Urban Climate News

Quarterly Newsletter of the IAUC

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From the IAUC President

Welcome to the June 2018 edition of the *Urban Climate News*.

The IAUC is pleased to announce that we have adopted a new diversity statement. It reads: *"The International Association for Urban Climate (IAUC) is committed to, and promotes inclusive and equitable participation of a diverse community in its membership and activities including publications, meetings, conferences, awards and honors."* IAUC's membership database shows that just over half of our members are female, but this representation does not extend through all of IAUC's activities. This initiative should help guide both IAUC and future ICUCs as they seek to identify Board Members, invited speakers, panelists and award winners.

In support of this initiative, a web resource https://500womenscientists.org/ has been identified that we believe will provide a useful tool for IAUC to help address diversity in identifying invited speakers. The **Request a Woman Scientist** platform connects to that organization's network of vetted women in science. It provides a searchable database to help identify relevant women scientists for scientific collaboration, when consulting for a news story, identifying keynote speakers or panelists, or for serving as a subject matter expert. I encourage our female members to sign up with this site. The site allows researchers to choose up to three disciplines and to add 'urban' to the keywords; this broadens the range of subdisciplines that can be represented within the tool.

To help celebrate and raise awareness of this statement, IAUC will be hosting a **Diversity and Equality on Urban Climate** event at ICUC-10 Monday Aug 6 from 5:30-7:00pm. This open event will include a presentation on the importance of the topic and the background for the new Diversity statement, an overview of the 500 Women Scientists web resource and an open discussion on what the IAUC community can do to enhance equality within the community.

And speaking of **ICUC-10**, the organizers now report that nearly 500 registrations have been received for the conference. The conference program is available on the web and a more detailed report is available on p 36. At its meeting just prior to ICUC-10, the Board expects to hear proposals from four groups representing Beijing, Hong Kong, Sao Paulo and Sydney on hosting **ICUC-11**. As in past years, we will be sharing summary information on the proposals and conducting an online preference survey of all IAUC members as part of the selection process. For further details, see the report on the ICUC-11 selection process on p 37.

Finally, the Board meeting at ICUC-10 will mark the changeover to a new IAUC Executive. We welcome **Nigel Tapper** (Monash University) who will become President and **Andreas Christen** (Universität Freiburg) who takes on the position of IAUC Secretary. Congratulations to Nigel and Andreas and I know they will do a great job. Thanks to **Emmanuel Rohinton** and **David Sailor** in their roles for helping with the election process.

Inside the June issue...

This edition of the *Urban Climate News* therefore marks the last column from me as President. I'd like to take this opportunity to thank the Board for their contributions and support and in particular I would like to acknowledge: **David Sailor**, who as Secretary has kept us on track with all of our Board business, elections, the ICUC conference proposals and generally providing sage advice; **Alexander Baklanov** for his efforts at building relations between IAUC and WMO that have culminated in a formal letter of agreement between the two organizations, his work behind the scenes to help secure funding for scientists from less developed nations to attend ICUCs, and providing an opportunity for IAUC to be represented at global events such as Habitat III and CitiesIPCC; **Gerald Mills**, who as Past-President has provided me with much useful input and advice on IAUC matters; **David Pearlmutter**, for his outstanding work on the *Urban Climate News*, which is one of the most-often mentioned elements of IAUC that our members find valuable; to **Nigel Tapper** who has led the awards committee, and to the ICUC-9 and ICUC-10 teams led by **Valéry Masson** and **Jorge Gonzalez** for their respective efforts at providing an excellent conference experience for our members. Finally – thanks to all of you – the IAUC members who help make the organization what it is. I'm proud of the organization and I feel honoured to have served as President. See you in New York in August!

– James Voogt,
IAUC President

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Six research priorities for cities and climate change

Xuemei Bai and colleagues call for long-term, cross-disciplinary studies to reduce carbon emissions and urban risks from global warming.

February 2018 — Cities must address climate change. More than half of the world's population is urban, and cities emit 75% of all carbon dioxide from energy use[1]. Meeting the target of the 2015 Paris climate agreement to keep warming well below 2°C above pre-industrial levels requires staying within a 'carbon budget' and emitting no more than around 800 gigatonnes of CO_2 in total after 2017. Yet bringing the rest of the world up to the same infrastructure level as developed countries (those listed as Annex 1 to the Kyoto Protocol) by 2050 could take up to 350 gigatonnes of the remaining global carbon budget[2]. Much of this growth will be in cities in the developing world (see 'Urban development challenge').

Cities are increasingly feeling the effects of extreme weather. Many are located on floodplains, in dry areas or on coasts. In 2017, more than 1,000 people died and 45 million people lost homes, livelihoods and services when severe floods hit southeast Asian cities, including Dhaka in Bangladesh and Mumbai in India. California's suburbs and Rio de Janeiro in Brazil have experienced floods and mudslides on the heels of drought, wildfires and heavy rains. Cape Town in South Africa has endured extreme drought since 2015. By 2030, millions of people and US$4 trillion of assets will be at risk from such events (see go.nature.com/2sbj4qh).

In response, the science of cities is evolving. Urban planners and decision-makers need evidence to help them manage risks and develop strategies for climate mitigation and adaptation. Scientists are increasingly thinking of cities as complex systems and working more closely with communities. New concepts are emerging, such as smart cities.

Yet the scope and applicability of urban research is stymied: a lack of long-term studies of urban climates and their impacts makes it hard for city officials to plan decades ahead. And research grants focused on single disciplines or local or national needs provide little scope for cross-disciplinary projects or comparative analyses between regions. Few online platforms exist to help cities share information and learn from one another.

Science needs to have a stronger role in urban policy and practice. In Edmonton, Canada, the Intergovernmental Panel on Climate Change (IPCC) and 9 global partners [brought] together some 700 researchers, policymakers and practitioners from 80 countries for the IPCC Cities and Climate Change Science Conference (https://citiesipcc.org). Participants establish[ed] a global research agenda that will inform the IPCC special report on cities — part of the panel's seventh assessment cycle, which begins in 2023.

The coastal city of San Juan in Puerto Rico was flooded after Hurricane Maria hit in September 2017. *Source:* https://www.nature.com

As members of the scientific steering committee for the IPCC conference, here we identify six priorities for cities and climate-change research.

Knowledge gaps

Mitigating and adapting to urban climate change will require work in several areas.

Expand observations — Researchers and city authorities need to extend the quantity and types of urban data collected. The biggest gaps are in the global south. Data on informal settlements are sparse or non-existent. As well as improving availability, the coverage, quality, resolution and reliability of data need to be enhanced, and reporting should be standardized. Methodologies for remote sensing with satellites, drones and autonomous vehicles need to be developed for monitoring dense urban fabrics.

Reliable inventories of greenhouse gases are needed – from individual dwellings, factories and roads – as well as methods for verifying them. Most policymakers and practitioners still rely on city-wide or national emissions data. It is crucial to track the origins and types of air pollution with climate effects – including methane, ozone, black carbon and aerosols – because reducing these is of benefit to public health as well as to climate mitigation.

To understand the wider impacts of flooding, it is crucial to map buried networks of pipes and cables as well as hidden spaces in buildings and below ground. Researchers also need to know how people interact with infrastructure and public spaces when an extreme weather event is forecast, for example.

Narratives and local knowledge must be assimilated with technical data. Old neighbourhoods in Kano, Nigeria, have proved more resilient to floods and heat than have developments built after 1980[3]. Flat mud roofs are better at absorbing and evaporating rainwater than are metal or concrete. And Nigerian cities have historically included many open spaces, green areas and wetlands.

A global network of 'urban observatories' – diverse cities that are focal points for research and long-term monitoring – is needed. Data, research and practice should be shared online. In the United Kingdom, Newcastle University collects 1 million measurements a day from sensors across the city and makes them openly available online in real time. These range from transport emissions, precipitation, water flows and air qualities to biodiversity measures such as beehive weight. The city council and the transport, energy, environmental and water sectors are using the data. Similar observatories are being developed in Sheffield and Bristol.

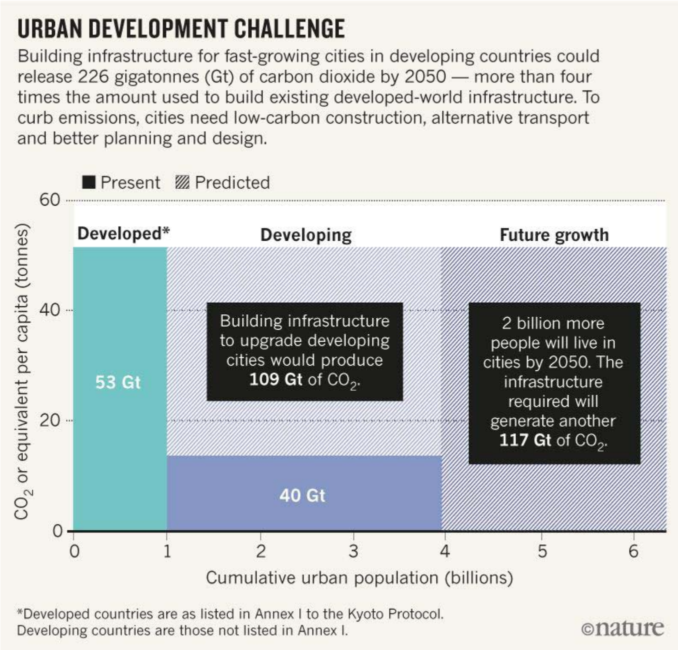
To ensure trust, such data need to be verifiable and used transparently. Researchers and practitioners need to develop mechanisms for governance, security, ethics and engagement. There are privacy and security concerns; for example, many cities are now legally required to protect private data. Some are reticent to publish information that might reveal they failed to meet targets.

Understand climate interactions — Climate processes are complex – more so in cities. For example, urban air pollution in Chinese cities is causing heavier rainfall as fine particles influence clouds[4]. Impermeable surfaces, such as concrete or asphalt, hold heat and reduce evaporative cooling, amplifying urban 'heat islands'[5].

Comparative studies are needed of cities in different contexts to disentangle these interactions and to find solutions. We need to know how urban morphologies, building materials and human activities affect atmospheric circulation, heat and light radiation, urban energy and water budgets. How much permeable paving is needed to lower flood risk, as Melbourne is doing with bluestone pavements? What is the impact of reflective roads and roofs, as tried in New York and Los Angeles?

Climate simulations need to account for urbanization, and be scaled down to city and neighbourhood levels. Methodologies for high-resolution risk assessment of heatwaves, coastal erosion and inundation are needed. Different approaches and models need to be compared, benchmarked and coupled with assessments of local social vulnerabilities and capabilities.

Study informal settlements — By 2050, three billion people, mostly in the global south, will be living in slums: neighbourhoods that have no mainstream governance, on land that is not zoned for development and in places that are exposed to climate-related hazards such as floods. Poor housing and basic services compound the risks for individuals and households.



Per capita data from Müeller et al. *Source:* https://www.nature.com

Enabling these communities to adapt is a priority. Assessments are needed of grass-roots efforts to address hazards. For example, community-based organizations are buying land outside flood zones and constructing resilient housing in the Philippines[6], and mapping flood risk in Gorakhpur, India. Such studies should look at formal and informal relationships and include voices from marginalized groups.

Models and analytical tools tailored to these communities need to be developed, because the approaches used in cities in the global north cannot be transplanted. Data scarcity, informal socio-economic processes and limited local capacities must be considered.

Policies need to be assessed. For example, the cities of Adama and Mekele in Ethiopia boosted affordable housing around their peripheries by increasing the area of land available for development. Keeping land tenure in government hands saves effort in the long run; large networks of infrastructure and public spaces can be planned and built coherently, without having to retrofit poorly designed areas. Informal settlements may have lessons for sustainability. Residents are often efficient at using scarce resources and reusing and recycling waste. Mitigation efforts need to support, rather than undermine, livelihoods and human well-being as well as the informal economy.

Harness disruptive technologies — The digital revolution is transforming cities. For example, urban shared-mobility schemes have improved air quality and social inclusion, and reduced congestion. In Lisbon, for instance, studies have shown that a fleet of shared taxis could maintain residents' mobility levels using only 3% of the current number of vehicles. Global adoption of shared, automated electric vehicles could cut world's vehicle stocks by one-third.

Yet these benefits could be reduced if the ease of using such technologies ultimately led to increased vehicle use. Researchers need to understand what drives positive and negative outcomes, as well as how to influence them – such as by enabling more shared travel through information and communication technologies.

Digitally connecting and controlling water, power, communications and transport systems increases the likelihood that climate hazards will affect such networks simultaneously. These coupled risks – and where responsibilities lie – are poorly understood[7]. Outages cascade and lead to shortages of food, cash and fuel, as happened in New York after Hurricane Sandy in 2012.

Affordable materials and technologies that can reduce the carbon intensity of future infrastructure in the global south should be developed and commercialized. For example, cement can be engineered to absorb more CO_2. Cement production is the third-largest human-made source of emissions after fossil-fuel burning and land-use change, contributing around 5.6% of global fossil-fuel and industry-related CO_2 emissions. 'Carbon-neutral' timber and bamboo have been used to build lightweight skyscrapers. These materials need to be sustainably produced at low cost. The C40's Climate Positive Development Program is experimenting in 18 cities to achieve net-negative emissions in mixed-development projects of up to 300,000 people.

Vegetation corridors, green parks, reed beds and low-lying areas that soak up water can be woven into the built environment to reduce flood and heat risks, while improving biodiversity and carbon storage. More needs to be known about the long-term performance and management of such features. Design and engineering standards need to be developed.

Support transformation — Bold strategies are needed for achieving low-carbon, resilient cities[8]. For example, China's 'sponge city' initiative helps to reduce urban flood risks by increasing green spaces, restoring wetlands and using permeable materials to absorb rainwater and delay runoff. More needs to be learned about how to change residents' lifestyles and consumption patterns, through policies and incentives, to make zero-carbon neighbourhoods and cities.

A start is to find and scale up successful local innovations. For example, Shanghai is experimenting with a range of low-carbon practices, including district heating networks, carbon labelling of consumer products and financial mechanisms[9]. Research and policy frameworks need to be developed to translate successful local innovations across cities.

Recognize global sustainability context — Cities are open, complex, dynamic systems with a global reach. Well-intended local actions can displace issues to other sectors or into the future. For example, one city's crackdown on energy-intensive production might shift the problem to less-regulated regions, with no net gain on emissions reduction. Many cities in China, South Korea and Vietnam have relocated industries outside the city to improve their environmental ratings.

A systems approach is needed to deliver on global climate change as well as the UN's New Urban Agenda and Sustainable Development Goals. More needs to be known about interactions, trade-offs and synergies between urban processes and their impacts elsewhere[10]. This entails working across disciplines and governance silos. 'Nexus approaches' that trace linkages between water, food and energy systems should be extended to other sectors, to understand the relationships between infrastructure provision, in–equality and resilience, for example.

Next steps

Researchers, policymakers, practitioners and other city stakeholders need to strengthen partnerships and produce knowledge together. Universities should support data platforms and long-term research programmes in their cities, while sharing knowledge nationally and internationally. Scientists should become more engaged with policy and practice networks such as C40 Cities, ICLEI Local Governments for Sustainability and United Cities and Local Governments.

We would like to see cities establish scientific advisory boards chaired by a chief science adviser, as many government departments do. These would enhance the profile of science, build capacity and leadership, and provide a point of contact.

Funding agencies need to provide grants for cross-disciplinary research and comparative studies, especially in the global south. Cities might mandate that companies bidding for large-scale government projects in renewable energy or sustainable transport, for example, contribute money for related university research, as is required in the Australian Capital Territory. Cities should develop business models and partnerships to accelerate successful experiments and scale up ideas and technologies.

Online platforms must go beyond data sharing to help researchers, policymakers, practitioners and citizens diagnose problems, generate solutions, trial and evaluate their effectiveness and embed learning. Future Earth's Urban Knowledge-Action Network shares this ambition, but requires stable financial and institutional support to support cities globally in the long term.

Research and innovation for mitigating urban climate change and adapting to it must be supported at a scale that is commensurate with the magnitude of the problem.

Original article: Bai X, Dawson RJ, Ürge-Vorsatz D, Delgado GC, Barau AS, Dhakal S, Dodman D, Leonardsen L, Masson-Delmotte V, Roberts DC & Schultz S. (2018) *Nature* 555:23-25. (https://www.nature.com/articles/d41586-018-02409-z)

The impact a year after the U.S. left the Paris agreement

Climate Mayors: Assessing the effectiveness of city leadership on the climate

May 2018 — Last June, during a press conference in the Rose Garden, President Trump announced the United States would be leaving the Paris climate accord, seeking a better deal for the country and more control over its own destiny.

It was a low point for environmentalists in the United States. As soon as Trump stepped to the podium, the country symbolically stepped away from its leadership role.

But almost instantaneously, other politicians filled the vacuum. Hundreds of city leaders pledged to live up to the Paris agreement and signed on as members of the Climate Mayors, a bipartisan, peer-to-peer network of mayors working to demonstrate leadership on climate change.

The coalition, which now boasts 405 members representing 70 million Americans, was one of the most visible in a growing list of coalitions and organizations seeking to demonstrate U.S. commitment to fighting climate change and lowering emissions. Along with We Are Still In (a group of corporations and civic leaders), C40 (an international group of mayors united to enact progressive climate policy), Ready for 100 (a Sierra Club campaign pushing renewable power), and others, the Climate Mayors pushed back against the narrative that the U.S. is abandoning its commitments, and embodied the grassroots energy for change.

But a year later, how should the organization's accomplishments by evaluated? The "come as you are" ethos to membership eschews additional strict commitments in favor of building a community.

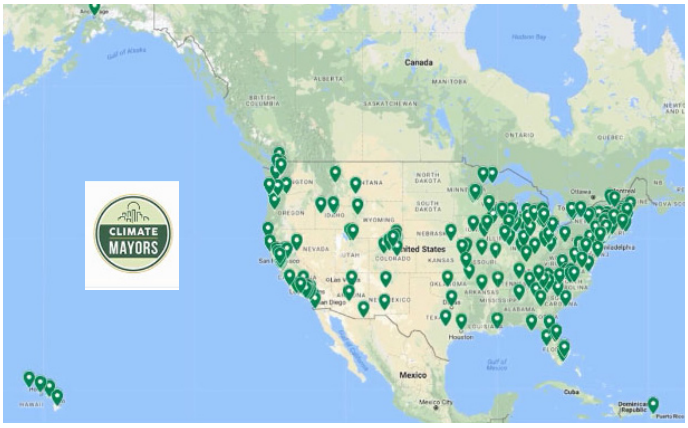
At a time when climate change, and the costs of increased temperatures and more extreme weather, are clear, does a group claiming to represent bipartisan action need to set the bar higher? Have they, for example, done enough to tackle carbon emissions from cars and transportation?

How city-led political coalitions can make an impact

According to a new study that examines the growth of city-led, issue-based coalitions, groups like Climate Mayors serve a very important purpose. At Boston University's Cities Initiative, executive director Katharine Lusk and research fellow Nicolas Gunkel recently co-authored a report, "Cities Joining Ranks," studying these groups. The report looked at 15 different organizations, 10 focused on environmental issues and one each pertaining to immigrant inclusion, gun violence, violence involving men and boys of color, volunteering, and broadband access.

In addition to filling a leadership vacuum at the federal level – one of the most frequent arguments for starting such groups – these coalitions also provide "strength in numbers," according to a survey of mayors conducted by Lusk and Gunkel.

"They view critical mass as being key to amplifying their voices to influence other levels of government," says Lusk. "In other words, they stand together to influence others and signal their priorities rather than gain support for a specific policy." Lauren Faber, the chief sustainability officer for Los Angeles, said putting together a group like the Climate Mayors was a goal for Los Angeles' own city leadership.



On March 9, the number of Climate Mayors members reached 400. *Source:* https://twitter.com/ClimateMayors

"Leading and growing a coalition has been a big part of LA's plan, and municipal support for strong climate action has been a goal for Mayor Eric Garcetti," she says. "I think he understands that, in forming such a group, it creates the right momentum around an issue, and an enhanced ability to act."

Meeting cities where they're at, and encouraging them to create, enact, and realize their own climate goals, offers a better chance for overall success, according to Faber, for both the coalition and the country at large.

"There are no emissions targets or climate action plans because that's a barrier to entry for this collective," she says. "This way, we're able to engage so many more cities that may lack some of the resources to do these things."

Meeting the climate challenges in the Trump era

Climate Mayors, also known as the Mayors National Climate Action Agenda, existed before President Trump pulled out of the Paris Climate Accord. It was formed in 2014 when Mayor Garcetti, then-Houston Mayor Annise Parker and then-Philadelphia Mayor Michael Nutter announced its creation during a United Nations climate summit in New York City. Much of the group's activities are coordinated out of Los Angeles, where the city's sustainability office organizes and directs meetings and information sharing between members.

While the group, and others such as C40, has existed for years, they "took on a new flavor," in the Trump era, says Faber. The expansion of these city climate coalitions coincides with a renewed focused by advocates and activists on local action.

After the 2016 election, the coalition reached out to the President-elect, writing a letter outlining the ways the group had worked with the previous administration, and asking to be a partner with the White House on fighting climate change.

But after withdrawal, it was important to take a stand.

Source: https://www.curbed.com/2018/5/30/17411024/paris-accord-climate-change-climate-mayors

India Delhi residents choke as dust blankets capital

June 2018 — Residents of India's capital Delhi are battling high pollution levels and extreme temperatures due to an unusual dust haze covering the city.

People have been complaining about breathing problems, with many saying the city has become unliveable.

The state government has responded by banning all construction and deploying the fire brigade to sprinkle water across the city. People have been advised to stay indoors as much as possible.

"In this case, dust has become a carrier of toxic pollutants. Pollution levels are 8-9 times higher than normal. And when we breathe, we are taking in toxic substances, which can have serious health repercussions," Anumita Roy Chowdhury, executive director of the Centre For Science and Environment, told BBC Hindi.

Delhi is already one of the most polluted cities in the world, but the recent weather pattern has caused more problems for its residents. Many have taken to social media to share their concerns and are urging the government to do something about it.

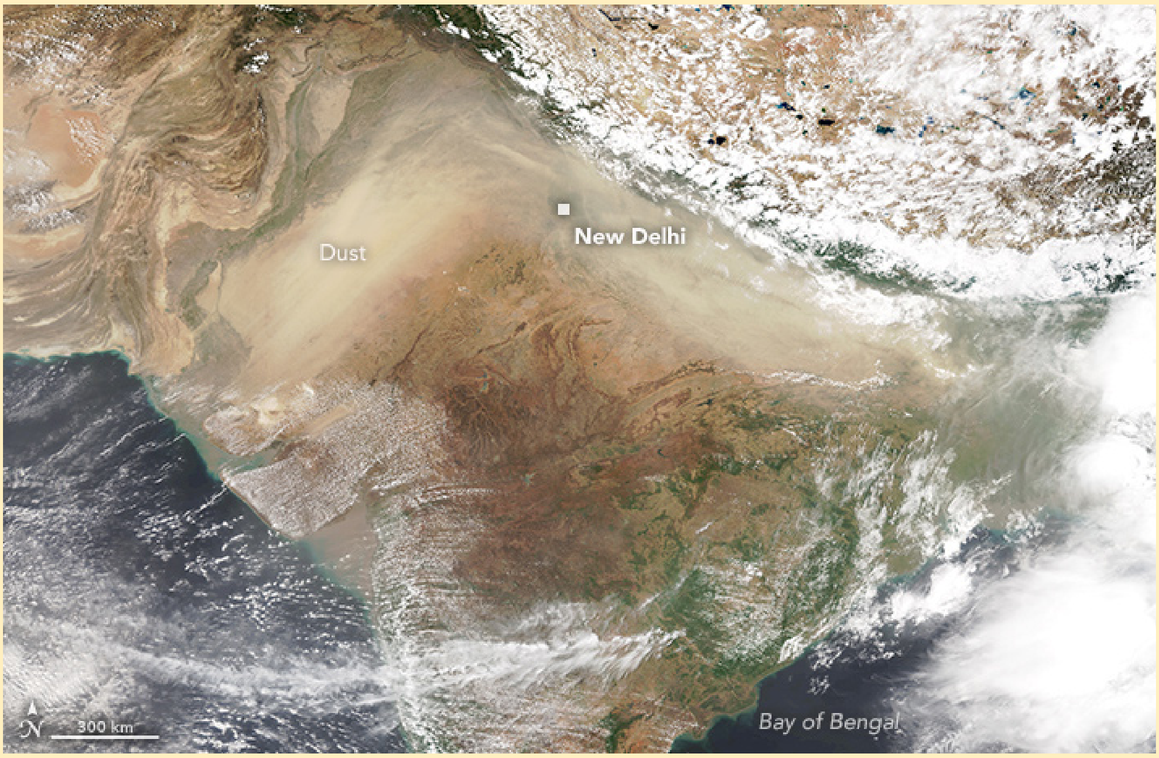
Experts say dust storms originating from the nearby desert state of Rajasthan are to blame. "This phenomenon is not uncommon in the pre-monsoon season," Dr Kuldeep Srivastava of the meteorological department told the BBC. "But this time the haze has stayed unusually longer because of the delay in the arrival of seasonal monsoon rains."

A thick blanket of dust has added to the woes of the city.
Source: www.bbc.com

The air quality worsens every year in November and December as farmers in the neighbouring states of Punjab and Haryana burn crop stubble to clear their fields.

Pollution levels reached 30 times the World Health Organization's safe limits in some areas of Delhi last year. The air quality improved in the following months, but has gone back to "severe" from "moderate" in June this year.

Source: https://www.bbc.com/news/world-asia-india-44480135



This image was acquired on June 14 by the Visible Infrared Imaging Radiometer Suite (VIIRS) on the Suomi NPP satellite. The dust was trapped between mountain ranges and appears in the shape of upside down "v" on the image.
Source: https://earthobservatory.nasa.gov/IOTD/view.php?id=92309

World Cup 2018 in Russia: What about the weather?

The 2018 FIFA World Cup is underway in Russia. But while the players compete for World Cup glory, there is one element that remains completely out of their control: the weather.

Held in 11 host cities across Russia, there are 1,550 miles between the two furthest FIFA 2018 destinations – Kaliningrad in the west, and Yekaterinburg in the east – meaning there could be great diversity of weather happening across the event.

And, while this time of year tends to be warm and on the drier side, rain, thunderstorms and sometimes even tornadoes can occur.

"Much like across the United States, there is the occasional frontal passage to bring cooling as well as some rain and thunderstorms on occasion," AccuWeather's Senior Meteorologist Jason Nicholls said.

"Strong to severe thunderstorms with downpours, hail and strong winds are not uncommon."

So, what kinds of temperatures can players and football fans expect?

Sources: Reuters / dailymail.co.uk

Volgograd

Set to be the warmest of all the host cities, Volgograd has an average June high of 26.6°C and an average July high of 29.3°C. Monthly rainfall is about 41mm in June and about 35mm in July.

Rostov-on-don

On average, Rostov-on-don sees highs of 26.6°C in June and an average July high of 29.2°C. Monthly rainfall is greater here with 70mm in June and 53mm in July.

Sochi

Football fans visiting Sochi can expect warm temperatures with an average June high of 24.6°C and an average July high of 27.4°C. However, they should also prepare for showers as it has the highest monthly rainfall with 104mm in June and 128mm in July.

Samara

Samara has an average June high of 25.3°C and an average July high of 26.9°C. Monthly rainfall is about 56mm in June and about 57mm in July.

Kazan

Kazan looks set to stay fine too with an average June high of 23.6°C and an July high of 25.5°C. On average the monthly rainfall in June reaches 63mm and 67mm in July.

Nizhny Novgorod

Nizhny Novgorod has an average high in June of 22.6°C and in July of 24.7°C, but it has previously seen record temperatures of 38.2°C. Monthly rainfall is slightly higher, at about 76mm in June and about 73mm in July.

Ekaterinburg

Ekaterinburg has an average June high of 23°C and an average July high of 24.4°C. Monthly rainfall is about 75mm in June and can reach up to 90mm in July.

Moscow

Moscow, which see World Cup matches play out at the Spartak Stadium and Luzhniki Stadium, has an average June high of 22°C and an average July high of 24.3°C. Monthly rainfall is about 80mm in June and 85mm in July.

Saransk

While still warm, Saransk is one of the cooler destinations with an average June high of 22.3°C and 23.9°C in July. Average monthly rainfall is 59mm in June and can reach up to 74mm in July.

Saint Petersburg

Saint Petersburg promises to stay warm with an average June high of 20°C and an July high of 23°C. However, there is a chance of rain with an average monthly rainfall of 71mm in June and 67mm in July.

Kaliningrad

Temperatures are similar in Kaliningrad too with an average high of 20.5°C in June and 23°C in July. Monthly rainfall is slightly higher here though with about 79mm in June and 77mm in July.

Source: https://www.independent.co.uk/life-style/world-cup-2018-russia-weather-june-england-football-matches-moscow-latest-a8382821.html

Micrometeorology of an ephemeral city: the Burning Man experiment

By Andrew Oliphant*[1], Garrett Bradford[2], Malori Redman[3], Ryan Thorp[4], Sam Stein[5], Lewis Ames[6]

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This article summarizes the recently published paper: Oliphant AJ, Stein S, Bradford G (2018) Micrometeorology of an ephemeral city, the Burning Man Experiment. *Urban Climate* 23:53-70. http://doi.org/10.1016/j.uclim.2017.03.001

Introduction

Urbanization impacts the climate system in multifaceted ways through alteration of airflow, and exchanges of radiation, heat, water and greenhouse gasses. Observations over a range of city types and sizes as well as the eco-regions they inhabit have revealed consistent micrometeorological impacts, such as increases in the Bowen ratio and heat storage flux, increases in surface roughness parameters, as well as increasing sources and decreasing sinks for CO_2. In synthesis, these studies also show large inter-city and intra-city variability, driven by differences in the size, density and configuration of cities and differences in their biophysical environment.

To this observational record, we wanted to add a unique urban environment, Black Rock City (BRC), Nevada, USA, an ephemeral city that rises from a dried lake bed (playa) for the week-long Burning Man Festival, a gathering of art and cultural sharing (http://burningman.org/). The city is unique in several ways that may contribute to our understanding of urban microclimates by comparison with results from more traditional cities. The first is that the site is arid, flat and devoid of vegetation for at least 5 km in every direction (Figs. 1 and 2). Thus the frictional properties of the surface are extremely small prior to the city and there are no sources or sinks of CO_2 from vegetation, no transpiration, and very little evaporation from the dry lakebed sediment. The second is that the city itself contains no concrete or paved surfaces ('urban' material in this context is primarily wooden structures, camping vehicles, tents, large shade structures and parked vehicles). Thirdly, transport within the city during the festival is almost entirely by bicycle or on foot, with large vehicle movements concentrated at either end of the festival during arrival and exodus of the population. Most importantly, the ephemeral nature of BRC provides the unusual opportunity to assess the micrometeorology of a city while it undertakes its full evolution from tiny settlement to dense city (~14,000 people/km^2) followed by rapid urban collapse and abandonment.

The experiment reported here was designed to capture the micrometeorological impacts of Black Rock City through its full evolution. In particular, we wanted to use this unique study site to target the following questions:

• How do surface frictional properties change as a function of urban density?

• How does BRC impact the surface energy balance? Does it produce an observable urban heat island?

• How can we isolate anthropogenic sources in measurements of the urban carbon cycle?

• What would be the effect on carbon emissions of restricting transport to walking and bicycling in neighborhoods?

• What can micrometeorology offer art?

In addition, the findings from this study may be more directly applicable to other temporary or informal settlements such as refugee camps, shanty towns or favelas due to similarities in building heights, density and ma-

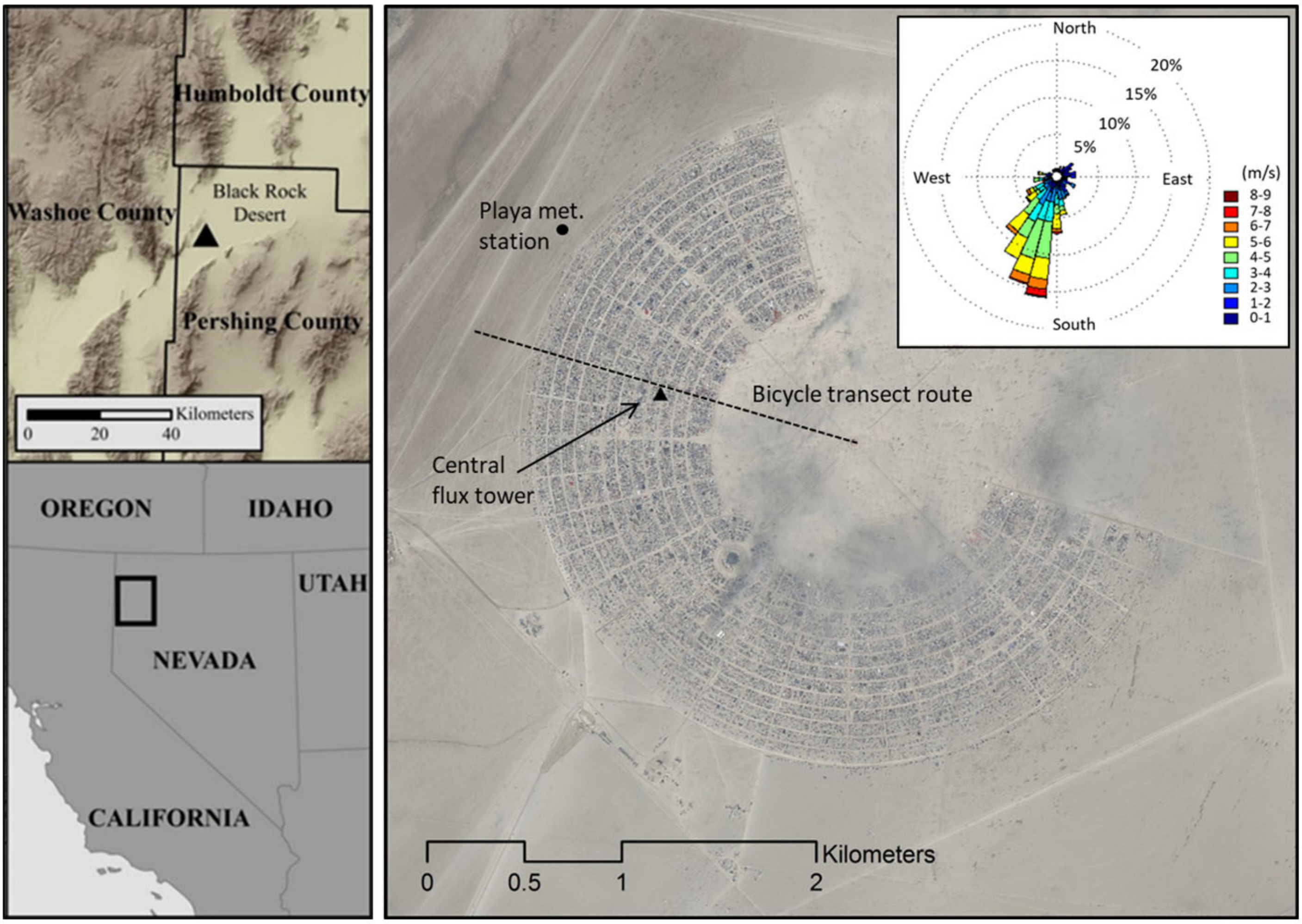

Figure 1. Site location maps (left) showing location of Black Rock Desert and Black Rock City, World-View 2 satellite image (right) of Black Rock City captured during the experiment in August 2013, with the location of the fixed measurement sites indicated as well as the bicycle temperature transect route (dashed line), and wind rose (inset) showing distributions of 30-minute winds captured from the central flux tower throughout the experimental period.

terials, lack of paving, limited vehicular transport, and in many cases, localized energy generation. According to the United Nations High Commission for Refugees, in summer 2013 (during this experiment), about half of the 34 million registered refugees and internally displaced people were housed in refugee camps, and according to the United Nations Habitat Program, a further 860 million lived in 'urban slums' globally.

The City and the Experiment

Deployment of instruments began a week prior to the start of the festival, when special projects that require substantial build time get permission to enter and set up. After the gates opened at the start of the festival, the population rapidly swelled to a peak of 70,000 within five days. The principal experimental infrastructure was a 27.5 m micro-meteorological tower, which was deployed on the playa in what was to become the center of a densely packed residential neighborhood of BRC one week later (Fig. 1 and Fig. 2). A second 2.5 m mast was installed over the bare playa surface on the outskirts of the city (with prevailing winds from the open playa) and a third bicycle-mounted 2.4 m mast was used to obtain cross sectional temperature profiles of the city (Fig. 1). The bicycle mast supported six levels of fine-wire thermocouples and a thermal infrared radiometer oriented toward the surface. The main tower contained a six-level profile of temperature, relative humidity and horizontal winds, with an eddy covariance system mounted at 12 m. This included a three-dimensional sonic anemometer (CSAT3), and a high frequency open path gas analyzer for CO_2 and H_2O concentrations (Li-7500). The tower system is fixed to and deployed from a mobile trailer unit which is part of the California State University Mobile Atmospheric Profiling System (CSU-MAPS), described more completely in Clements and Oliphant (2014). Full deployment details for the Burning Man Experiment are provided in Oliphant et al. (2017).

In order to provide a check on observed CO_2 fluxes and to help interpret likely sources, an inventory approach

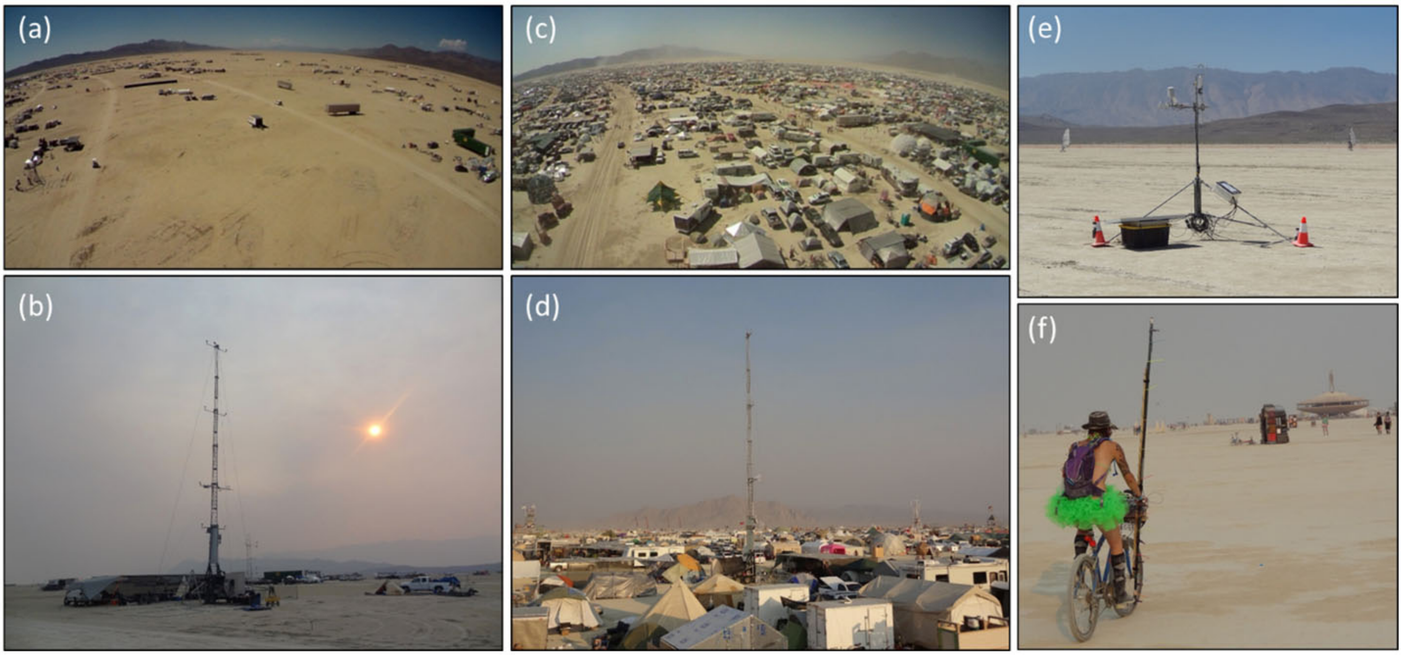

Figure 2. Images captured from the top of the flux tower facing south (a, c) and near ground level showing the tower area (b, d), prior to the start of the event (a, b) and during the peak (c, d), as well as the small playa met station (e) and the mobile temperature profiler (f) operated by Malori Redman in the central playa near the eastern extent of the transect with the Burning Man central art piece 'The Man' in the distance (see Fig. 1 for locations).

was used to independently estimate CO_2 emissions. This modeling strategy estimates CO_2 sources and sinks based on inventories of land surface type, census data, traffic counts, and other data unique to the site (Kellet et al., 2013). Assuming gross primary production and autotrophic respiration by vegetation was negligible, sources of CO_2 from the urban surface were therefore divided into three anthropogenic sources: metabolic, stationary, and mobile sources. The data used to make these estimates primarily came from the annual report of the Burning Man organization (Afterburn Report 2013) including a census report detailing population changes as well as transportation and energy consumption surveys of attendees.

The art of micrometeorology

An important part of the Burning Man culture is a sharing economy (interpreted widely), whereby each camp shares something unique freely to fellow citizens. 'Camps' vary widely in definition, containing from a few to a few hundred people. Our project, 'Camp Antenna', included about 40 people, with five researchers directly involved in urban micrometeorology, and the others involved in a variety of ways to share our project ideas and to blur the experiences of science and art. For example, 10 Hz three-dimensional wind velocity voltage analogue signals from the sonic anemometer were delivered to an Arduino microcontroller, which converted them to a digital signal for input to sound engineering software (MaxMSP). San Francisco Bay Area musician Lewis Ames then created music from the raw 10 Hz turbulence data. He provided a framework of rhythm and some control on sequencing of oscillators to keep the result more-or-less musical, although the note choice, timbre and effects of 10 different oscillators were controlled completely by the three wind components to create 'turbulence music'. Links to the music can be found at http://online.sfsu.edu/andrewo/BRC2013.html. In addition, a Total Control lighting system on the tower guys produced a chaser sequence at night, the speed of which was controlled by real-time wind speed, and a projector displayed live 10-Hz data graphics from the sonic anemometer and gas analyzer on a building sidewall (Fig. 3). On three of the festival nights we hosted open parties featuring turbulence music and light displays, presentations of observations and urban climate discussions. Of course meteorology-themed cocktails were served and alcohol was poured from a working Galileo Thermometer.

Results

The main findings derived from the dataset captured during the Burning Man experiment include; (1) analysis of modification of the surface layer wind profile and surface roughness characteristics, (2) evaluation of the urban heat island and changes to the surface energy balance, and (3) assessment of CO_2 emissions patterns through the evolution of the city, and estimates of the breakdown of component sources. Here, we will briefly summarize and highlight some results from each topic and point the reader to further sources, should they wish to pursue more detail.

Urban modification of surface layer winds

Wind profiles in the atmospheric surface layer showed overall reductions in wind speed through the lower 27.5 m and agreed approximately with Monin-Obukov logarithmic wind profiles (Fig. 4a). Roughness length in this case was estimated by extrapolating the logarithmic wind profile from two observational heights in the inertial sublayer to the height at which wind speed reached zero for 30-minute cases of near-neutral stability. This height is the sum of zero plane displacement height (z_d) and roughness length (z_0) and was found to nearly double between periods prior to the festival (0.24 m) and during the fully developed city (0.45 m) (Oliphant et al. 2017). An increase is z_d was separately found using the anemometric technique of Rooney (2001) as well as an increase in z_0 estimated by the eddy stress method (Grimmond et al. 1998). According to the morphometric model of MacDonald et al. (1998) applied to BRC, z_d peaked in the most densely packed neighborhoods to the south of the tower, but z_0 was relatively

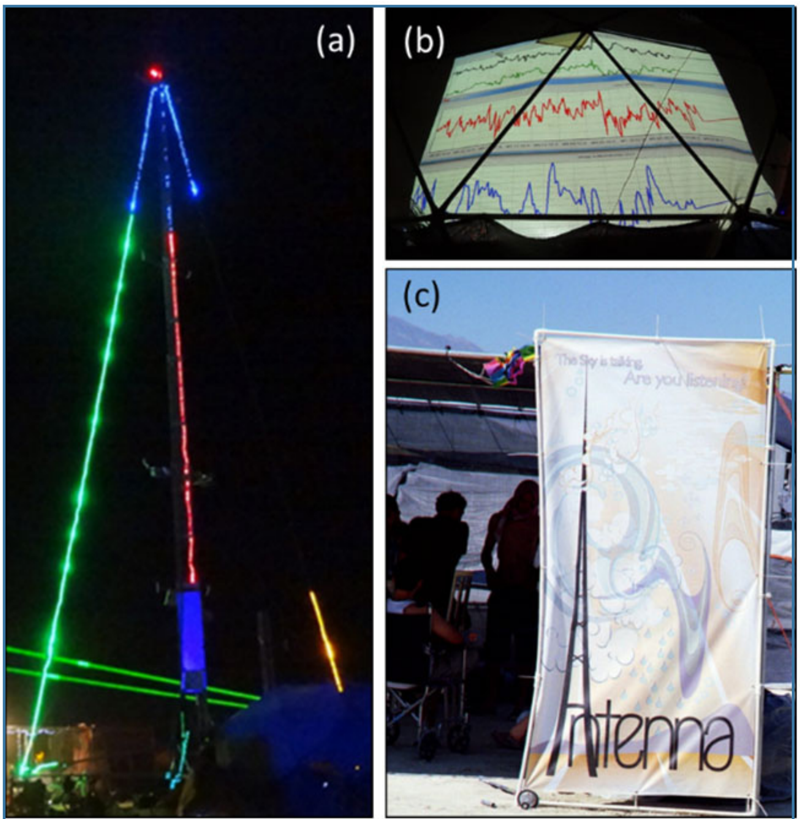

Figure 3. Micrometeorology art-science theme camp including (a) tower lit up at night, (b) live projected data displays and (c) Camp Antenna banner and bar entrance (the sign on the banner reads, 'the sky is talking, are you listening?')

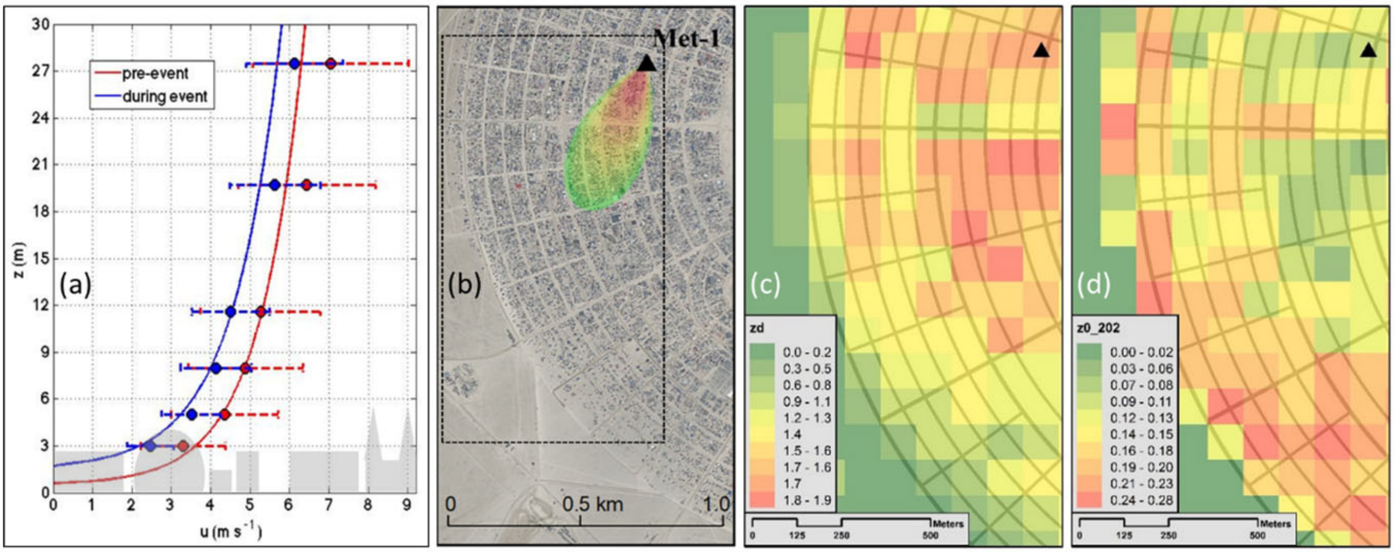

Figure 4. (a) Mean wind speeds (circles) +/- one standard deviation (dashed bars) prior to and during the Burning Man event for 30-minute cases under near-neutral atmospheric stability conditions, (b) satellite image showing neighborhoods to the south and west of the flux tower including estimated 70% of the flux footprint (color spray) under average wind speed and direction in neutral stability conditions (using Hsieh et al. 2000 model). The dashed rectangle in (b) represents the approximate area shown in the morphometric model results for z_d (c) and z_0 (d). The flux tower location is indicated by the solid black triangle. Modified from Bradford (2015) and Oliphant et al. (2017).

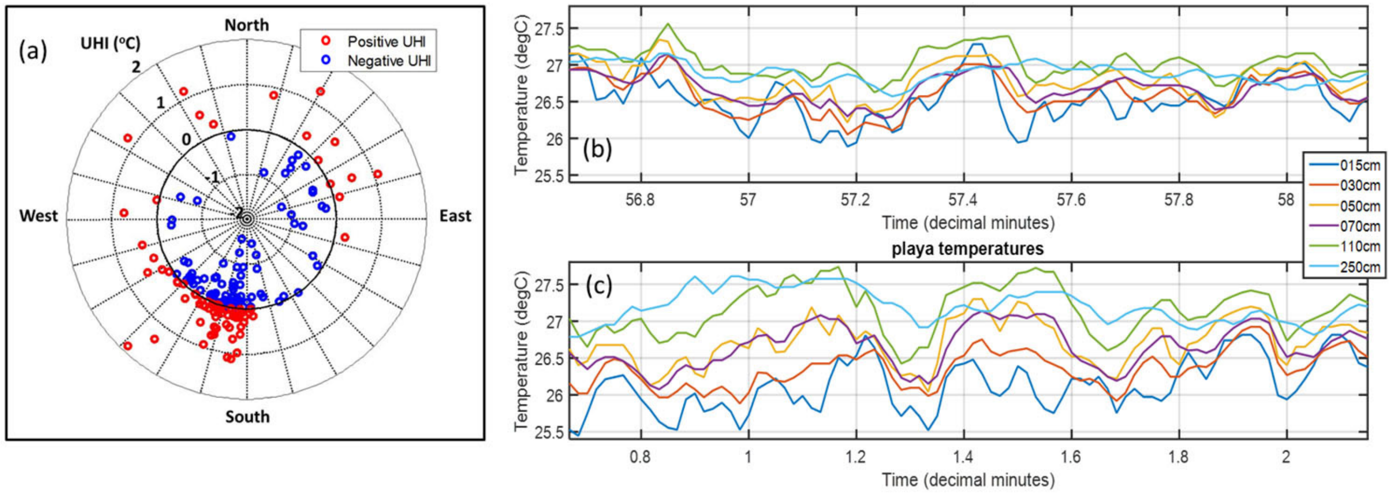

Figure 5. (a) Urban Heat Island index plotted by wind direction, calculated from temperatures measured at 2.5 m at the flux tower in the city and on the open playa (from Redman 2014) and two 90-second windows of one-second temperature observations at six heights on the moving bicycle (b) within the city near the flux tower and (c) a few minutes later in the open playa windward of the city, near 8pm PDT.

smaller there, and highest in the lower density neighborhoods on the windward edge of the city (Fig. 4c and 4d, Bradford 2015). Over the evolution of the city, z_0 (determined morphometrically) increased sharply just prior to the start of the event and remained nearly constant throughout the event (Bradford 2015). In contrast, z_d increased steadily throughout the study period. This shows that, as object density reaches a threshold, increasing the number of obstacles raises the momentum sink rather than increasing overall roughness. Overall, the fully-developed BRC produced roughness values similar to, but somewhat smaller than a suburban neighborhood of a more traditional city (Bradford 2015).

Urban Heat Island

Black Rock City did not produce an observable Urban Heat Island. UHI in this case was assessed by 30-minute temperature differences between the urban and playa measurement sites, as well as temperature profile differences from bicycle observations (Fig. 1). 30-minute UHI values throughout the festival were normally distributed, with a mode close to 0, and 80% of observations within ±0.5 °C (Redman 2014). Figure 5a shows this was true of all wind directions and Redman (2014) also showed that there was no diurnal pattern to UHI values and no correlation with wind speed. From the bicycle transects, although mean differences in temperature between urban and open playa sections were similarly negligible, the shape of the profile in the lower 2.5 m was consistently different. In the case shown in Figure 5b, the emerging nocturnal surface inversion is evident in both locations, and the mean temperature difference was less than 0.1 °C between the two locations. However, the inversion is much steeper in the open playa, with both lower temperatures near the surface and higher temperatures at 2.4 m. The impact of larger boundary layer eddies on temperature fluctuations (with periodicities of 5-10 seconds) is evident in both locations. However the more isothermal nature of the urban temperature profile suggests stronger mixing, presumably from smaller eddies generated by surrounding surface roughness elements.

To our knowledge, this is the only city where a regular UHI could not be determined at all from observations. Here, the uniqueness of BRC allows us to postulate causality of positive UHI's observed elsewhere. First, the decrease in vegetation and available water for latent heat flux was not important in this case. There was no reduction in vegetation and arguably an increase in surface water available due to human activities. Other arid cities share this characteristic and yet show significant UHIs, including in Tuscon (Comrie 2000) and Phoenix (Hawkins et al. 2004), Arizona. In fact at BRC, a slight decrease in the Bowen ratio was observed after the city developed (Oliphant et al. 2017) as well as higher specific humidity inside the city (Redman 2014). Albedo also increased slightly as the city developed but the overall impact of BRC on the surface energy balance was negligible (Oliphant et al. 2017). The significant heat storage flux that traditional urban fabric produces seemed to be negligible in this case, as there was very little change in the surface energy balance residual before and during the festival, a lack of diurnal pattern in UHI, and a lack of positive sensible heat fluxes after sunset (Redman 2014). This suggests that heat storage is the key driver of UHIs in arid cities with traditional urban fabric.

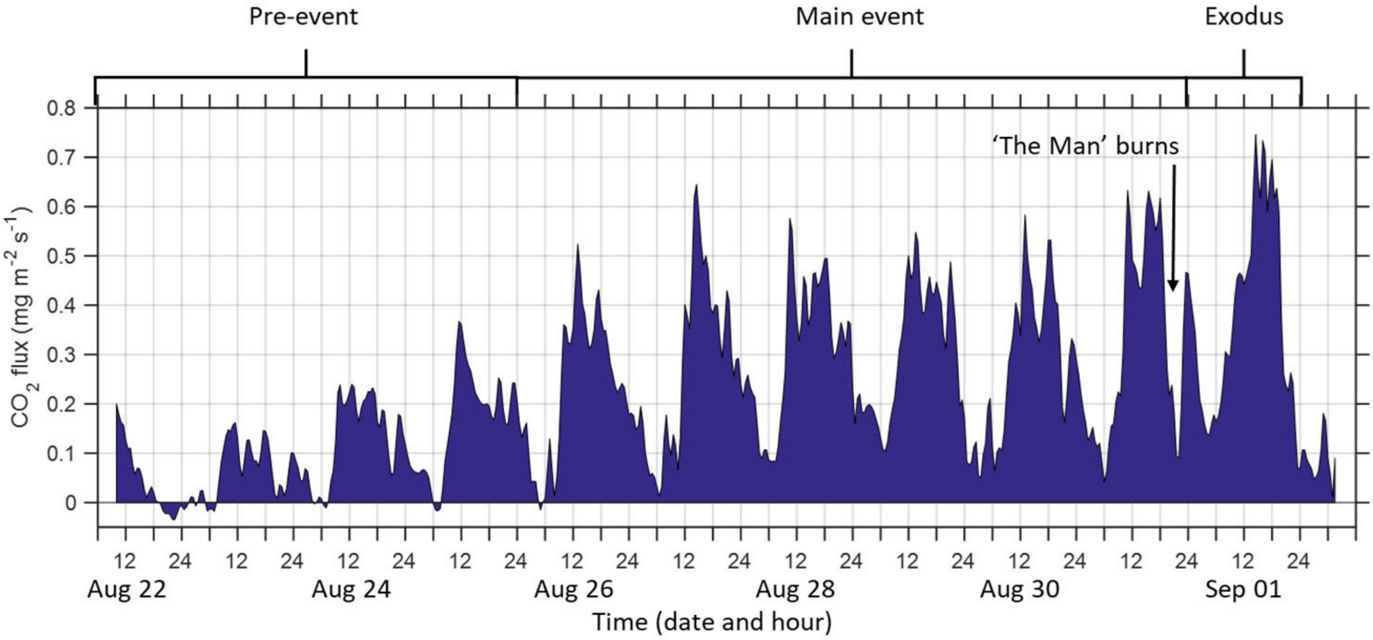

Figure 6. 30-minute average CO2 fluxes from BRC over the entire study period. Data gaps have been filled and a three-point (90-minute) moving average filter was applied (after Oliphant et al. 2017).

Urban CO_2 fluxes

CO_2 fluxes were the surface-atmosphere exchange process most impacted by the presence of the city. These fluxes were almost always positive (indicating the surface was a net source of CO_2 to the atmosphere) though weakly negative on occasion at night (Fig. 6). Prior to the main influx of population, CO_2 fluxes were around 5.2 gC m^{-2} d^{-1} but rapidly rose five-fold over the next four days to a daily average during the event of 24.8 gC m^{-2} d^{-1}. The daily flux peaked on the final day (33.3 gC m^{-2} d^{-1}) when the main exodus from the city occurred as well as burning of flammable waste in burn barrels. These are high rates of CO_2 fluxes by global standards, similar to those observed in Mexico City, Mexico (Velasco et al. 2005) and central London, UK (Helfter et al. 2010). Results of the inventory-based model of daily CO_2 fluxes compared well with observed fluxes in both the general magnitude and inter-diel variability (Oliphant et al. 2017). Breaking down the model components and observing the diurnal characteristics of the observed fluxes lead us to conclude that the largest contributor of CO_2 is local combustion of fossil fuels for stationary sources of energy, primarily for air-conditioning units and secondarily for nighttime lights and music and other media. Mobile sources of CO_2 were very high during arrival to and exodus from the city. However, during the festival when the vast majority of the population moved by bicycle or on foot, daily total mobile sources accounted for the smallest contribution to emissions (even smaller than human metabolic sources), and CO_2 per capita was three times smaller than during the vehicle-dominant phases (Oliphant et al. 2017).

A curious cultural artifact also shows up in the dataset. Each year, on the penultimate night of the event (August 31 in 2013), a massive wooden sculpture known as 'The Man' (pictured in Fig. 2f) is burned in the center of the playa. By tradition, almost all of the citizens of BRC gather for several hours around the sculpture to watch and celebrate the burning, and the city neighborhoods within the flux source area were quiet, dark and almost empty of people. The CO_2 flux clearly dipped through the evening hours from about 1800 to a low point at 2200 PDT, during the burning of The Man (Fig. 6). Following this, the CO_2 flux climbed sharply back to high levels as the population density rapidly climbed in the neighborhoods, and generators were turned on in large numbers for the final major night of festivities.

Conclusions

The objective of the experiment described here was to provide a unique ephemeral city to the urban micrometeorological observational record, that of Black Rock City, Nevada. The changes to surface roughness properties, surface energy balance, urban heat island, as well as CO_2 fluxes were captured through the full evolution of a city over two weeks as 70,000 people gathered on a bare playa surface for the annual week-long Burning Man Festival, then rapidly dispersed immediately afterward. CO_2 fluxes changed the most over the evolution of the city, rising from very low values prior to the festival to rates large by global city standards, averaging 24.8 gC

m^{-2} d^{-1} throughout the festival. Most of the CO_2 source during the festival was for local electricity generation, while transport sources peaked near the start and end of the festival (peak of 33.3 gC m^{-2} d^{-1} on the main departure day), with extremely low rates during the festival due to a culture of bicycling and walking. Black Rock City was not observed to generate an urban heat island effect. Surface energy balance observations over the full period changed very little, with little evident urban impact. This was in part due to the arid and vegetation-free nature of the playa environment which limited impact on the latent heat flux, and in part due to the lack of concrete and paving which limited impact on the storage heat flux compared with more traditional cities. Surface roughness was found to increase as a function of urban density by both anemometric and morphometric methods, with zero plane displacement rising from near-zero to peak at about 1.9 m in the densest neighborhoods during the peak of the population and roughness length rising from near-zero to peak at about 0.25 m near the windward edge of the city. Micrometeorology can also be translated into music and art, and can connect people to their microclimates in visceral and intangible ways, requiring no prior knowledge to learn from direct experience, and offering a gateway to conversations about our impacts on the climate system.

Acknowledgements

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References

Bradford, G. 2015. Investigations of surface roughness length modification in Black Rock City, Nevada. Masters' Thesis in M.S. Geographical Information Sciences, Dept. Geography & Environment, San Francisco State University, California, USA. Retrieved from http://geog.sfsu.edu/geog/sites/sites7.sfsu.edu.geog/files/thesis/grb_final_w_figures.pdf.

Burningman.org. 2013. "2013 AfterBurn Report". Burning Man Project. Retrieved from http://burningman.org/culture/history/brc-history/afterburn/2013-2/.

Clements, C. and Oliphant, A.J., 2014. The California State University- Mobile Atmospheric Profiling System (CSU-MAPS): A facility for research and education in boundary-layer meteorology, *Bulletin of the American Meteorological Society*, 95, 1713-1724. doi:10.1175/BAMS-D-13-00179.1

Comrie, A., 2000: Mapping a Wind-Modified Urban Heat Island in Tucson, Arizona (with Comments on Integrating Research and Undergraduate Learning). *Bulletin of the American Meteorological Society* 81: 2417-2431.

Grimmond, C. S. B., King, T. S., Roth, M., & Oke T. R. 1998. Aerodynamic roughness of urban areas derived from wind observations. *Boundary-Layer Meteorology*, 89(1), 1-24.

Hawkins, T. W., A. J. Brazel, W. L. Stefanov, W. Bigler, and E. M. Saffell, 2004: The role of rural variability in urban heat island determination for Phoenix, Arizona. *J. Appl. Meteor.*, 43, 476– 486, doi:10.1175/1520-0450(2004)043,0476:TRORVI.2.0.CO;2.

Helfter, C., Famulari, D., Phillips, G.J., B arlow, J.F., Wood, C.R., Grimmond, C.S.B. and Nemitz, E., 2010. Controls of carbon dioxide concentrations and fluxes above central London. *Atmospheric Chemistry & Physics Discussions*,10, pp. 23739-23780.

Hsieh, C.I., Katul, G. and Chi, T.W., 2000. An approximate analytical model for footprint estimation of scalar fluxes in thermally stratified atmospheric flows. *Advances in water Resources*, 23(7), pp.765-772.

Kellett, R., A. Christen, N.C. Coops, M. van der Laan, B. Crawford, T.R. Tooke, & I. Olchovski. 2013. A systems approach to carbon cycling and emissions modeling at an urban neighborhood scale. *Landscape and Urban Planning* 110; 48-58.

MacDonald, R. W., R. F. Griffiths, and D. J. Hall, 1998. An improved method for estimation of surface roughness of obstacle arrays. *Atmos. Environ*., 32, 1857–1864.

Oliphant, A.J. Stein, S. and Bradford, G. 2018: Micrometeorology of an ephemeral city, the Burning Man Experiment, *Urban Climate*, 23, 53-70. http://doi.org/10.1016/j.uclim.2017.03.001.

Redman, M. 2014. Investigating the Urban Heat Island effect of Black Rock City, Nevada during the Burning Man Festival, 2013. Undergraduate Thesis in B.S. Meteorology, Dept. Earth & Climate Sciences, San Francisco State University, California, USA.

Rooney, G. G. 2001. Comparison of upwind land use and roughness length measured in the urban boundary layer. *Boundary-layer Meteorology*, 100(3), 469-485.

Velasco, E., Pressley, S., Allwine, E., Westberg, H. and Lamb, B., 2005. Measurements of CO_2 fluxes from the Mexico City urban landscape. *Atmospheric Environment*, 39(38), 7433-7446.

Wieringa, J. 1993. Representative Roughness Parameters for Homogeneous Terrain. *Boundary Layer Meteorology*, 63(4), 323-393.

Urban climate studies in Glasgow: Antecedents to future directions

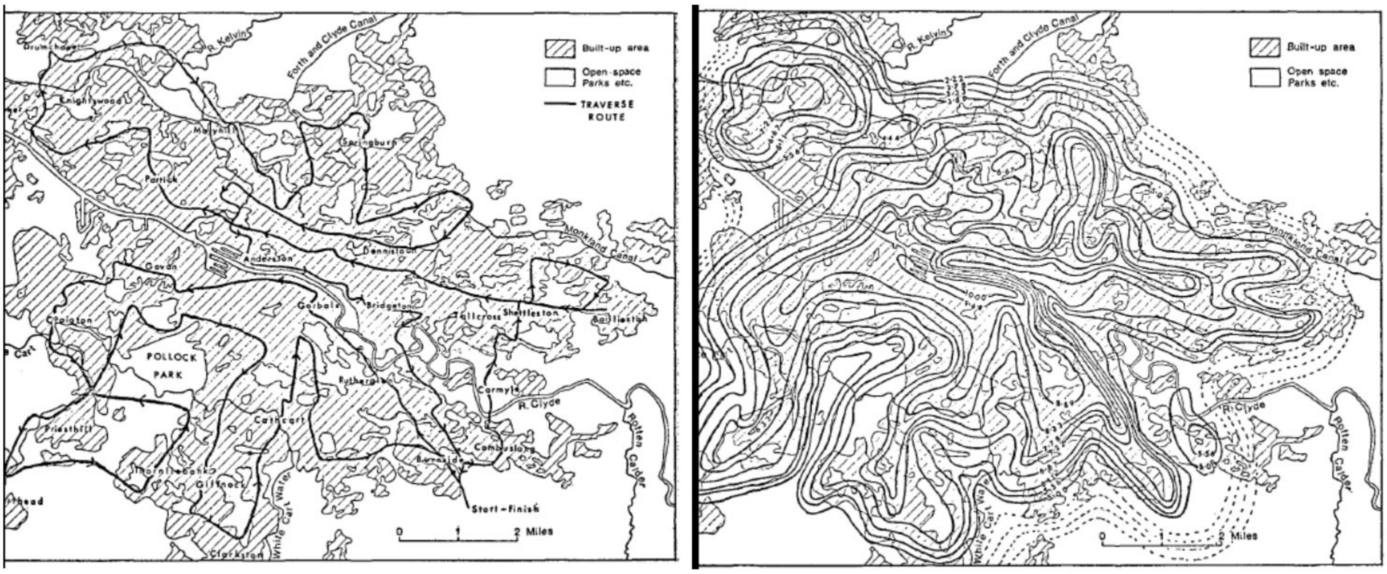


Figure 1. Glasgow's Urban Heat Island in 1975. Traverse route (left) and isotherm lines (right) for 22:00-01:30 on October 7, 1975. ***Source: Hartley, 1977***

The importance of urban climate knowledge on cool climate cities is gaining attention, thanks largely to awareness of climate change and the generally weak levels of preparedness to deal with such changes, especially in terms of air temperature and thermal comfort. Nevertheless, this is a relatively new phenomenon; after all, urban warming had been seen as a 'positive' in cold climates not that long ago (e.g. Chandler, 1965 in London – less heating energy needs, longer growing season, reduced need for snow clearance, etc.). During the last 50 years considerable knowledge on the urban climate of cold climate cities (many of which are mature urban centres) has been accumulated.

The aim of the present article is to highlight recent developments (last 10 years) in the study of urban climate in Glasgow, UK and how this has interfaced with policy developments, especially towards climate change adaptation. We aim to trace the trajectory of our recent efforts towards this and explore the linkages to policy development and action towards adapting to climate change in Glasgow and the surrounding region.

Background and historical developments

One of the earliest descriptions of the Glasgow UHI phenomenon was carried out over 40 years ago (Hartley, 1977). Figure 1 shows the structure of the UHI on a mid-autumn night in 1975.

However, there have been no other published records of Glasgow urban climate studies – until about ten years ago, when we began our collaborations in the study of thermal anomaly and urban thermal comfort with a view to both understanding the nature of the 'problem' and the 'solutions' and policy implications of the phenomenon.

Nature of Glasgow's UHI

An initial study was carried out in 2010-11 (Emmanuel and Krüger 2012) investigating changes in air temperature within the urbanized area of Glasgow relative to the surrounding Central Belt Region climate using historical data from several sources: UK Met Office (climate normals and running data for a 50 year-period); MIDAS Surface Weather Stations network of the British Atmospheric Data Centre (BADC); and Weather Underground network. Our results suggested that the urban area superimposes a local warming effect over regional trends. Even though regional trends are accompanied by a similar decrease in heating degree days (HDD) in Glasgow's urban area over time – with local decrease in HDD possibly due to regional warming, a comparison between climate normals for Glasgow Airport and West of Scotland shows higher temperatures in Glasgow than regional averages. The number of days with night frost in the urban area drops significantly, from around 70 to 36 days per annum.

In a subsequent study (Krüger and Emmanuel, 2013), we evaluated the effect of atmospheric stability on seasonal ambient temperature differences after deploying two Davis VantagePro2 weather stations at an urban site (at Glasgow Caledonian University, GCU) and at a rural setting (Figure 2). In the same study, intra-urban temperature differences were concomitantly monitored with a string of T/RH Tinytag data loggers located across Glasgow on a N-S transect (Figure 3). The purpose was to estimate the effect of background atmospheric on urban-vs-rural (UHI) as well as on intra-urban air temperature differences in order to identify relationships between morphology and local climate. The monitoring period (from late February to early September 2011) was classified in terms of atmospheric

Figure 2. Weather stations used in the UHI study: urban (left, at GCU) and rural location (right, at Cochno Farm)

stability classes according to the modified Pasquill-Gifford-Turner (PGT) classification system (Mohan and Siddiqui, 1998). A consistent warming pattern was observed both between the farthest T/RH station and the group mean with noticeable influence of atmospheric conditions, expressed as PGT Day Types, during the observation period (Table 1). The UHI, by its turn, was not particularly affected by the choice of more stable conditions for analysis according to the PGT scheme (Table 2).

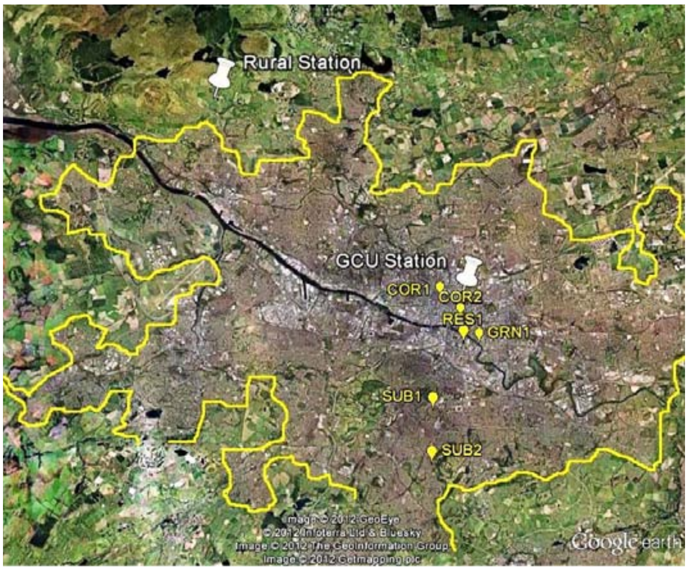


Figure 3. Network of weather stations (used in the UHI study) and local temperature/relative humidity stations (intra-urban air temperature differences) in and around Glasgow's urban area

More recently, we investigated the joint effect of atmospheric conditions and urban morphology, expressed as the Sky View Factor (SVF), on intra-urban variability in the city core (Drach et al., 2018). Thirty two locations were

Table 1. Maximum air temperature differences (in K) to 'Group Mean' for different periods and atmospheric conditions – intra-urban T/RH stations

	T/RH stations						Max. Temp. Diff.
	SUB2	RES1	SUB1	GRN1	COR1	COR2	
All data	-1.5	-0.6	-0.4	0.3	0.6	1.6	3.1
Cold Period	-1.4	-0.5	-0.4	0.2	0.5	1.5	3.0
Warm Period	-1.6	-0.6	-0.4	0.4	0.7	1.6	3.2
Day Type I	-2.7	-0.9	-0.5	0.7	1.2	2.1	4.9
Day Type II	-1.6	-0.7	-0.5	0.5	0.7	1.5	3.1
Day Type III	-1.4	-0.6	-0.4	0.3	0.6	1.6	3.0
Unclassified days	-1.4	-0.5	-0.4	0.3	0.5	1.5	2.9

Table 2. Average UHI (ΔT_{u-r} in K) for different periods and atmospheric conditions

	daytime (average)	night time (average)	night time (minimum)
All data	1.6	2.1	3.1
Cold Period	1.6	2.2	3.2
Warm Period	1.6	2.1	3.1
Day Type I	1.6	2.2	3.4
Day Type II	1.9	2.4	3.2
Day Type III	1.7	2.6	3.9
Unclassified days	2.0	1.3	2.9

selected on the basis of SVF with a wide variety of urban shapes (narrow streets, neighbourhood green spaces, urban parks, street canyons and public squares) and compared to a reference urban weather station during a total of twenty three transects during late spring and summer periods. The locations used in this study differed from the ones used before, as they are located in the city core area. The method consisted of diurnal transects, covered on foot or by bicycle following designated routes (eastbound and westbound) as shown in Figure 4.

The urban area wherein traverses took place was selected according to a previous study by Emmanuel and Loconsole (2015) where authors used the Local Climate Zone 'LCZ' classification for Glasgow from LIDAR data available with local authorities in order to identify potential problem areas as regards overheating in summer. According to that study, the city centre area (Glasgow City Centre West and Glasgow City Centre East) was categorized as the LCZ class 'compact midrise'. Maximum daytime intra-urban temperature differences were found to be strongly correlated with atmospheric stability classes. Furthermore, significant intra-urban differences in air temperature are noticeable in urban canyons (e.g. in E-W street canyons), with a direct correlation to the site's SVF (or sky openness) and with an indiscernible trend under open-air conditions (Figure 5).

The UHI intensity in Glasgow can reach almost 4°C under certain atmospheric conditions, yet such temperature differences are not solely determined by atmospheric stability classes, i.e. such are not determining factors for explaining local UHI. On the other hand, daytime intra-urban temperature differences tend to be affected by PGT patterns with increasing urban density. Particular Day Types (resulting PGT class for daytime periods) will bring stronger temperature differentiation within urban core locations. By identifying the dominant atmospheric classes in summer for Glasgow as A-B (cf. Figure 5) (Drach et al., 2018), it may be assumed that such conditions favor strong differences in air temperature within urban canyons, impacting to a greater or lesser extent the thermal comfort of pedestrians.

Figure 4. Study area with monitoring points and traverses in Glasgow's city core

Thermal comfort in urban Glasgow

With the aim of understanding the thermal preferences and defining a preliminary outdoor comfort range for Glasgow's urban population, an extensive series of measurements and surveys were carried out during winter and summer 2011 during 19 monitoring campaigns at six different monitoring points in pedestrian downtown areas (Krüger et al., 2012). For data collection, we used a Davis Vantage Pro2 weather station, equipped with temperature and humidity sensors, cup anemometer with wind vane, silicon pyranometer and globe thermometer.

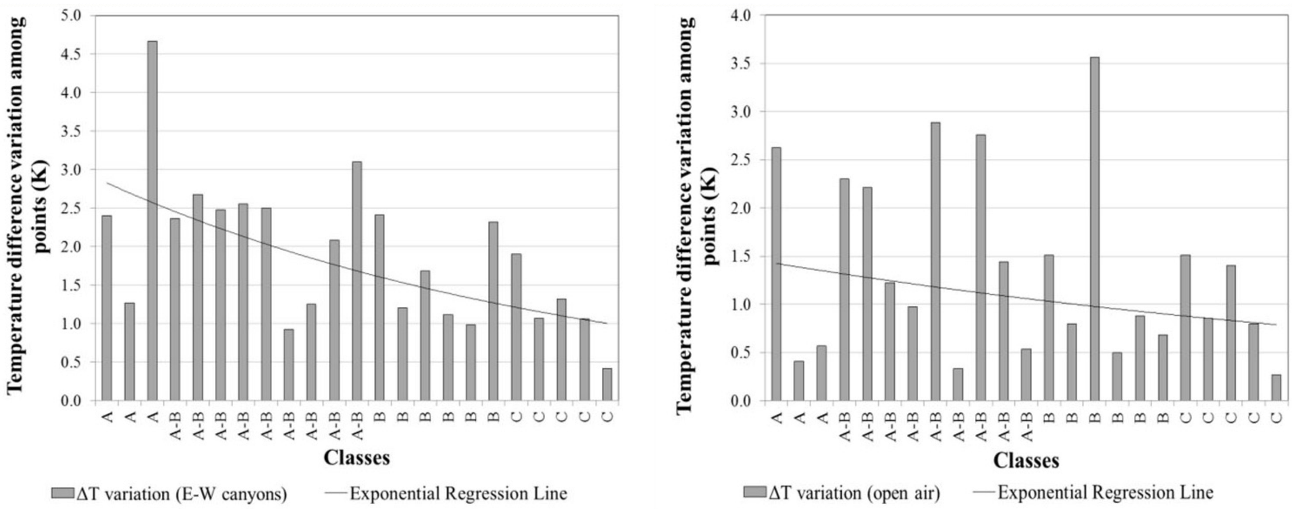
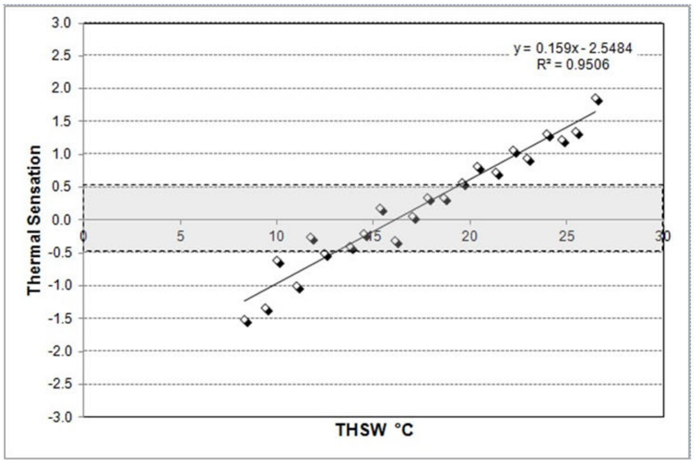


Figure 5. Relative variations in air-temperature differences for varying atmospheric conditions – for E-W street canyons (left), and for open-air locations (right).



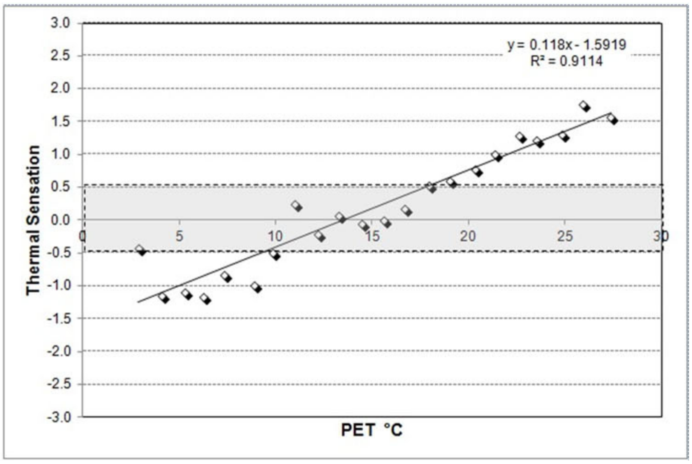


Figure 6. Binned TS data against different thermal indices: THSW (left) and PET (right)

Two thermal indices were adopted for comparisons against field data (in this case, thermal sensation votes): the 'Temperature Humidity Sun Wind' (THSW) index, and the Physiological Equivalent Temperature (PET) index (Krüger et al., 2013). The THSW index uses humidity and temperature to calculate an apparent temperature, expressed in °C, incorporating the heating effect of solar radiation and the cooling effect of wind on perceived temperature (Steadman 1984). The PET index, expressed in °C, is defined by Höppe (1999) as the equivalent temperature to the air temperature in which, for a typical internal situation, the thermal balance of the human does not change, considering the same core and skin temperatures as in the original situation. Whereas THSW is a direct output from Davis VantagePro2 weather stations, PET calculations were performed with the RayMan model (Matzarakis et al., 2010).

Correlating binned thermal sensation (TS) data to discrete changes in temperature in the two scales (THSW and PET) allowed us to assess comfort ranges for both indices, with high correlation coefficients between binned TS data and index values (r-squared 0.95 and 0.91, for THSW and PET, respectively) (Figure 6).

The obtained comfort/thermal neutrality ranges for Glasgow are roughly 13-19°C (THSW) and 9-18°C (PET). Thermal discomfort due to cold or heat can be assumed to be THSW or PET values below or above these ranges, respectively. Remarkably, optimal ranges for the PET index in Glasgow are lower than those suggested by literature, which might be related to long-term climate acclimatization of Glaswegians.

The preliminary definition of a comfort zone allowed us to assess the impact of the urban area with respect to thermal comfort/discomfort levels at the reference urban location relative to a rural location (using data from the reference station at GCU and at the stationary weather station at Cochno Farm, cf. Figure 2) (Krüger et al., 2013). THSW data assessed directly from readings of the two Davis stations and post-processed PET data in RayMan for the two locations, expressed as percent variations in thermal comfort/discomfort due to cold and heat yielded statistically significant differences between the rural site and the urban location ($p<<<0.05$) with the urban site benefitting from less cold though with a slight increase in heat stress.

From the outdoor comfort campaigns, an important finding was to obtain a target condition, i.e. to identify optimal exposure conditions for pedestrians which could serve as guidance in urban planning design. The beneficial aspect of having less cold in the city in a high-latitude location such as Glasgow can yet be deceptive. High latitude urban areas such as Glasgow already have a significant cooling load – e.g. Kolokotroni et al. (2007) showed that the urban heat island effect would cause an increase in annual cooling load slightly higher than the annual heating load (25% and 22%, respectively) in London. Climate change might bring greater heat stress and cooling needs in the future.

Mitigation of urban heat island in Glasgow

Emmanuel and Loconsole (2015) explored the role of green infrastructure to mitigate local warming in the Glasgow Clyde Valley (GCV) region, with simulations in ENVI-met considering six scenarios: present (2012) and future (2050) predictions for different percentages of increased green cover relative to a base-case scenario. Based on a LCZ classification of the city region, the study concluded that green infrastructure could play a significant role in mitigating the urban overheating expected under a warming climate in the GCV Region. A green cover increase of approximately 20% over the present level could eliminate a third to a half of the expected extra urban heat island effect in 2050 (Figure 7). This level of increase in green cover could also lead to local reductions in surface temperature by up to 2ºC. From the thermal comfort perspective, it was estimated that over half of the street users would consider their experience of the city centre to be thermally acceptable (i.e. with a 'comfort vote' between −1.0 and +1.0 for the PMV index, according to ISO 7730) for a 20% increase in green cover, even under a warm 2050 scenario (Table 3).

While a 20% increase in green cover in the urban core might appear impractical at first, green infrastructure assessment schema such as the Green Area Ratio (GAR) method currently in use in Berlin and elsewhere may provide a methodology to devise alternative approaches to enhancing green cover in urban areas. We have explored such options for the Glasgow city core (Table 4).

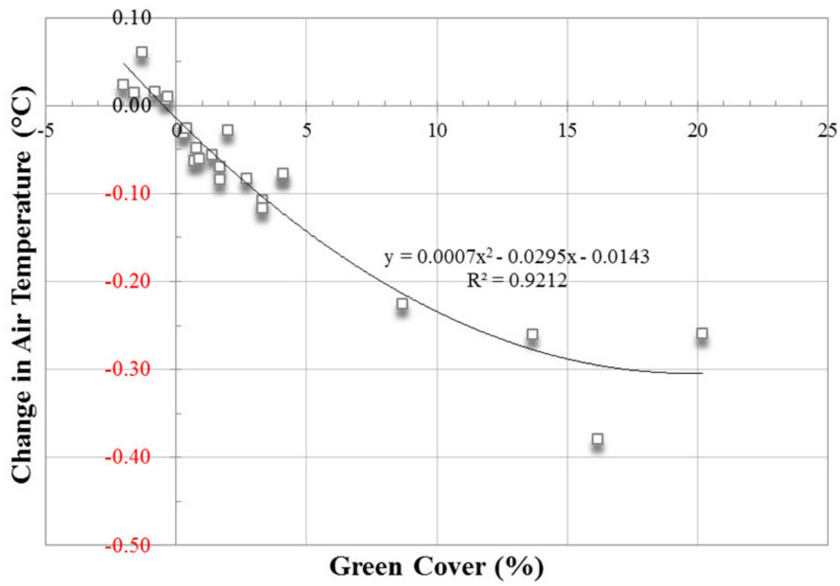


Figure 7. Average daytime temperature reduction effect in summer from changes in green cover for Glasgow

Policy Implications

The Adaptation Sub Committee (ASC) of the UK Committee on Climate Change (CCC) in its second synthesis report (ASC, 2017) on Climate Change Risk Assessment, highlighted addressing flood risks and heat related impacts on health and wellbeing as in urgent need for further action/research in Scotland. In Glasgow itself, the Local Climate Impact profile during the last 40 years (Glasgow City Council, 2016) shows that average rainfall has increased by 21%; maximum temperatures have increased on average by 1.21°C and the number of heat waves is up by 6 days per year.

Our urban climate studies in Glasgow have had considerable traction within the climate change adaptation policy community. In particular, our work in partnership with the Glasgow Clyde Valley Green Network Partnership (GCVGNP) has been influential in pushing the 'green infrastructure' agenda as a potential adaptation option for both flood prevention at the regional scale as well as overheating mitigation at local scale (Emmanuel, 2013).

We have thus attempted to embed urban climate studies within the wider (and potentially more popular) attempts to adapt to climate change. This might provide a template for engagement with the policy development community, not just in the cold climate regions.

References

Adaptation Sub Committee, UK Committee on Climate Change, 2017. UK Climate Change Risk Assessment 2017, Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/584281/uk-climate-change-risk-assess-2017.pdf

Drach P, Krüger E, Emmanuel R, 2018. Effects of atmospheric stability and urban morphology on daytime intra-urban temperature variability for Glasgow, UK. *Science of the Total Environment* 627:782-791.

Table 3. Changes in Predicted Mean Vote (PMV) due to a 20% increase in green cover in 2050, relative to current conditions, with highlighted comfort range as given in ISO 7730

PMV	Glasgow City Centre – West	Glasgow City Centre – East	Paisley	Clyde Gateway	Wishaw	Hamilton
< -2.0	-	-	-	-	-	-
-2.0 to -1.5	-	-	-	-	-	-
-1.5 to -1.0	-	-	0.7%			2.0%
-1.0 to -0.5	-	-	7.7%	1.0%	1.4%	8.9%
-0.5 to 0.0	4.9%	3.6%	31.1%	20.4%	11.9%	19.1%
0.0 to +0.5	31.8%	35.6%	12.5%	8.4%	9.2%	8.4%
+0.5 to 1.0	15.8%	15.4%	5.8%	3.9%	2.1%	5.4%
+1.0 to +1.5	0.6%	2.1%	15.3%	15.3%	9.6%	18.7%
+1.5 to +2.0	7.0%	6.8%	24.6%	44.2%	57.6%	34.9%
> 2.0	40.0%	36.6%	2.5%	6.8%	8.2%	2.6%

Table 4. Alternative approaches to increasing green cover by 20% in Glasgow City Centre					
Scenario	**Permeable vegetated area (m^2)**	**Street trees (Nos.)**	**Intensive Roof Garden (m^2)**	**Extensive Roof Garden (m^2)**	**Green façade (m^2)**
A large park only	1,056	-	-	-	-
Street trees only	-	528	-	-	-
50% of additional greenery in street trees, balance intensive roof garden	-	264	755	-	-
50% of additional greenery in street trees, balance extensive roof garden	-	264	-	1,056	-
Mix of intensive (50%) and extensive (50%) roof garden	-	-	755	1,056	-
50% of all 'sun facing' (i.e. South & West) façade covered in green	-		-	-	1,268

Emmanuel R, Krüger E. 2012. Urban Heat Islands and its impact on climate change resilience in a shrinking city: the case of Glasgow, UK, *Building & Environment* 53:137-149.

Emmanuel R, 2013. Green infrastructure for overheating adaptation in Glasgow, Published by Glasgow Clyde Valley Green Netowrk Partnership (GCVGNP), Glasgow. Available at: https://www.gcvgreennetwork.gov.uk/publications/212-climate-change-gi-for-overheating-adaptation

Emmanuel R, Loconsole A. 2015. Green infrastructure as an adaptation approach to tackle urban overheating in the Glasgow Clyde Valley Region, *Landscape & Urban Planning* 138:71-86.

Glasgow City Council, 2016. Glasgow's Local Climate Impact Profile, available at: https://www.glasgow.gov.uk/CHttpHandler.ashx?id=7272&p=0

Hartley M. 1977. Glasgow as an urban Heat-Island, *Scottish Geographical Magazine* 93(2):80-89.

Höppe P, 1999. The physiological equivalent temperature – a universal index for the biometeorological assessment of the thermal environment, *International journal of Biometeorology* 43(2):71-75.

Kolokotroni M, Zhang Y, Watkins R, 2007. The London Heat Island and building cooling design. *Solar Energy* 81(1):102-110.

Krüger E, Drach P, Emmanuel R, Corbella O. 2012. Assessment of daytime outdoor comfort levels in and outside the urbanized area of Glasgow, U.K. *International Journal of Biometeorology* 57(4):521-533.

Krüger E, Drach P, Emmanuel R, Corbella O. 2013. Urban heat island and differences in outdoor comfort levels in Glasgow, UK. *Theoretical & Applied Climatology* 112:127-141.

Krüger E, Emmanuel R, 2013. Accounting for atmospheric stability conditions in Urban Heat Island studies: the case of Glasgow, UK. *Landscape & Urban Planning* 117:112-121.

Matzarakis A, Rutz F, Mayer H, 2010. Modelling radiation fluxes in simple and complex environments: basics of the RayMan model, *International Journal of Biometeorology* 54: 131-139.

Oertel A, Emmanuel R, Drach P. 2015. Predicted versus measured thermal comfort and optimal comfort ranges in the outdoor environment of Glasgow, UK, *Building Services Engineering Research and Technology*, 36(4):482-499.

Steadman RG. 1984. A universal scale of apparent temperature, *Journal of Climate and Applied Meteorology*, 23(12): 1674-1687.



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Women in STEMM leadership: lessons from Antarctica

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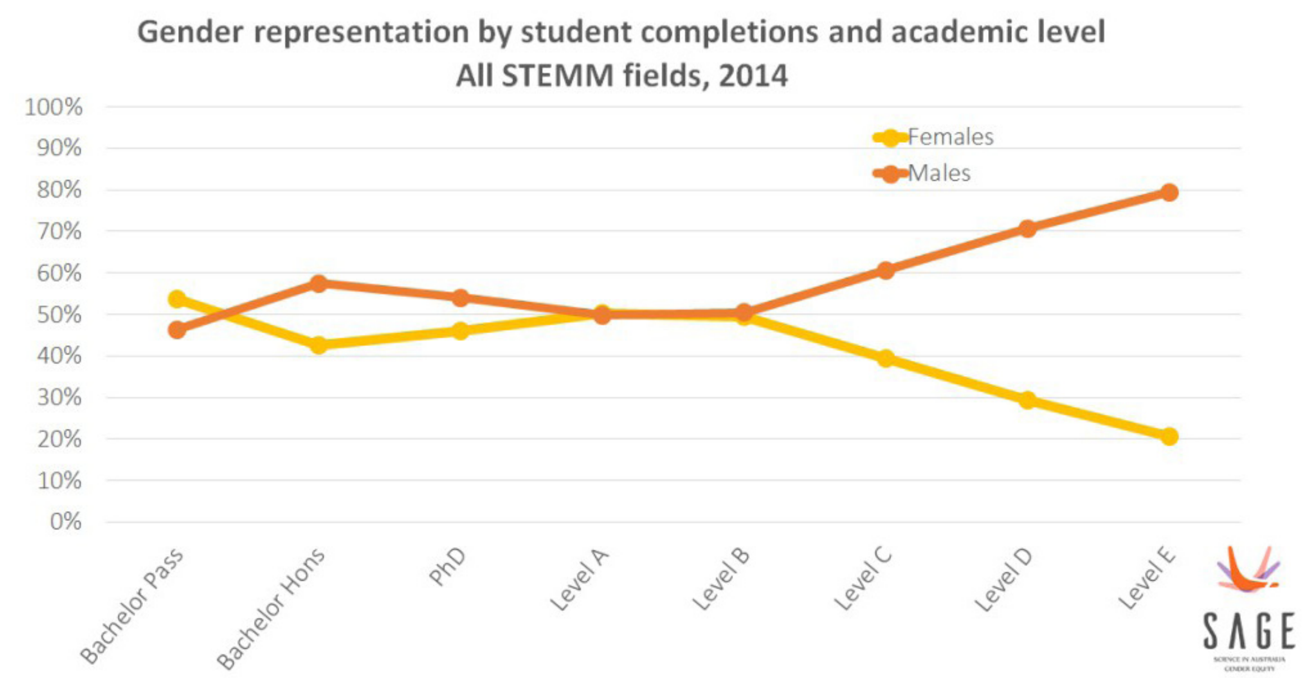
Melissa Hart recently embarked on a three-week expedition to Antarctica, culminating her year-long participation in the Homeward Bound Women in STEMM leadership program.

As a woman in science I have become quite used to often being the only woman in a meeting, or attending conferences or workshops where the vast majority of keynote speakers are men. I say I have become used to these situations, but I am never actually comfortable in them. When you are the only woman in the room, it is quite easy to feel like an impostor. And the numbers don't stack up; women are at parity with men in under and postgraduate degrees, yet they make up less than a quarter of university professors. Biases against women in science are both implicit and explicit. And we all exhibit biases, regardless of our gender. A recent study found that both men and women faculty ranked a job applicant called "John" more competent, suitable for hire, and offered a higher salary, than when the exact same application was labeled "Jennifer". Furthermore, woman postdoctoral applicants have to publish at least three times as many papers in prestigious journals to be judged as successful as male applicants.

Organizations that are diverse and equitable are often more productive and innovative. Consider the loss of intellectual capacity we experience by not involving women in an equitable way, and by not elevating them to leadership positions.



Gender distribution of student completions and staff working in STEMM fields. Source: Higher Education Research Data, 2014 (http://www.sciencegenderequity.org.au/gender-equity-in-stem/)

So what can we do to redress this gender balance?

Women in STEMM leadership programs are one strategy. I have recently completed the Homeward Bound Women in STEMM (science, technology, engineering, mathematics, medicine) leadership program. Homeward Bound has a long-term goal to build and support, over the next 10 years, a global network of 1000 women focusing on the leadership and strategy required to contribute towards a more sustainable future. Each year's cohort undertakes a year-long program to develop leadership, strategic and communication capabilities, culminating in a 3-week voyage to Antarctica. Antarctica is chosen as the backdrop is it provides a perfect location for an introspective program, does not belong to any one country, and prior to the 1960s many countries did not allow women scientists to travel there. Homeward Bound is creating the largest ever all women expeditions to Antarctica.

I was one of 78 women, from 23 countries, selected via a globally competitive process, to join the program's 2nd cohort. The women came from all sectors of STEMM, and consisted of one-third early career, one-third mid-career, and one-third senior STEMM professionals.

The program is delivered remotely, via zoom, over 11 months, and then in February, 2018 we met in Ushuaia, Argentina, to board a recommissioned NOAA research vessel on a 3-week expedition to Antarctica. During the voyage we spent half of each day working on the program, and the other half on Antarctic land visits, including visits to five research stations where we learned about the science program and were able to ask questions about leading in such a remote environment.

A total of 78 women from 23 countries joined the Antarctic expedition, representing a wide range of scientific fields. An organization like the IAUC can also play a vital role in supporting women in leadership positions, by promoting inclusion, equity and diversity among its membership.

The Homeward Bound program consists of lectures, personal and leadership development tools, coaching sessions, visibility and science communication training and the opportunity to develop collaborations. We all came out of the program with insight into our individual leadership style and strategies to make it more effective, our own personal visibility goals, and a 100 day strategy plan to put this all in place.

What I believe to be one of the fundamental outcomes of this program is the network of Homeward Bound women now growing globally. This network has now become a brain trust we can all call on at any time for advice, mentoring, or simply sharing of experiences as women working in STEMM. This network has led to new collaborations that have resulted in prizes, grants and publications, and I find myself continuously benefiting from it in my career. I look forward to seeing what a network of 1000 women can achieve at the culmination of the Homeward Bound initiative.

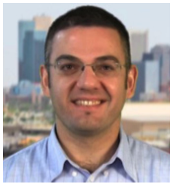
A paper that came out just last month shows that academic societies, like the IAUC, can also play a vital role in supporting women in leadership. The authors found that the societies with more women in leadership positions were those that had a visible statement of equality. They include a gender equity check list that suggests that professional societies should, among others: form a committee dedicated to equity and diversity, provide written expectations for appropriate behavior at society events, track demographic data of society members, and communicate about inclusion, diversity and equity to the membership.

I chair an Equity and Diversity committee within the Australian Meteorological and Oceanographic Society (AMOS) that has made significant developments into our society's culture around equity. However, I still struggle to find men interested in joining the committee, or being involved in committee events. These are issues that cannot fall wholly on women in leadership within a society; they cannot be seen as simply "women's issues", they also require male champions of change.

I invite members of IAUC to consider what equity in STEMM should look like, and encourage urban climate women to consider the Homeward Bound program. I am more than happy to answer any questions about the program or the application process.

Urban climate, urban biometeorology, and science tools for cities at EGU 2018






By Sorin Cheval[1,2,3], Matthias Demuzere[4], Matei Georgescu[5], Hendrik Wouters[4]
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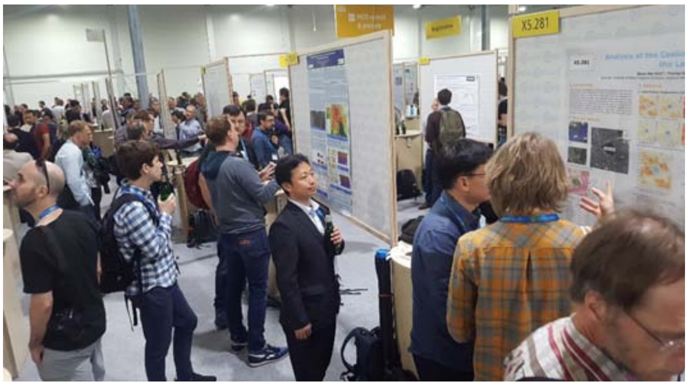
On 8–13 April 2018, the European Geosciences Union (EGU) General Assembly was held in Vienna, Austria. The well-known yearly event hosted by the capital of Austria gathered geoscientists from all around the world; about 15,000 scientists from 106 different countries registered this year. With the urban environment of increasing scientific concern, one of the EGU sessions was dedicated to **"Urban climate, urban biometeorology, and science tools for cities"**.

In recent years, this session has been regularly included in EGU's programme and has attracted broad participation from the scientific community. In 2018, the session featured 18 oral presentations and 31 posters and for the first time, included three oral sessions. The three blocks of oral sessions tackled a variety of subjects aiming to identify and assess key gaps, challenges and solutions for cities located in different geographic environments. The presentations focused on themes such as urban climate modelling at different scales, including bio-meteorological assessments under climate change scenarios, thermal comfort impacts, urban planning, the role of earth observation products and tools for urban climate services, and numerous public representatives attended the session.

Oral session on "Urban climate, urban biometeorology, and science tools for cities" within the EGU General Assembly, 11 April 2018. Credit: Winston Chow



Poster session on Urban climate, urban biometeorology, and science tools for cities within the EGU General Assembly, 11 April 2018. Credit: Matthias Demuzere

The oral sessions included one invited presentation delivered by **Prof. Andreas Matzarakis** (– Wetterdienst, Research Centre Human Biometeorology, Freiburg, Germany) entitled "Possibilities and limitations of applying thermal indices and micro-scale bio-climate models in urban environments."

The poster session equally offered a good opportunity to share knowledge and experience between the academic community and practitioners around the globe. Moreover, the geographic coverage of the contributions (e.g., case studies from cities including Vancouver, Prague, Moscow, Seoul, and multiple cities in India) demonstrated the considerable interest in urban climate and its impact on human comfort in cities worldwide. The vibrant interaction among researchers offered a unique opportunity for dissemination of novel approaches and techniques, opportunities for collaboration among new colleagues, and development of strategic engagement between existing colleagues.

Building on the success of the 2018 session on **Urban climate and urban biometeorology** at the EGU General Assembly, we are strongly committed to organize this session next year (7–12 April 2019), and we welcome interest from the urban climate community in contributing and sharing your research results at the conference in 2019.

Urban Climate News: A brief review of the last 18 months

Greetings to all, on the eve of ICUC-10 in New York City. A year and a half have passed since my last 18-month review of contributions to the *Urban Climate News* (previous 18-month reviews can be seen in the June 2009, December 2010, June 2012, December 2013 and June 2015 issues).

During this time I have had the good fortune to work with a newly expanded editorial staff, which includes **Paul Alexander** ("In the News"), **Helen Ward** (Features and Urban Projects), **Joe McFadden** (Conferences), and **Matthias Demuzere** (Bibliography). I would like to thank each and every one of these dedicated people for their enthusiasm and cooperative spirit, and also to recognize the many other IAUC members who have contributed their time and energy to the newsletter.

A special word of gratitude is due to **James Voogt**, who is finishing his term as President of the IAUC. Jamie has provided not only a reliable and calm hand at the wheel, but also a clear voice of leadership when the organization's values of inclusiveness and tolerance needed to be expressed. I'm sure I speak for many in thanking Jamie for his truly collaborative efforts over the last few years, and in welcoming **Nigel Tapper** as the new President.

Over the course of these last eighteen months, Paul has given us a special series of articles profiling the eleven winners of the **C40 Cities Award** for addressing climate change in 2016. We have seen how cities are taking the initiative and being recognized for addressing a multiplicity of climate-related issues: Melbourne and Sydney in the realm of Building Energy Efficiency, Portland for Climate Action, Paris for Adaptation Planning and Assessment, Yokohama for Clean Energy, Shenzhen for Finance & Economic Development, Copenhagen for Climate Adaptation Action, Addis Ababa for Urban Transportation, Curitiba for Sustainable Communities, Kolkata for Solid Waste, and Seoul for Social Equity & Climate Change. Nowhere was the intertwining of urbanization and climate illustrated more dramatically then in Houston, where Hurricane Harvey made landfall last August.

Understanding the nature of these urban phenomena, and developing tools to cope with them in the future, is what drives many of us in the IAUC. The published research studies and ongoing projects that have been featured in recent issues of *UCN* (see Tables below) offer a glimpse of how these efforts are advancing. Thanks again to Helen for identifying these activities and facilitating their publication here, and I invite you to contact her at Helen.Ward@uibk.ac.at if you are interested in sharing your material with the urban climate community.

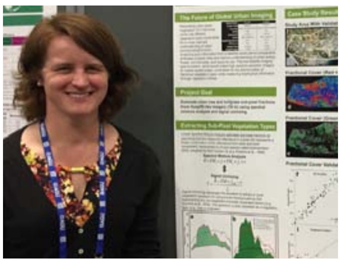
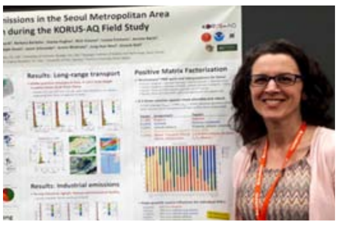
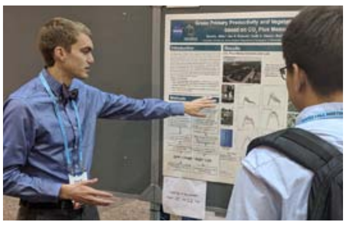
Another indicator of the vitality of our field is the sheer number of international gatherings devoted to urban climate-related themes. Special reports on recent conferences and announcements of those upcoming are all overseen by Joe (mcfadden@ucsb.edu), and I urge you to let him know about any such events – past or future – that would be of interest to our readers. Likewise, you can add to the ever-growing database of urban climate publications by contacting Matthias (matthias.demuzere@ugent.be), Chair of the (also ever-growing) Bibliography Committee.

For all those attending ICUC10, I wish you an enjoyable time in NYC as well as a stimulating conference – and I look forward to seeing you there!

— *David Pearlmutter, Editor*

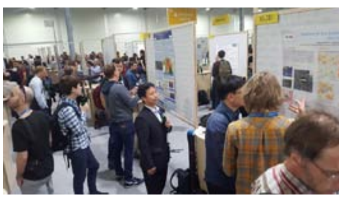
Feature Articles	Author(s)	Issue
Linking indoor climates to weather, human behaviour and building design	Anna Mavrogianni et al.	March 2017
HUMINEX: The HUMan INfluence EXperiment to evaluate the quality of crowdsourced data on urban morphology	Marie-Leen Verdonck et al.	June 2017
Mitigating urban heat islands: Does research support the needs of policy makers?	Or Aleksandrowicz et al.	September 2017
Urban Multi-scale Environmental Predictor – An extensive tool for climate services in urban areas	Fredrik Lindberg et al.	December 2017
Urban Aerodynamic Roughness and Wind-Speed Estimation	Christoph W. Kent et al.	March 2018
Micrometeorology of an ephemeral city: the Burning Man experiment	Andrew Oliphant et al.	June 2018

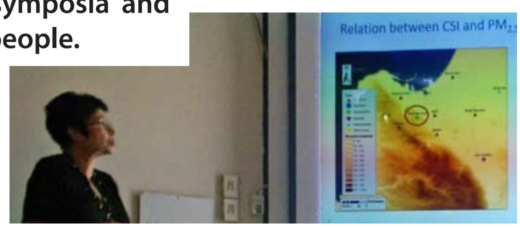
Urban Project Reports	Author(s)	Issue
On the intensity of methane exchange between the urban surface and atmosphere: Are cities comparable sources of methane to wetlands?	Włodzimierz Pawlak et al.	March 2017
The effects of Urban Cool Island measures on outdoor climate: Simulations for a new district of Toulouse, France	Tathiane Martins et al.	March 2017
Soil respiration across the greater Boston area; a substantial source of CO_2 to the atmosphere	Stephen M. Decina	June 2017
Urban cooling from heat mitigation strategies: Systematic review of the numerical modeling literature	Scott Krayenhoff et al.	June 2017
Urban Climate Summer School (Romania) – Key Outcomes, Lessons Learned and Future Directions	Sorin Cheval et al.	September 2017
Insights from more than ten years of CO2 flux measurements in the city of Basel, Switzerland	Christian Feigenwinter et al.	September 2017
Single-column Urban Boundary Layer Inter-comparison Modelling Experiment (SUBLIME): Call for participation	Gert-Jan Steeneveld et al.	December 2017
Crowdsourcing urban air temperatures from citizen weather stations	Fred Meier et al.	December 2017
Are detailed urban parameter datasets highly relevant for urban climate modelling?	Oscar Brousse et al.	March 2018
How high-resolution large-eddy simulation modelling is used to support urban planning in Helsinki, Finland	Mona Kurppa et al.	March 2018
Urban climate studies in Glasgow: Antecedents to future directions	Rohinton Emmanuel et al.	June 2018




Special Reports in recent issues have highlighted the diversity of international conferences, symposia and other gatherings related to climate and people.



Recent Urban Climate Publications

Acero JA, Arrizabalaga J (2018) Evaluating the performance of ENVI-met model in diurnal cycles for different meteorological conditions. *Theoretical and Applied Climatology* 131:455–469.

Adnan MN, Safeer R, Rashid A (2018) Consumption based approach of carbon footprint analysis in urban slum and non-slum areas of Rawalpindi. *Habitat International* 73:16-24.

Aerts JCJH, Botzen WJ, Clarke KC, Cutter SL, Hall JW, Merz B, Michel-Kerjan E, Mysiak J, Surminski S, Kunreuther H (2018) Integrating human behaviour dynamics into flood disaster risk assessment. *Nature Climate Change* 8:193-199.

Ali H, Mishra V (2018) Contributions of Dynamic and Thermodynamic Scaling in Subdaily Precipitation Extremes in India. *Geophysical Research Letters* 45:2352–2361.

Ali SB, Patnaik S (2018) Thermal comfort in urban open spaces: Objective assessment and subjective perception study in tropical city of Bhopal, India. *Urban Climate* 24:954 - 967.

Aliyu YA, Botai JO (2018) Appraising city-scale pollution monitoring capabilities of multi-satellite datasets using portable pollutant monitors. *Atmospheric Environment* 179:239-249.

Allegrini J, Carmeliet J (2018) Simulations of local heat islands in Zürich with coupled CFD and building energy models. *Urban Climate* 24:340 - 359.

Alsahli MM, Al-Harbi M (2018) Allocating optimum sites for air quality monitoring stations using GIS suitability analysis. *Urban Climate* 24:875 - 886.

Alves CA, Evtyugina M, Vicente AMP, Vicente ED, Nunes TV, Silva PMA, Duarte MAC, Pio CA, Amato F, Querol X (2018) Chemical profiling of PM10 from urban road dust. *Science of The Total Environment* 634:41-51.

Amani-Beni M, Zhang B, Xie G-d, Xu J (2018) Impact of urban park's tree, grass and waterbody on microclimate in hot summer days: A case study of Olympic Park in Beijing, China. *Urban Forestry & Urban Greening* 32:1-6.

Ayet A, Tandeo P (2018) Nowcasting solar irradiance using an analog method and geostationary satellite images. *Solar Energy* 164:301 - 315.

Azam M-H, Bernard J, Morille B, Musy M, Andrieu H (2018) A pavement-watering thermal model for SOLENE-microclimat: Development and evaluation. *Urban Climate* 25:22-36.

Azam M-H, Morille B, Bernard J, Musy M, Rodriguez F (2018) A new urban soil model for SOLENE-microclimat: Review, sensitivity analysis and validation on a car park. *Urban Climate* 24:728 - 746.

In this edition is a list of publications that have come out between **March and May 2018**. As usual, papers published since this date are welcome for inclusion in the next newsletter and IAUC online database. Please send your references to the email address below with a header "IAUC publications" and the following format: Author, Title, Journal, Year, Volume, Issue, Pages, Dates, Keywords, URL, and Abstract. Please send the references **in a .bib format**.

As of this month, Qunshan Zhao from the School of Geographical Sciences & Urban Planning (Arizona State University, USA) joined the BibCom team. Note that we are always looking for (young) researchers to join and contribute to the Committee. If you are interested to join or would like to receive more information, please let me know via the email address below.

Regards,

Matthias Demuzere

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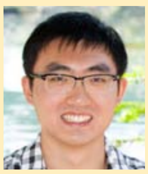
Qunshan Zhao

Azenas V, Cuxart J, Picos R, Medrano H, Simo G, Lopez-Grifol A, Gulias J (2018) Thermal regulation capacity of a green roof system in the mediterranean region: The effects of vegetation and irrigation level. *Energy and Buildings* 164:226 - 238.

Baalbaki R, Nassar J, Salloum S, Shihadeh AL, Lakkis I, Saliba NA (2018) Comparison of atmospheric polycyclic aromatic hydrocarbon levels in three urban areas in Lebanon. *Atmospheric Environment* 179:260-267.

Bai X, Dawson RJ, Urge-Vorsatz D, Delgado GC, Barau AS, Dhakal S, Dodman D, Leonardsen L, Masson-Delmotte V, Roberts D, Schultz S (2018) Six research priorities for cities and climate change. *Nature* 555:19-21.

Bai Z, Cui X, Wang X, Xie H, Chen B (2018) Light absorption of black carbon is doubled at Mt. Tai and typical urban area in North China. *Science of The Total Environment* 635:1144-1151.

Bocher E, Petit G, Bernard J, Palominos S (2018) A geoprocessing framework to compute urban indicators: The MApUCE tools chain. *Urban Climate* 24:153 - 174.

Busch H, Bendlin L, Fenton P (2018) Shaping local response – The influence of transnational municipal climate networks on urban climate governance. *Urban Climate* 24:221 - 230.

Cai M, Ren C, Xu Y, Lau KK-L, Wang R (2018) Investigating the relationship between local climate zone and land surface temperature using an improved WUDAPT methodology – A case study of Yangtze River Delta, China. *Urban Climate* 24:485 - 502.

Casas-Castillo MC, Rodríguez-Solà R, Navarro X, Russo B, Lastra A, González P, Redaño A (2018) On the consideration of scaling properties of extreme rainfall in Madrid (Spain) for developing a generalized intensity-duration-frequency equation and assessing probable maximum precipitation estimates. *Theoretical and Applied Climatology* 131:573–580.

Cheng C, Bi C, Wang D, Yu Z, Chen Z (2018) Atmospheric deposition of polycyclic aromatic hydrocarbons (PAHs) in Shanghai: the spatio-temporal variation and source identification. *Frontiers of Earth Science* 12:63-71.

Cheng L, Li S, Xu H, Liu X, Mao J, Ruan X, Li M (2018) Calculating potential of solar energy and CO2 emissions reduction for city-scale buildings based on 3D remote sensing technologies. *Remote Sensing of Environment* 209:612-632.

Chui AC, Gittelson A, Sebastian E, Stamler N, Gaffin SR (2018) Urban heat islands and cooler infrastructure – Measuring near-surface temperatures with hand-held infrared cameras. *Urban Climate* 24:51 - 62.

Cindori M, Juretic F, Kozmar H, Dzijan I (2018) Steady RANS model of the homogeneous atmospheric boundary layer. *Journal of Wind Engineering and Industrial Aerodynamics* 173:289–301.

Crawford B, Krayenhoff E, Cordy P (2018) The urban energy balance of a lightweight low-rise neighborhood in Andacollo, Chile. *Theoretical and Applied Climatology* 131:55–68.

Cyranoski D (2018) China tests giant air cleaner to combat urban smog. *Nature* 555:152-153.

Dai Y, Mak CM, Ai Z, Hang J (2018) Evaluation of computational and physical parameters influencing CFD simulations of pollutant dispersion in building arrays. *Building and Environment* 137:90 - 107.

De B, Mukherjee M (2018) "Optimisation of canyon orientation and aspect ratio in warm-humid climate: Case of Rajarhat Newtown, India". *Urban Climate* 24:887 - 920.

Deilami K, Kamruzzaman M, Liu Y (2018) Urban heat island effect: A systematic review of spatio-temporal factors, data, methods, and mitigation measures. International *Journal of Applied Earth Observation and Geoinformation* 67:30-42.

Desai MS, Dhorde AG (2018) Trends in thermal discomfort indices over western coastal cities of India. *Theoretical and Applied Climatology* 131:1305–1321.

Dhunny AZ, Samkhaniani N, Lollchund MR, Rughooputh SDDV (2018) Investigation of multi-level wind flow characteristics and pedestrian comfort in a tropical city. *Urban Climate* 24:185 - 204.

Di-Bernardino A, Monti P, Leuzzi G, Querzoli G (2018) Pollutant fluxes in two-dimensional street canyons. *Urban Climate* 24:80 - 93.

Dilimulati A, Stathopoulos T, Paraschivoiu M (2018) Wind turbine designs for urban applications: A case study of shrouded diffuser casing for turbines. *Journal of Wind Engineering and Industrial Aerodynamics* 175:179–192.

Dimitriou K, Kassomenos P (2018) Day by day evolution of a vigorous two wave Saharan dust storm – Thermal and air quality impacts. *Atmósfera* 31:105-124.

Dong G, Weng B, Qin T, Yan D, Wang H, Gong B, Bi W, Xing Z (2018) The Impact of the Construction of Sponge Cities on the Surface Runoff in Watersheds, China. *Advances in Meteorology*

Dong L, Mitra C, Greer S, Burt E (2018) The Dynamical Linkage of Atmospheric Blocking to Drought, Heatwave and Urban Heat Island in Southeastern US: A Multi-Scale Case Study. *Atmosphere* 9:

Du M, Zhang M, Wang S, Zhu X, Che Y (2018) Near-surface air temperature lapse rates in Xinjiang, northwestern China. *Theoretical and Applied Climatology* 131:1221–1234.

Duan G, Ngan K (2018) Effects of Time-Dependent Inflow Perturbations on Turbulent Flow in a Street Canyon. *Boundary-layer Meteorology* 167:257–284.

Egusquiza A, Prieto I, Izkara JL, Bejar R (2018) Multi-scale urban data models for early-stage suitability assessment of energy conservation measures in historic urban areas. *Energy and Buildings* 164:87 - 98.

Elser M, El-Haddad I, Maasikmets M, Bozzetti C, Wolf R, Ciarelli G, Slowik JG, Richter R, Teinemaa E, Huglin C, Baltensperger U, Prevot ASH (2018) High contributions of vehicular emissions to ammonia in three European cities derived from mobile measurements. *Atmospheric Environment* 175:210-220.

Evariste FF, Jean SD, Victor K, Claudia M (2018) Assessing climate change vulnerability and local adaptation strategies in adjacent communities of the Kribi-Campo coastal ecosystems, South Cameroon. *Urban Climate* 24:1037 - 1051.

Ferwati S, Skelhorn C, Shandas V, Voelkel J, Shawish A, Ghanim M (2018) Analysis of urban heat in a corridor environment – The case of Doha, Qatar. *Urban Climate* 24:692 - 702.

Fix MJ, Cooley D, Hodzic A, Gilleland E, Russell BT, Porter WC, Pfister GG (2018) Observed and predicted sensitivities of extreme surface ozone to meteorological drivers in three US cities. *Atmospheric Environment* 176:292-300.

Fomba KW, van Pinxteren D, Mueller K, Spindler G, Herrmann H (2018) Assessment of trace metal levels in size-resolved particulate matter in the area of Leipzig. *Atmospheric Environment* 176:60-70.

de Foy B (2018) City-level variations in NOx emissions derived from hourly monitoring data in Chicago. *Atmospheric Environment* 176:128-139.

Freitag BM, Nair US, Niyogi D (2018) Urban Modification of Convection and Rainfall in Complex Terrain. *Geophysical Research Letters* 45:2507–2515.

Gao Y, Lee X, Liu S, Hu N, Wei X, Hu C, Liu C, Zhang Z, Yang Y (2018) Spatiotemporal variability of the near-surface CO2 concentration across an industrial-urban-rural transect, Nanjing, China. *Science of The Total Environment* 631-632:1192-1200.

Garau M, Badas MG, Ferrari S, Seoni A, Querzoli G (2018) Turbulence and Air Exchange in a Two-Dimensional Urban Street Canyon Between Gable Roof Buildings. *Boundary-layer Meteorology* 167:123–143.

Garcia-Alcega S, Nasir ZA, Ferguson R, Noël C, Cravo-Laureau C, Whitby C, Dumbrell AJ, Colbeck I, Tyrrel S, Coulon F (2018) Can chemical and molecular biomarkers help discriminate between industrial, rural and urban environments? *Science of The Total Environment* 631-632:1059-1069.

García-Pérez S, Sierra-Pérez J, Boschmonart-Rives J (2018) Environmental assessment at the urban level combining LCA-GIS methodologies: A case study of energy retrofits in the Barcelona metropolitan area. *Building and Environment* 134:191 - 204.

Garcia-Yee JS, Torres-Jardon R, Barrera-Huertas H, Castro T, Peralta O, Garcia M, Gutierrez W, Robles M, Torres-Jaramillo JA, Ortinez-Alvarez A, Ruiz-Suarez LG (2018) Characterization of NOx-O-x relationships during daytime interchange of air masses over a mountain pass in the Mexico City megalopolis. *Atmospheric Environment* 177:100-110.

Garuma GF (2018) Review of urban surface parameterizations for numerical climate models. *Urban Climate* 24:830 - 851.

Garuma GF, Blanchet J-P, Girard É, Leduc M (2018) Urban surface effects on current and future climate. *Urban Climate* 24:121 - 138.

Ghazalli AJ, Brack C, Bai X, Said I (2018) Alterations in use of space, air quality, temperature and humidity by the presence of vertical greenery system in a building corridor. *Urban Forestry & Urban Greening* 32:177-184.

Ghobadi A, Khosravi M, Tavousi T (2018) Surveying of Heat waves Impact on the Urban Heat Islands: Case study, the Karaj City in Iran. *Urban Climate* 24:600 - 615.

Girard P, Nadeau DF, Pardyjak ER, Overby M, Willemsen P, Stoll R, Bailey BN, Parlange MB (2018) Evaluation of the QUIC-URB wind solver and QESRadiant radiation-transfer model using a dense array of urban meteorological observations. *Urban Climate* 24:657 - 674.

Glumac AS, Hemida H, Hoffer R (2018) Wind energy potential above a high-rise building influenced by neighboring buildings: An experimental investigation. *Journal of Wind Engineering and Industrial Aerodynamics* 175:32–42.

Gong F-Y, Zeng Z-C, Zhang F, Li X, Ng E, Norford LK (2018) Mapping sky, tree, and building view factors of street canyons in a high-density urban environment. *Building and Environment* 134:155 - 167.

Gough H, Sato T, Halios C, Grimmond CSB, Luo Z, Barlow JF, Robertson A, Hoxey R, Quinn A (2018) Effects of variability of local winds on cross ventilation for a simplified building within a full-scale asymmetric array: Overview of the Silsoe field campaign. *Journal of Wind Engineering and Industrial Aerodynamics* 175:408–418.

Goulart EV, Coceal O, Belcher SE (2018) Dispersion of a Passive Scalar Within and Above an Urban Street Network. *Boundary-layer Meteorology* 166:351–366.

Gu Y, Li D (2018) A modeling study of the sensitivity of urban heat islands to precipitation at climate scales. *Urban Climate* 24:982 - 993.

H. Silva III, Fillpot B (2018) Modeling nexus of urban heat island mitigation strategies with electricity/power usage and consumer costs: a case study for Phoenix, Arizona, USA. *Theoretical and Applied Climatology* 131:661–669.

H.T.Choy L, Ho WK (2018) Building a low carbon China through Coasean bargaining. *Habitat International* 75:139-146.

Halios CH, Barlow JF (2018) Observations of the Morning Development of the Urban Boundary Layer Over London, UK, Taken During the ACTUAL Project. *Boundary-layer Meteorology* 166:395–422.

Han S, Liu J, Hao T, Zhang Y, Li P, Yang J, Wang Q, Cai Z, Yao Q, Zhang M, Wang X (2018) Boundary layer structure and scavenging effect during a typical winter haze fog episode in a core city of BTH region, China. *Atmospheric Environment* 179:187-200.

Hang HT, Rahman A (2018) Characterization of thermal environment over heterogeneous surface of National Capital Region (NCR), India using LANDSAT-8 sensor for regional planning studies. *Urban Climate* 24:1 - 18.

Hao Y, Xie S (2018) Optimal redistribution of an urban air quality monitoring network using atmospheric dispersion model and genetic algorithm. *Atmospheric Environment* 177:222-233.

Hardin AW, Liu Y, Cao G, Vanos JK (2018) Urban heat island intensity and spatial variability by synoptic weather type in the northeast U.S. *Urban Climate* 24:747 - 762.

Hatvani-Kovacs G, Bush Judy andv E, Boland J (2018) Policy recommendations to increase urban heat stress resilience. *Urban Climate* 25:51 - 63.

He B-J (2018) Potentials of meteorological characteristics and synoptic conditions to mitigate urban heat island effects. *Urban Climate* 24:26 - 33.

He Y, Tablada A, Wong NH (2018) Effects of non-uniform and orthogonal breezeway networks on pedestrian ventilation in Singapore's high-density urban environments. *Urban Climate* 24:460 - 484.

He Y, Wu Z, Liu X, Deng F (2018) Analysis of surface air temperature variations and local urbanization effects on central Yunnan Plateau, SW China. *Theoretical and Applied Climatology* 131:101–110.

Hernandez-Paniagua IY, Lowry D, Clemitshaw KC, Palmer PI, Fisher RE, France JL, Mendoza A, O'Doherty S, Forster G, Lanoiselle M, Nisbet EG (2018) Diurnal, seasonal, and annual trends in tropospheric CO in Southwest London during 2000-2015: Wind sector analysis and comparisons with urban and remote sites. *Atmospheric Environment* 177:262-274.

Hintz MJ, Luederitz C, Lang DJ, Wehrden Hv (2018) Facing the heat: A systematic literature review exploring the transferability of solutions to cope with urban heat waves. *Urban Climate* 24:714 - 727.

Huang Q, Lu Y (2018) Urban heat island research from 1991 to 2015: a bibliometric analysis. *Theoretical and Applied Climatology* 131:1055–1067.

Huszar P, Karlicky J, Belda M, Halenka T, Pisoft P (2018) The impact of urban canopy meteorological forcing on summer photochemistry. *Atmospheric Environment* 176:209-228.

Hutchins MG, Abesser C, Prudhomme C, Elliott JA, Bloomfield JP, Mansour MM, Hitt OE (2018) Combined impacts of future land-use and climate stressors on water resources and quality in groundwater and surface waterbodies of the upper Thames river basin, UK. *Science of The Total Environment* 631-632:962-986.

Iftikhar M, Alam K, Sorooshian A, Syed WA, Bibi S, Bibi H (2018) Contrasting aerosol optical and radiative properties between dust and urban haze episodes in megacities of Pakistan. *Atmospheric Environment* 173:157-172.

Imran HM, Kala J, Ng AWM, Muthukumaran S (2018) An evaluation of the performance of a WRF multi-physics ensemble for heatwave events over the city of Melbourne in southeast Australia. Climate Dynamics 50:2553-2586.

James CA, John CM, Menon R (2018) Assessment of spatio-temporal changes in terrestrial carbon sequestration due to Kochi metro rail project in India. *Urban Climate* 24:703 - 713.

Jandaghian Z, Touchaei AG, Akbari H (2018) Sensitivity analysis of physical parameterizations in WRF for urban climate simulations and heat island mitigation in Montreal. *Urban Climate* 24:577 - 599.

Jhaldiyal A, Gupta K, Gupta PK, Thakur P, Kumar P (2018) Urban morphology extractor: a spatial tool for characterizing urban morphology. *Urban Climate* 24:237 - 246.

Jiang L, Zhan W, Voogt J, Zhao L, Gao L, Huang F, Cai Z, Ju W (2018) Remote estimation of complete urban surface temperature using only directional radiometric temperatures. *Building and Environment* 135:224 - 236.

Johnson B, Shepherd JM (2018) An urban-based climatology of winter precipitation in the northeast United States. *Urban Climate* 24:205 - 220.

Kandya A, Mohan M (2018) Mitigating the Urban Heat Island effect through building envelope modifications. *Energy and Buildings* 164:266 - 277.

Kantor N, Gal CV, Gulyas A, Unger J (2018) The Impact of Facade Orientation and Woody Vegetation on Summertime Heat Stress Patterns in a Central European Square: Comparison of Radiation Measurements and Simulations. *Advances in Meteorology*

Kashima S, Yorifuji T, Sawada N, Nakaya T, Eboshida A (2018) Comparison of land use regression models for NO2 based on routine and campaign monitoring data from an urban area of Japan. *Science of The Total Environment* 631-632:1029-1037.

Kennedy C, Stewart ID, Westphal MI, Facchini A, Mele R (2018) Keeping global climate change within 1.5°C through net negative electric cities. *Current Opinion in Environmental Sustainability* 30:18 - 25.

Kent CW, Grimmond CSB, Gatey D, Barlow JF (2018) Assessing methods to extrapolate the vertical wind-speed profile from surface observations in a city centre during strong winds. *Journal of Wind Engineering and Industrial Aerodynamics* 173:100–111.

Khalifa A, Bouzouidja R, Marchetti M, Buès M, Bouilloud L, Martin E, Chancibaut K (2018) Individual contributions of anthropogenic physical processes associated to urban traffic in improving the road surface temperature forecast using TEB model. *Urban Climate* 24:778 - 795.

Khalil HAEE, Ibrahim A, Elgendy N, Makhlouf N (2018) Could/should improving the urban climate in informal areas of fast-growing cities be an integral part of upgrading processes? Cairo case. *Urban Climate* 24:63 - 79.

Kikumoto H, Ooka R, Han MT, Nakajima K (2018) Consistency of mean wind speed in pedestrian wind environment analyses: Mathematical consideration and a case study using large-eddy simulation. *Journal of Wind Engineering and Industrial Aerodynamics* 173:91–99.

Kirshen P, Aytur S, Hecht J, Walker A, Burdick D, Jones S, Fennessey N, Bourdeau R, Mather L (2018) Integrated urban water management applied to adaptation to climate change. *Urban Climate* 24:247 - 263.

Kirthiga SM, Patel NR (2018) Impact of updating land surface data on micrometeorological weather simulations from the WRF model. *Atmósfera* 31:165-183.

Kotharkar R, Bagade A (2018) Local Climate Zone classification for Indian cities: A case study of Nagpur. *Urban Climate* 24:369 - 392.

Kotharkar R, Ramesh A, Bagade A (2018) Urban Heat Island studies in South Asia: A critical review. *Urban Climate* 24:1011 - 1026.

Kovalets IV, Efthimiou GC, Andronopoulos S, Venetsanos AG, Argyropoulos CD, Kakosimos KE (2018) Inverse identification of unknown finite-duration air pollutant release from a point source in urban environment. *Atmospheric Environment* 181:82-96.

Krähenmann S, Walter A, Brienen S, Imbery F, Matzarakis A (2018) High-resolution grids of hourly meteorological variables for Germany. *Theoretical and Applied Climatology* 131:899–926.

Kubilay A, Derome D, Carmeliet J (2018) Coupling of physical phenomena in urban microclimate: A model integrating air flow, wind-driven rain, radiation and transport in building materials. *Urban Climate* 24:398 - 418.

Kyriakodis GE, Santamouris M (2018) Using reflective pavements to mitigate urban heat island in warm climates - Results from a large scale urban mitigation project. *Urban Climate* 24:326 - 339.

Lai J, Zhan W, Huang F, Quan J, Hu L, Gao L, Ju W (2018) Does quality control matter? Surface urban heat island intensity variations estimated by satellite-derived land surface temperature products. *ISPRS Journal of Photogrammetry and Remote Sensing* 139:212-227.

Lai LW (2018) The influence of urban heat island phenomenon on PM concentration: an observation study during the summer half-year in metropolitan Taipei, Taiwan. *Theoretical and Applied Climatology* 131:227–243.

Lee D, Oh K (2018) Classifying urban climate zones (UCZs) based on statistical analyses. *Urban Climate* 24:503 - 516.

Lee D, Woo J, Lee S (2018) An analytically based numerical method for computing view factors in real urban environments. *Theoretical and Applied Climatology* 131:445–453.

Lee H, Mayer H (2018) Maximum extent of human heat stress reduction on building areas due to urban greening. *Urban Forestry & Urban Greening* 32:154-167.

Leroyer S, Belair S, Spacek L, Gultepe I (2018) Modelling of radiation-based thermal stress indicators for urban numerical weather prediction. *Urban Climate* 25:64 - 81.

Levermore G, Parkinson J, Lee K, Laycock P, Lindley S (2018) The increasing trend of the urban heat island intensity. *Urban Climate* 24:360 - 368.

Lewis AC (2018) The changing face of urban air pollution. *Science* 359:744 - 745.

Li HF, Cui GX, Zhang ZS (2018) A New Scheme for the Simulation of Microscale Flow and Dispersion in Urban Areas by Coupling Large-Eddy Simulation with Mesoscale Models. *Boundary-layer Meteorology* 167:145–170.

Li S, Zhu M, Yang W, Tang M, Huang X, Yu Y, Fang H, Yu X, Yu Q, Fu X, Song W, Zhang Y, Bi X, Wang X (2018) Filter-based measurement of light absorption by brown carbon in PM2.5 in a megacity in South China. *Science of The Total Environment* 633:1360-1369.

Li W, Li L, Chen C-l, Kacarab M, Peng W, Price D, Xu J, Cocker III DR (2018) Potential of select intermediatevolatility organic compounds and consumer products for secondary organic aerosol and ozone formation under relevant urban conditions. *Atmospheric Environment* 178:109-117.

Li W, Zhou Y, Cetin KS, Yu S, Wang Y, Liang B (2018) Developing a landscape of urban building energy use with improved spatiotemporal representations in a cool-humid climate. *Building and Environment* 136:107 - 117.

Li Y, Ren T, Kinney PL, Joyner A, Zhang W (2018) Projecting future climate change impacts on heat-related mortality in large urban areas in China. *Environmental Research* 163:171-185.

Liu L, Tans PP, Xia L, Zhou L, Zhang F (2018) Analysis of patterns in the concentrations of atmospheric greenhouse gases measured in two typical urban clusters in China. *Atmospheric Environment* 173:343-354.

Liu T, Marlier ME, DeFries RS, Westervelt DM, Xia KR, Fiore AM, Mickley LJ, Cusworth DH, Milly G (2018) Seasonal impact of regional outdoor biomass burning on air pollution in three Indian cities: Delhi, Bengaluru, and Pune. *Atmospheric Environment* 172:83-92.

Liu Y, Li T, Peng H (2018) A new structure of permeable pavement for mitigating urban heat island. *Science of The Total Environment* 634:1119-1125.

Lontorfos V, Efthymiou C, Santamouris M (2018) On the time varying mitigation performance of reflective geoengineering technologies in cities. *Renewable Energy* 115:926-930.

Mason SG, Fragkias M (2018) Metropolitan planning organizations and climate change action. *Urban Climate* 25:37-50.

Matsuda K, Onishi R, Takahashi K (2018) Tree-crown-resolving large-eddy simulation coupled with three-dimensional radiative transfer model. *Journal of Wind Engineering and Industrial Aerodynamics* 173:53–66.

McDonald BC, de Gouw JA, Gilman JB, Jathar SH, Akherati A, Cappa CD, Jimenez JL, Lee-Taylor J, Hayes PL, McKeen SA, Cui YY, Kim S-W, Gentner DR, Isaacman-VanWertz G, Goldstein AH, Harley RA, Frost GJ, Roberts JM, Ryerson TB, Trainer M (2018) Volatile chemical products emerging as largest petrochemical source of urban organic emissions. *Science* 359:760-764.

Merrouni AA, Elalaoui FE, Ghennioui A, Mezrhab A, Mezrhab A (2018) A GIS-AHP combination for the sites assessment of large-scale CSP plants with dry and wet cooling systems. Case study: Eastern Morocco. *Solar Energy* 166:2-12.

Miller L, Xu X, Wheeler A, Zhang T, Hamadani M, Ejaz U (2018) Evaluation of missing value methods for predicting ambient BTEX concentrations in two neighbouring cities in Southwestern Ontario Canada. *Atmospheric Environment* 181:126-134.

Millstein D, Levinson R (2018) Preparatory meteorological modeling and theoretical analysis for a neighborhood-scale cool roof demonstration. *Urban Climate* 24:616-632.

Mo Z, Liu C-H (2018) Wind tunnel measurements of pollutant plume dispersion over hypothetical urban areas. *Building and Environment* 132:357-366.

Mo Z, Liu C-H (2018) A wind tunnel study of ventilation mechanism over hypothetical urban roughness: The role of intermittent motion scales. *Building and Environment* 135:94-103.

Montecinos S, Cereceda P, Rivera D (2018) Fog collection and its relationship with local meteorological variables in a semiarid zone in Chile. *Atmósfera* 31:143-153.

Morakinyo TE, Lau KK-L, Ren C, Ng E (2018) Performance of Hong Kong>s common trees species for outdoor temperature regulation, thermal comfort and energy saving. *Building and Environment* 137:157 - 170.

Morini E, Touchaei AG, Rossi F, Cotana F, Akbari H (2018) Evaluation of albedo enhancement to mitigate impacts of urban heat island in Rome (Italy) using WRF meteorological model. *Urban Climate* 24:551 - 566.

Munoz D, Beckers B, Besuievsky G, Patow G (2018) A technique for massive sky view factor calculations in large cities. *International Journal of Remote Sensing* 39:4040-4058.

Nakajima K, Ooka R, Kikumoto H (2018) Evaluation of k-epsilon Reynolds stress modeling in an idealized urban canyon using LES. *Journal of Wind Engineering and Industrial Aerodynamics* 175:213–228.

Nazarian N, Martilli A, Kleissl J (2018) Impacts of Realistic Urban Heating, Part I: Spatial Variability of Mean Flow, Turbulent Exchange and Pollutant Dispersion. *Boundary-layer Meteorology* 166:367–393.

Nemeth Z, Rosati B, Zikova N, Saima I, Bozo L, de Espana CD, Schwarz J, Zdimal V, Wonaschuetz A (2018) Comparison of atmospheric new particle formation events in three Central European cities. *Atmospheric Environment* 178:191-197.

Nice KA, Andrew Coutts M, Tapper NJ (2018) Development of the VTUF-3D v1.0 urban micro-climate model to support assessment of urban vegetation influences on human thermal comfort. *Urban Climate* 24:1052 - 1076.

Opoku R, Mensah-Darkwa K, Muntaka AS (2018) Techno-economic analysis of a hybrid solar PV-grid powered air-conditioner for daytime office use in hot humid climates? A case study in Kumasi city, Ghana. *Solar Energy* 165:65-74.

Palmer D, Koubli E, Cole I, Betts T, Gottschalg R (2018) Satellite or ground-based measurements for production of site specific hourly irradiance data: Which is most accurate and where? *Solar Energy* 165:240-255.

Pani SK, Lin N-H, Chantara S, Wang S-H, Khamkaew C, Prapamontol T, Janjai S (2018) Radiative response of biomass-burning aerosols over an urban atmosphere in northern peninsular Southeast Asia. *Science of The Total Environment* 633:892-911.

Panwar M, Agarwal A, Devadas V (2018) Analyzing land surface temperature trends using non-parametric approach: A case of Delhi, India. *Urban Climate* 24:19 - 25.

Peng J, Ma J, Liu Q, Liu Y, Hu Y, Li Y, Yue Y (2018) Spatial-temporal change of land surface temperature across 285 cities in China: An urban-rural contrast perspective. *Science of The Total Environment* 635:487-497.

Placidi M, Ganapathisubramani B (2018) Turbulent Flow Over Large Roughness Elements: Effect of Frontal and Plan Solidity on Turbulence Statistics and Structure. *Boundary-layer Meteorology* 167:99–121.

Pomerantz M (2018) Are cooler surfaces a cost-effect mitigation of urban heat islands? *Urban Climate* 24:393 - 397.

Potchter O, Cohen P, Lin T-P, Matzarakis A (2018) Outdoor human thermal perception in various climates: A comprehensive review of approaches, methods and quantification. *Science of The Total Environment* 631-632:390-406.

Pratt GC, Herbrandson C, Krause MJ, Schmitt C, Lippert CJ, McMahon CR, Ellickson KM (2018) Measurements of gas and particle polycyclic aromatic hydrocarbons (PAHs) in air at urban, rural and near-roadway sites. *Atmospheric Environment* 179:268-278.

Qaid A, Lamit H, Ossen DR, Rasidi MH (2018) Effect of the position of the visible sky in determining the sky view factor on micrometeorological and human thermal comfort conditions in urban street canyons. *Theoretical and Applied Climatology* 131:1083–1100.

Rao DVSKK, Premalatha M, Naveen C (2018) Models for forecasting monthly mean daily global solar radiation from in-situ measurements: Application in Tropical Climate, India. *Urban Climate* 24:921 - 939.

Reames LJ, Stensrud DJ (2018) Influence of a Great Plains Urban Environment on a Simulated Supercell. *Monthly Weather Review* 146:1437-1462.

Rodriguez RS, Urge-Vorsatz D, Barau AS (2018) Sustainable Development Goals and climate change adaptation in cities. *Nature Climate Change* 8:181-183.

Romanic D, Hangan H, Ćurić M (2018) Wind climatology of Toronto based on the NCEP/NCAR reanalysis 1 data and its potential relation to solar activity. *Theoretical and Applied Climatology* 131:827–843.

Rong Y, Panmao Z, Yanyu L Implications of differential effects between 1.5 and 2 °C global warming on temperature and precipitation extremes in China's urban agglomerations. *International Journal of Climatology* 38:2374-2385.

Rosso F, Golasi I, Castaldo VL, Piselli C, Pisello AL, Salata F, Ferrero M, Cotana F, Vollaro AdL (2018) On the impact of innovative materials on outdoor thermal comfort of pedestrians in historical urban canyons. *Renewable Energy* 118:825-839.

Saaroni H, Amorim JH, Hiemstra JA, Pearlmutter D (2018) Urban Green Infrastructure as a tool for urban heat mitigation: Survey of research methodologies and findings across different climatic regions. *Urban Climate* 24:94 - 110.

Sahay S (2018) Climatic variability and dengue risk in urban environment of Delhi (India). *Urban Climate* 24:863 - 874.

Salamanca F, Zhang Y, Barlage M, Chen F, Mahalov A, Miao S (2018) Evaluation of the WRF-Urban Modeling System Coupled to Noah and Noah-MP Land Surface Models Over a Semiarid Urban Environment. *Journal of Geophysical Research - Atmospheres* 123:2387-2408.

Sannigrahi S, Bhatt S, Rahmat S, Uniyal B, Banerjee S, Chakraborti S, Jha S, Lahiri S, Santra K, Bhatt A (2018) Analyzing the role of biophysical compositions in minimizing urban land surface temperature and urban heating. *Urban Climate* 24:803 - 819.

Santamouris M, Haddad S, Saliari M, Vasilakopoulou K, Synnefa A, Paolini R, Ulpiani G, Garshasbi S, Fiorito F (2018) On the energy impact of urban heat island in Sydney: Climate and energy potential of mitigation technologies. *Energy and Buildings* 166:154-164.

Sarangi C, Tripathi SN, Qian Y, Kumar S, Leung LR (2018) Aerosol and Urban Land Use Effect on Rainfall Around Cities in Indo-Gangetic Basin From Observations and Cloud Resolving Model Simulations. *Journal of Geophysical Research - Atmospheres* 123:3645-3667.

Saraswati, Sharma SK, Mandal TK (2018) Five-year measurements of ambient ammonia and its relationships with other trace gases at an urban site of Delhi, India. *Meteorology and Atmospheric Physics* 130:241–257.

Sasaki Y, Matsuo K, Yokoyama M, Sasaki M, Tanaka T, Sadohara S (2018) Sea breeze effect mapping for mitigating summer urban warming: For making urban environmental climate map of Yokohama and its surrounding area. *Urban Climate* 24:529 - 550.

Scaramboni C, Crispim CP, Toledo Jr. JC, Campos MLAM (2018) Investigating hydrogen peroxide in rainwater of a typical midsized city in tropical Brazil using a novel application of a fluorometric method. *Atmospheric Environment* 176:201-208.

Schinasi LH, Benmarhnia T, De Roos AJ (2018) Modification of the association between high ambient temperature and health by urban microclimate indicators: A systematic review and meta-analysis. *Environmental Research* 161:168-180.

Scungio M, Stabile L, Rizza V, Pacitto A, Russi A, Buonanno G (2018) Lung cancer risk assessment due to traffic-generated particles exposure in urban street canyons: A numerical modelling approach. *Science of The Total Environment* 631-632:1109-1116.

Sha C, Wang X, Lin Y, Fan Y, Chen X, Hang J (2018) The impact of urban open space and 'lift-up' building design on building intake fraction and daily pollutant exposure in idealized urban models. *Science of The Total Environment* 633:1314-1328.

Sharma MC, Pandey VK, Kumar R, Latief SU, Chakrawarthy E, Acharya P (2018) Seasonal characteristics of black carbon aerosol mass concentrations and influence of meteorology, New Delhi (India). *Urban Climate* 24:968 - 981.

Shi Y, Zhang Y (2018) Remote sensing retrieval of urban land surface temperature in hot-humid region. *Urban Climate* 24:299 - 310.

Shindell D, Faluvegi G, Seltzer K, Shindell C (2018) Quantified, localized health benefits of accelerated carbon dioxide emissions reductions. *Nature Climate Change* 8:291+.

Silva JS, da Silva RM, Santos CAG (2018) Spatiotemporal impact of land use/land cover changes on urban heat islands: A case study of Paço do Lumiar, Brazil. *Building and Environment* 136:279 - 292.

Solecki W, Rosenzweig C, Dhakal S, Roberts D, Barau AS, Schultz S, Urge-Vorsatz D (2018) City transformations in a 1.5 degrees C warmer world. *Nature Climate Change* 8:177-181.

Sousa J, García-Sánchez C, Gorlé C (2018) Improving urban flow predictions through data assimilation. *Building and Environment* 132:282 - 290.

Stergiopoulou A, Katavoutas G, Samoli E, Dimakopoulou K, Papageorgiou I, Karagianni P, Flocas H, Katsouyanni K (2018) Assessing the associations of daily respiratory symptoms and lung function in schoolchildren using an Air Quality Index for ozone: Results from the RESPOZE panel study in Athens, Greece. *Science of The Total Environment* 633:492-499.

Stewart ID, Kennedy CA, Facchini A, Mele R (2018) The Electric City as a Solution to Sustainable Urban Development. *Journal of Urban Technology* 25:3-20.

Takebayashi H, Senoo M (2018) Analysis of the relationship between urban size and heat island intensity using WRF model. *Urban Climate* 24:287 - 298.

Taleghani M (2018) The impact of increasing urban surface albedo on outdoor summer thermal comfort within a university campus. *Urban Climate* 24:175 - 184.

Taleghani M, Berardi U (2018) The effect of pavement characteristics on pedestrians' thermal comfort in Toronto. *Urban Climate* 24:449 - 459.

Teicher HM (2018) Practices and pitfalls of competitive resilience: Urban adaptation as real estate firms turn climate risk to competitive advantage. *Urban Climate* 25:9 - 21.

Templeton NP, Vivoni ER, Wang Z-H, Schreiner-McGraw AP (2018) Quantifying Water and Energy Fluxes Over Different Urban Land Covers in Phoenix, Arizona. *Journal of Geophysical Research - Atmospheres* 123:2111-2128.

Toy S, Aytaç As, Kántor N (2018) Human biometeorological analysis of the thermal conditions of the hot Turkish city of Şanliurfa. *Theoretical and Applied Climatology* 131:611–623.

Trombetti M, Thunis P, Bessagnet B, Clappier A, Couvidat F, Guevara M, Kuenen J, Lopez-Aparicio S (2018) Spatial inter-comparison of Top-down emission inventories in European urban areas. *Atmospheric Environment* 173:142-156.

Tsoka S, Tolika K, Theodosiou T, Tsikaloudaki K, Bikas D (2018) A method to account for the urban microclimate on the creation of 'typical weather year' datasets for building energy simulation, using stochastically generated data. *Energy and Buildings* 165:270 - 283.

Urge-Vorsatz D, Rosenzweig C, Dawson RJ, Rodriguez RS, Bai X, Barau AS, Seto KC, Dhakal S (2018) Locking in positive climate responses in cities. *Nature Climate Change* 8:174-177.

Varentsov M, Wouters H, Platonov V, Konstantinov P (2018) Megacity-Induced Mesoclimatic Effects in the Lower Atmosphere: A Modeling Study for Multiple Summers over Moscow, Russia. *Atmosphere* 9:

Vujović D, Todorović N (2018) Urban-rural fog differences in Belgrade area, Serbia. *Theoretical and Applied Climatology* 131:889–898.

Walters WW, Fang H, Michalski G (2018) Summertime diurnal variations in the isotopic composition of atmospheric nitrogen dioxide at a small midwestern United States city. *Atmospheric Environment* 179:1-11.

Wang D, Chen Y, Zhan W (2018) A geometric model to simulate thermal anisotropy over a sparse urban surface

(GUTA-sparse). *Remote Sensing of Environment* 209:263-274.

Wang J, Feng J, Yan Z (2018) Impact of Extensive Urbanization on Summertime Rainfall in the Beijing Region and the Role of Local Precipitation Recycling. *Journal of Geophysical Research - Atmospheres* 123:3323-3340.

Wang L, Guan Q, Wang F, Yang L, Liu Z (2018) Association between heating seasons and criteria air pollutants in three provincial capitals in northern China: Spatiotemporal variation and sources contribution. *Building and Environment* 132:233 - 244.

Wang Q, Wang J, Hou Y, Yuan R, Luo K, Fan J (2018) Micrositing of roof mounting wind turbine in urban environment: CFD simulations and lidar measurements. *Renewable Energy* 115:1118-1133.

Wang R, Ren C, Xu Y, Lau KK-L, Shi Y (2018) Mapping the local climate zones of urban areas by GIS-based and WUDAPT methods: A case study of Hong Kong. *Urban Climate* 24:567 - 576.

Wang WC, Chong WT, Chao TH (2018) Performance analysis of a cross-axis wind turbine from wind tunnel experiments. *Journal of Wind Engineering and Industrial Aerodynamics* 174:312–329.

Wang Y, Ni Z, Peng Y, Xia B (2018) Local variation of outdoor thermal comfort in different urban green spaces in Guangzhou, a subtropical city in South China. *Urban Forestry & Urban Greening* 32:99-112.

Wang Y, Wu Z, Ma N, Wu Y, Zeng L, Zhao C, Wiedensohler A (2018) Statistical analysis and parameterization of the hygroscopic growth of the sub-micrometer urban background aerosol in Beijing. *Atmospheric Environment* 175:184-191.

Wen H, Malki-Epshtein L (2018) A parametric study of the effect of roof height and morphology on air pollution dispersion in street canyons. *Journal of Wind Engineering and Industrial Aerodynamics* 175:328–341.

Wu CL, Chiang Y (2018) A geodesign framework procedure for developing flood resilient city. *Habitat International* 75:78-89.

Wu L, Zhang J (2018) Assessing population movement impacts on urban heat island of Beijing during the Chinese New Year holiday: effects of meteorological conditions. *Theoretical and Applied Climatology* 131:1203–1210.

Xie Y, Huang T, Li J, Liu J, Niu J, Mak CM, Lin Z (2018) Evaluation of a multi-nodal thermal regulation model for assessment of outdoor thermal comfort: Sensitivity to wind speed and solar radiation. *Building and Environment* 132:45 - 56.

Xie ZT, Fuka V (2018) A Note on Spatial Averaging and Shear Stresses Within Urban Canopies. *Boundary-layer Meteorology* 167:171–179.

Xu H, Shi T, Wang M, Fang C, Lin Z (2018) Predicting effect of forthcoming population growth?induced impervious surface increase on regional thermal environment: Xiong>an New Area, North China. *Building and Environment* 136:98 - 106.

Xu Q, Dong Y-x, Yang R (2018) Influence of land urbanization on carbon sequestration of urban vegetation: A temporal cooperativity analysis in Guangzhou as an example. *Science of The Total Environment* 635:26-34.

Xu X, Chen F, Shen S, Miao S, Barlage M, Guo W, Mahalov A (2018) Using WRF-Urban to Assess Summertime Air Conditioning Electric Loads and Their Impacts on Urban Weather in Beijing. *Journal of Geophysical Research - Atmospheres* 123:2475-2490.

Yang B, Olofsson T, Wang F, Lu W (2018) Thermal comfort in primary school classrooms: A case study under subarctic climate area of Sweden. *Building and Environment* 135:237 - 245.

Yang X, Yao L, Jin T, Peng LL, Jiang Z, Hu Z, Ye Y (2018) Assessing the thermal behavior of different local climate zones in the Nanjing metropolis, China. *Building and Environment* 137:171 - 184.

Ye W-F, Ma Z-Y, Ha X-Z (2018) Spatial-temporal patterns of PM2.5 concentrations for 338 Chinese cities. *Science of The Total Environment* 631-632:524-533.

Yin C, Yuan M, Lu Y, Huang Y, Liu Y (2018) Effects of urban form on the urban heat island effect based on spatial regression model. *Science of The Total Environment* 634:696-704.

Yokoyama H, Ooka R, Kikumoto H (2018) Study of mobile measurements for detailed temperature distribution in a high-density urban area in Tokyo. *Urban Climate* 24:517 - 528.

Yoo C, Im J, Park S, Quackenbush LJ (2018) Estimation of daily maximum and minimum air temperatures in urban landscapes using MODIS time series satellite data. *ISPRS Journal of Photogrammetry and Remote Sensing* 137:149-162.

Zeng Q, Wu Z, Jiang G, Li P, Ni Y, Li G, Pan X (2018) The association between inhalable particulate matter and YLL caused by COPD in a typical city in northern China. *Atmospheric Environment* 172:26-31.

Zengerling C (2018) Action on climate change mitigation in German and Chinese cities – A search for emerging patterns of accountability. *Habitat International* 75:147-153.

Zhang R, Sun X, Shi A, Huang Y, Yan j, Nie T, Yan X, Li X (2018) Secondary inorganic aerosols formation during haze episodes at an urban site in Beijing, China. *Atmospheric Environment* 177:275-282.

Zhang X, Chu Y, Wang Y, Zhang K (2018) Predicting daily PM2.5 concentrations in Texas using high-resolution satellite aerosol optical depth. *Science of The Total Environment* 631-632:904-911.

Zhang Y, Li XF (2018) A study of fresh air control in subway stations. *Journal of Wind Engineering and Industrial Aerodynamics* 175:384–390.

Zhao Q, Sailor DJ, Wentz EA (2018) Impact of tree locations and arrangements on outdoor microclimates and human thermal comfort in an urban residential environment. *Urban Forestry & Urban Greening* 32:81-91.

Zheng Y, Ren C, Xu Y, Wang R, Ho J, Lau K, Ng E (2018) GIS-based mapping of Local Climate Zone in the high-density city of Hong Kong. *Urban Climate* 24:419 - 448.

Zhou X, Chen H (2018) Impact of urbanization-related land use land cover changes and urban morphology changes on the urban heat island phenomenon. *Science of The Total Environment* 635:1467-1476.

Ziaul SK, Pal S (2018) Analyzing control of respiratory particulate matter on Land Surface Temperature in local climatic zones of English Bazar Municipality and Surroundings. *Urban Climate* 24:34 - 50.

Zou J, Sun J, Liu G, Yuan R, Zhang H (2018) Vertical Variation of the Effects of Atmospheric Stability on Turbulence Statistics Within the Roughness Sublayer Over Real Urban Canopy. *Journal of Geophysical Research - Atmospheres* 123:2017-2036.

Žuvela-Aloise M, Andre K, Schwaiger H, Bird DN, Gallaun H (2018) Modelling reduction of urban heat load in Vienna by modifying surface properties of roofs. *Theoretical and Applied Climatology* 131:1005–1018.

Upcoming Conferences...

INTERNATIONAL CONFERENCE ON THE MANAGEMENT OF ENERGY, CLIMATE AND AIR FOR A SUSTAINABLE SOCIETY MECAS2018
Havana, Cuba • July 4-6, 2018
https://mecas2018.com/

10TH INTERNATIONAL CONFERENCE ON URBAN CLIMATE (ICUC10) AND 14TH SYMPOSIUM ON THE URBAN ENVIRONMENT (SUE) OF THE AMERICAN METEOROLOGICAL SOCIETY (AMS)
New York, USA • August 6-10, 2018
https://www.ametsoc.org/ams/index.cfm/meetings-events/ams-meetings/10th-international-conference-on-urban-climate-14th-symposium-on-the-urban-environment/

EUROPEAN METEOROLOGICAL SOCIETY ANNUAL MEETING: SESSION ON "AIR POLLUTION, WEATHER AND CLIMATE AND THEIR MUTUAL INTERACTIONS FROM LOCAL/URBAN TO GLOBAL SCALES"
Budapest, Hungary • September 3-7, 2018
https://www.ems2018.eu/

SPIE REMOTE SENSING 2018 CONFERENCE ON "REMOTE SENSING TECHNOLOGIES AND APPLICATIONS IN URBAN ENVIRONMENTS"
Berlin, Germany • September 10-13, 2018
https://spie.org/ERS/conferencedetails/remote-sensing-technologies-and-applications-in-urban-environments

THIRD ICOS SCIENCE CONFERENCE: SESSION ON "URBAN GREENHOUSE GAS BUDGET – FROM NOVEL MONITORING NETWORKS TO SOURCE IDENTIFICATION"
Prague, Czech Republic • September 11-13, 2018
https://conference.icos-ri.eu/abstracts/

WORLD FORUM ON URBAN FORESTS: CHANGING THE NATURE OF CITIES
Mantua, Italy • November 28 - December 1, 2018
https://www.wfuf2018.com/

PASSIVE & LOW ENERGY ARCHITECTURE (PLEA 2018): SMART & HEALTHY WITHIN THE 2° LIMIT
Hong Kong, China • December 10-12, 2018
http://www.plea2018.org/

AMERICAN GEOPHYSICAL UNION FALL MEETING SESSION ON "URBAN AREAS AND GLOBAL CHANGE"
Washington, D.C., USA • December 10-14, 2018
https://fallmeeting.agu.org/2018/

Calls for Abstract submissions...

Urban Climate – Special Issue on "Urban Data and Climate Information Services" (deadline 15 July 2018)

Atmosphere – Special Issue on "Urban Climate" (deadline 31 December 2018)

10th International Conference on Urban Climate (ICUC-10)

August 6-10, 2018
New York City, USA

http://icuc10.ccny.cuny.edu/

More than 500 paid registrations have been received for ICUC-10 and both conference hotels are fully booked. The organizers anticipate about 600 conference attendees.

The program is now well defined and available from https://ams.confex.com/ams/ICUC10/meetingapp.cgi/Home/0

Work continues on some details of related events, including special guests. A number of conference related events are taking place in association with ICUC-10. These include:

- A GOES-R workshop hosted by NOAA with two groups, LST and aerosols.
- An IAUC sponsored Diversity and Equality on Urban Climate event (Monday 6 pm).
- Urban Climate Authors Charrette (Tuesday 6 pm): meet authors of recent books and monographs on urban climate who will be present to meet researchers, answer questions, and sign books.
- A practical workshop, led by Fredrik Lindberg, on the Urban Multi-scale Environmental Predictor (UMEP) Wednesday 1-5 pm. Pre-registration required.

Confirmed plenary speakers and their topics include:

Cynthia Rosenzweig (NASA, New York City), "Developing Climate Risk Information for Building Climate Resiliency in Cities"; **Chao Ren** (The Chinese University of Hong Kong) "Urban Climate Science for Planning Healthy Cities in Asia"; **J. Marshall Shepherd** (Univ. of Georgia), "Beyond the Question, 'Does Urbanization Affect Precipitation?': What's Next?"; **Alan F. Blumberg**, (Jupiter, Hoboken, NJ), "The Urban Ocean - A New Frontier"; and **Shiguang Miao** (Institute of Urban Meteorology, China Meteorological Administration), "SURF Project: Comprehensive Observations of the Beijing Urban Boundary Layer and Development of an Urban Weather Prediction Model."

The conference has further leveraged two other related events. The first is a US National Science Foundation workshop on **Urban Climate and Resiliency**. This workshop will have participants contribute to answering one or more science questions related to Urban Climate and Resiliency, with a one day post-conference workshop to synthesize results followed by a report to the US National Academies. The second is an **Urban Design Climate Workshop** to be held on 10 and 11 August in New York City at the New York Institute of Technology. This workshop will draw experts from ICUC-10 and the New York City launch by the Urban Climate Change Research Network (UCCRN) of the publication *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network (ARC3.2)*. The workshop is intended to examine the Sunnyside Yard in the Queens district of New York City, which is under consideration for large-scale development. The analysis is intended to identify microclimatic hots spots and to undertake an evaluation of urban thermal comfort for both present day and 2050 conditions.

The Organizers look forward to greeting you in New York City in August!

INTERNATIONAL ASSOCIATION FOR URBAN CLIMATE

ICUC-11 update: The Final Four

In March the IAUC initiated the process of soliciting proposals to host the next **International Conference on Urban Climate (ICUC-11)**. We received a total of 11 expressions of interest which the Board screened with an emphasis on:

- location, including geographic diversity from recent locations
- familiarity of the proposing team with IAUC
- proposed timing

The Board then invited a subset of the proposing teams to submit full proposals by June 15. Four full proposals were received for the following locations (and tentative proposed dates):

- **Beijing, CHINA** (June 2021)
- **Hong Kong, CHINA** (Dec 2021)
- **Sao Paulo, BRAZIL** (July 2021)
- **Sydney AUSTRALIA** (Aug-Sept 2021)

In the coming weeks the IAUC Board will share summary information from each proposal with the entire IAUC membership and solicit the membership's input through an online preference survey. The proposing teams will be interviewed by the Board during the ICUC-10 meeting in New York in August. It is anticipated that the Board will then announce the selected venue before the end of the year.

— David Sailor, IAUC Secretary

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The next edition of ***Urban Climate News*** will appear in late September. Contributions for the upcoming issue are welcome, and should be submitted by August 31, 2018 to the relevant editor.

Submissions should be concise and accessible to a wide audience. The articles in this Newsletter are unrefereed, and their appearance does not constitute formal publication; they should not be used or cited otherwise.

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