No
2014	Yin S, Lam K, Sandberg M, Li Y. The spacing effect on the pure plumes rising from high-rise compact building layouts.	Proceedings of the 2014 Conference on Indoor Environmental Quality and Health in Taiwan, Mainland China, Hong Kong and East Asia, Taipei, Taiwan.	2017	Yes	Yes	No
2014	Yin S, Lam K, Sandberg M, Li Y. Wind effect on plume rising from a high-rise compact building cluster.	Proceedings of the 2nd General Meeting of the Hong Kong Wind Engineering Society, Hong Kong.	2017	Yes	Yes	No
2014	Yin S, Li Y. The rising of urban buoyant plumes from high-rise compact buildings in the turbulent cross-flows.	. In Proceedings of the 14th International Conference on Indoor Air Quality and Climate, July 7-12, 2014, Hong Kong, Editors Yuguo Li and Xinyan Yang, vol VI, page 292-294.	2017	Yes	Yes	No
2014	Yin S, Sandberg M, Li Y. Water tank investigation of single and multiple buoyant plumes from squared blocks in calm environment.	In Proceedings of the 14th International Conference on Indoor Air Quality and Climate, July 7-12, 2014, Hong Kong, Editors Yuguo Li and Xinyan Yang, vol VI, page 295-297.	2017	Yes	Yes	No
2015	Choi SYN, Wong MS, Nichol JE. The evaluation of urban heat islands and impervious surface area in the Pearl River Delta Region using multi-sensor remote sensing data	The 3rd GlobTemperature User Consultation Meeting, University of Reading, U.K., June 11-12 2015.	2017	Yes	Yes	No
2015	Fan Y, Li Y, Hang J and Wang K. Diurnal change of wall flows and energy balance on the south facing wall when background wind is absent.	The 10th Pacific Symposium on Flow Visualization and Image Processing. Naples, Italy.	2017	Yes	Yes	No
2015	Fan Y, Li Y, Hang J and Wang K. Estimate the flow rate caused by high-rise building walls natural convection in urban canopy layer.	8th International Symposium on Turbulence, Heat and Mass Transfer. Sarajevo, Bosnia and Herzegovina.	2017	Yes	Yes	No
2015	Fan Y, Li Y, Hang J and Wang K. Non-symmetrical plumes generated by a single high-rise building.	The 9th International Symposium on Heating, Ventilation, and Air Conditioning and The 3rd International Conference on Building Energy and Environment. Tianjin, China.	2017	Yes	Yes	No

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2015	Fan Y, Li Y, Hang J and Wang K. Significant wall flows along a high-rise building at no wind condition.	Hong Kong Wind Engineering Society 2nd Workshop. Hong Kong.	2017	Yes	Yes	No
2015	Wang X and Li Y. The urban heat island circulation with idealized building clusters by up-scaling CFD model: from buildings scale to city scale	In: The Proceedings of 9th International Conference on Urban Climate, Toulouse France, 20-24 July 2015.	2017	Yes	Yes	No
2015	Wang K, Li Y, et al. The stone forest as a small scale field model for urban climate studies.	In 9th International Conference on Urban Climate jointly with 12th Symposium on the Urban Environment. July 20-24, 2015, France	2017	Yes	Yes	No
2015	Wang S. A low-cost back-calculation method for massive on-site diurnal microclimate observation	In: Proceedings of the 95th American Meteorological Society Annual Meeting (AMS95). Phoenix, USA.	2017	Yes	Yes	No
2015	Wang S & Li Y. A wavelet-based method for diurnal urban climate observation using globe thermometers.	In: the 9th International conference on Urban Climate (ICUC9). Toulouse, France.	2017	Yes	Yes	No
2015	Wang S & Li Y. Experimental study on the suitability of acrylic and copper globe thermometer for diurnal outdoor use.	In: the 9th International conference on Urban Climate (ICUC9). Toulouse, France.	2017	Yes	Yes	No
2015	Yang JX, Wong MS, Menenti M, Nichol JE. Modeling the effective spectral emissivity of a complex 3D urban landscape for improved retrieval of the radiometric surface temperature: a case study on Hong Kong	The 3rd GlobTemperature User Consultation Meeting, University of Reading, U.K., June 11-12 2015.	2017	Yes	Yes	No
2015	Yang X and Li Y Impact of urban morphology on average urban albedo.	In: Proceedings of the 9th International Conference on Urban Climate, Toulouse, France.	2017	Yes	Yes	No
2015	Yang X, Wang X and Li Y. Effect of urban morphology on the urban air temperature - traverse study.	In: Proceedings of the 9th International Conference on Urban Climate, Toulouse, France.	2017	Yes	Yes	No
2015	Yin S, Lam K, Sandberg M and Li Y. The near field temporal flow dynamics in triple buoyant plumes.	Proceedings of 3rd International Conference on Building Energy and Environment, Tianjin, China	2017	Yes	Yes	No
2015	Yin S, Lam K, Sandberg M, and Li Y. The near-field flow structure in triple buoyant plumes.	Proceedings of the International Symposium Turbulence, Heat and Mass Transfer 8, Sarajevo, Bosnia and Herzegovina.	2017	Yes	Yes	No
2016	Wang K, Li Y. A field study in a stone forest as a small-scale field model for urban climate.	In International Conference on Geographies of Health and Living in Cities: Making Cities Healthy for All, June 21-24, 2016, Hong Kong.	2017	Yes	Yes	No

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2016	Fan Y, Hunt JCR, Li Y. Buoyancy and turbulence-driven atmospheric circulation over urban areas	Wu, J., Hunt, J.C.R. (Eds.), Ancst conference on climate change and urban environment, Beijing, China.	2017	Yes	Yes	No
2016	Fan Y, Hunt JCR, Li Y The structure of different scale turbulent plumes in urban-like stably stratified turbulent boundary layers.	IMA Conference on Turbulence, Waves and Mixing in Honour of Lord Julian Hunt's 75th Birthday, Cambridge, UK.	2017	Yes	Yes	No
2016	Fan Y, Hunt JCR, Yin S, Li Y. Different scales of eddy structures and their roles on the pollutant dispersion in and over the urban canopy layer.	15th CMAS conference, Chapel Hill, NC, USA.	2017	Yes	Yes	No

**10. Student(s) trained** (please attach a copy of the title page of the thesis)

Name	Degree registered for	Date of registration	Date of thesis submission/ graduation
Wang, Xiaoxue	PhD	01/09/2010	03/2015 (graduated)
Wang, Shang	PhD	01/09/2010	11/2015 (graduated)
Yin, Shi	PhD	01/09/2012	09/2016 (graduated)
Wang, Kai	PhD	01/09/2012	12/2017(graduated)
Fan, Yifan	PhD	01/09/2013	08/2017 (expected submission)

**11. Other impact** (*e.g. award of patents or prizes, collaboration with other research institutions, technology transfer, etc.*)**Collaboration with other research institutions**

- In Task 2.2, we established close collaboration with Sun Yat Sen University, School of Environment.
- Visits or mutual visits were established with University of Reading, Nanjing University School of Atmospheric Sciences, Chinese Academy of Sciences Institute of Atmospheric Sciences, University of Notre Dame (Professor Joe Fernando), National Center for Atmospheric Research (US), Department of the Geophysical Sciences, University of Chicago, School of Architecture, Tsinghua University etc. Strong interests have been received from leading urban planning institutes in Beijing, Shanghai and Guangzhou.
- Yifan Fan is invited to attend a fluid mechanics symposium at Cambridge University.
- Yifan Fan spent 6 months in Duke University in 2016-2017.
- Head of Hedley Center Prof Stephen Belcher, one advisor of this project became the William Mong Distinguished Speaker at HKU Engineering.
- Yuguo Li visited Tsinghua University and Dalian University of Technology in December 2016 for collaboration.
- Yuguo Li visited Chinese Science Academy Institute of Atmospheric Science and Nanjing University for collaboration in urban climate over the last 3 years.
- Good exchange between HKU and MIT Smart (Singapore) with planned joint research activities.
- Yuguo Li joined a new CRF proposal on urban wind studies led by Prof Edward Ng at CUHK in Jan 2017.

**Knowledge exchange**

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- The PC hosted a major conference Indoor Air 2014 July 2014 at the University of Hong Kong. More than 1000 participants from 45 countries attended. A major programme on urban climate was organized with two plenary speakers (Professor Edward Ng and Professor Julian Hunt (Co-PI)). The project team also had a special technical session on outdoor environment.
- Janet Nichol was invited to mount a 6-month-long exhibition at Hong Kong Science Museum, which opened on 27th June 2014 on “Monitoring Hong Kong’s Urban Heat Island”. This topic was selected as first choice by public voting, and contains posters and videos on the relationship between urban heating, city ventilation and buoyancy flow in urban canyons, resulting from the collaborative work between HKU and PolyU.
- Yuguo Li gave an invited lecture on “city winds at calm conditions” at the 3rd Hong Kong Wind Engineering Society Workshop, on 15-16 December 2016.
- Yuguo Li gave a talk on “thermal environment in Hong Kong – a cool island and delaying thermal noon” at Climathon Conference: Extreme Heat, Extreme Density - Problems and Solutions, HKUST, Oct 29 2016.
- Yuguo Li gave a talk on the CRF studies in the HKO research forums in 2016 and also in 2017.
- We organized a one-day Hong Kong Workshop on urban winds and thermal environment on 16 Feb 2016 with participants from the local research community.

### **Awards of the project team**

- Yin Shi received the best paper award (third prize), the 2014 Conference on Indoor Environmental Quality and Health in Taiwan, Mainland China, Hong Kong and East Asia.
- Yuguo Li received the John Rydberg Gold Medal from SCANVAC, 2014
- Wang Shang received the best poster award in the 9th International Conference on Urban Climate, Toulouse, France
- Yuguo Li received the HKU outstanding researcher award in 2015
- Yuguo Li received the honorary doctor degree from Aalborg University, Denmark in 2015
- Yuguo Li received the Inoue Memorial Award, SHASE, The Society of Heating, Air-Conditioning and Sanitary Engineers of Japan in 2016.
- Charles Wong received Early Career Award, Research Grants Council in 2014
- Yuguo Li became a new member of BOD in the Chinese Society of Environment Science, December 2016.

### **Public lecturer**

- Charles Wong was invited to deliver a public lecture in InnoCarnival at Hong Kong Science Park, 2014 on “Urban Heat Island in Hong Kong”
- Charles Wong was invited to deliver a public lecture in Hong Kong Science Museum, 2014 on “Urban Heat Island in Hong Kong”
- Charles Wong and Yuguo Li were invited to deliver a talk at DEVB GLTMS R&D knowledge-sharing session "Augmenting Liveability in Hong Kong", Development Bureau, HKSAR Government

### **Plenary lecturers**

- Yuguo Li delivered a plenary talk on “city ventilation” at Roomvent 2014, Sao Paulo, Brazil.
- Yuguo Li delivered a plenary talk on “Towards design of city climate and environment” in the 9<sup>th</sup> Symposium of Built Environment PhD supervisors, 24-25 August, 2014.
- Yuguo Li delivered a plenary talk, “Wind in cities and its roles in urban warming and air pollution”, the 7th International Conference on Fluid Mechanics, 24-27 May, 2015, Qingdao, China
- Yuguo Li delivered a plenary talk, “Fluid dynamics problems in building physics”, The 6th Conference of the International Association of Building Physics, 15-18 June, 2015, Torino, Italy
- Yuguo Li delivered a plenary talk. “Wind in cities and its roles in urban warming and air pollution”. The 9th National Symposium on New Advances in Refrigeration and Air-conditioning, 3-6 August, 2016, Luoyang, China.

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- Yuguo Li has been invited to a plenary talk on city ventilation in the 7th Conference of the International Association of Building Physics, September 23-26, 2018, Syracuse, USA.

Project Coordinator

Contact Information:

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