



HIRI NEWS



Modeling Washington DC's Heat Island, NY Health & Climate Research, Conference Updates, and More!

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Ozone and Extreme Heat Around Washington DC

Dr. Ivan Cheung, of the Department of Geography at the George Washington University in Washington, DC presented his findings to the group on the temperature and ozone impacts of the city's heat island. His slides traced the emergence of an urban-rural temperature differential after the 1940's, and described its current relationship to meteorology, air pollution, and urban sprawl.

To characterize the local heat island effect and its causes and impacts, Ivan used historical and remotely sensed data. He obtained monthly

mean temperature from two rural (Baltimore-Washington and Dulles International Airports) and one urban site (National Airport) to establish a time series urban heat island (UHI) index. These data show a dramatic increase in the UHI indices for all months throughout the 1940s and 50s. The UHI peaked in the late 1970s (reaching a 4.0°F difference between the rural and urban sites), but has since leveled off. Not coincidentally, this trend, which started in the 1980s and continued through the 1990s, is consistent with the transition of rural to built-up land in the outer counties of the metropolitan area. What appears to be a diminishing heat island effect masks the continued influence of land use on meteorology, as suburban temperatures increase to the level of urban temperatures.

Ivan's data suggest a direct correlation between urban heat islands and the occurrence of extreme heat events. This can be observed from the higher number of 100°F days in Washington over time. In the 50-year period, the number of 100°F days seldom exceeded 10. Such unusual years occurred once in the early 1950s, once in the late 1980s, and three times in the 1990s. Significantly, since 1999 there have been 21 100°F days. The nighttime cooling rate during these hot spells is also suppressed due to the existence of heat-retaining materials that line the urban canyon.

This unusually hot weather can cause a higher incidence of ground level ozone concentration violations and resulting respiratory and cardiovascular illness. This effect is likely the most significant and potentially devastating heat island impact in DC, which has been designated a serious ground level ozone non-attainment area since 1990.

Since local ozone concentrations are impacted by both regional ozone transport and local emissions of ozone precursors (such as volatile

organic compounds and nitrogen oxides), Ivan has been investigating the relative contribution of each. In addition, he has initiated research on another factor that may influence ozone concentrations in DC: local land-cover characteristics. These include building density, percentage of impervious surface, and vegetative cover, which can be evaluated with remote sensing data.

Thus, the impact of land cover and land use on temperature – and resulting ozone concentrations – will be another focus of Ivan's research. He will use hourly ozone concentration records at 23 monitoring sites across the district to link localized ozone hot spots to secondary heat islands and cool spots within the DC heat island. A dense network of Automated Weather Source rooftop observation sites will aid in this analysis, as will a Landsat Enhanced Thematic Mapper (ETM+ images) and other GIS databases.

Ivan welcomed additional questions and requests for information from call participants. He can be reached at: icheung@gwu.edu

Linking Future Climate Scenarios and Public Health In the NY Area

Joyce Rosenthal, an Instructor at Columbia University joined the call to discuss the New York Climate and Health Project that she manages. The purpose of the study is to improve the ability of models to assess the heat and air quality impacts of future urban land use and climate, which is expected to change significantly in the decades ahead. Joyce's team is comprised of researchers from Columbia University, Montclair State University, Duke University, State University of NY

at Albany, NASA-Goddard Institute for Space Studies.

Currently, computer models to simulate land use and land cover, air quality, public health, and global change, do not "talk to each other". Given recent advances in physical research linking these phenomena, it is becoming increasingly important to improve the ability of these research tools to share information. Joyce said that her team is filling a research gap by improving the ability of current models to predict how public health stressors will be affected by future land use and climate change in the New York area. The study abstract notes that, "To date, there has been little effort to link climate change and land use/land cover (LU/LC) models in assessments of potential future impacts of heat stress and air quality."

The project methodology involves applying the model to counties in the greater NYC Metropolitan East Coast (MEC) region. This will answer several key questions about how scenarios of climate change and land use will affect public health. For instance, "How will the frequency and severity of extreme heat events change by 2080 based on future regional land use and climate change?" Another question asked by the team is, "How might future exposure and response to intense heat and air quality differ among various socio-economic classes and race across the MEC region?"

Joyce said that for estimates of future climate outcomes the research team will use the Intergovernmental Panel on Climate Change (IPCC) scenarios, "A2" and "B2." The A2 scenario envisions population growth to 15 billion by the year 2100 and rather slow economic and technological development. It projects higher greenhouse gas emissions than the B2 scenario. The B2 scenario envisions slower population growth (10.4 billion by

2100) with a more rapidly evolving economy and more emphasis on environmental protection. B2 therefore produces lower emissions and less future warming compared to A2. Climate change results based on the A2 and B2 scenarios are discussed in the IPCC Third Assessment Report, which can be accessed at:

<http://www.ipcc.ch/activity/tar.htm>

In conclusion, Joyce indicated that successfully describing the interactions among these factors will enhance our knowledge of how building decisions impact public health under different scenarios of climate change. She also hopes it will help identify the role economic and demographic factors have on resulting public health impacts. For more information, Joyce encouraged call participants to contact her directly: jr438@columbia.edu

Heat Island Mitigation in Atlanta

Ben Taube, of the City of Atlanta Department of the Environment, briefed the group on the city's energy policy task force and its proposal for a city-hall green roof. He also talked about the city's first pervious parking lot, which is located at the Department of Corrections and is being analyzed for stormwater mitigation and other benefits by Georgia Tech University.

Atlanta became interested in pursuing a city-hall rooftop garden for a number of reasons. Since 1973, the metropolitan area has experienced rapid urbanization and accompanying loss of greenspace. Impervious cover has simultaneously decreased, based on changes in land use/land cover. This has contributed significantly to the degradation of air and water quality, and has overburdened the stormwater system.

The objectives Ben outlined for the proposed green roof include the following:

(a) Generate data on greenroof performance in areas that may include energy efficiency, stormwater retention, the extension of roof membrane life-span, and plant survival.

(b) Produce information on the summertime cooling benefits of greenroofs, potentially including indicators such as greenhouse gas reduction, smog mitigation, and energy efficiency.

(c) Increase the awareness of greenroof benefits by providing professionals with an opportunity to visit a working pilot.

Ben elaborated on the potential for green roofs in a recent Atlanta Constitution news column: "As Atlanta is . . . in noncompliance with [ozone] air quality, greenroofs could be retrofitted onto the majority of government buildings and included as a requirement for new construction."

The paper notes that if the project is completed, city-hall would not be the first Atlanta building to have a planted roof. "A parking garage roof at the Georgia World Congress Center is planted, mostly with turf, as is Zoo Atlanta's Conservation Action Resource Center, which has foliage, flowering shrubs, perennials and vines."

The Toronto Urban Heat Island Summit

Catherine Wood, from the Toronto Atmospheric Fund (TAF), updated call participants about the North American Urban Heat Island Summit. She said that from May 1 to 4, researchers, municipal leaders and practitioners from Canada, the United States, Japan, and other countries gathered in Toronto to discuss heat island research, adaptation, and mitigation. The Summit highlighted recent action

– including best practices, initiatives, and policies – in both the US and Canada, and new scientific research on urban heat islands (including associated health and environmental impacts).

The conference kicked off with an opening ceremony and presentation by Dr. David Sailor, of the National Institute for Global Environmental Change at Tulane University. The first full day focused on climate change and urban adaptation issues, including discussions on the latest urban heat island and health research. Keynote speakers included Dr. Tim Oke (University of British Columbia), Dr. Art Rosenfeld (California Energy Commission) and Dr. Laurence Kalkstein (University of Delaware) among others. On the next day, presentation topics examined research applications, highlighting solutions and best practices in urban heat island mitigation and adaptation.

TAF and the Clean Air Partnership hosted the summit with support from the Government of Canada's Climate Change Action Fund, Health Canada, and the US Environmental Protection Agency. Overall, Catherine believes the summit was a success and she encourages attendees to submit their list of top 10 action items to TAF. Presentations and papers from the summit will be made available on TAF's website, http://www.city.toronto.on.ca/taf/uhis_summit.htm

Cities in ICLEI's Heat Island Reduction Initiative Meet at Summit

Ryan Bell, of the International Council for Local Environmental Initiatives (ICLEI), joined the call to discuss the May 4th meeting of representatives from the Cities for Climate Protection's UHI Policy Adoption and Peer Exchange Initiative. The five cities participating in the project include Louisville,

Tucson, Philadelphia, San Jose, and Atlanta.

Ryan spoke primarily about the projects and programs that each city has initiated under ICLEI's program. The Louisville team has developed initial plans and identified potential funding sources for a showpiece greenroof project on a 9-story downtown building. Work also continues on promoting cool roofing materials, educating the public, and investigating a prospective demand-side management (DSM) program through the local power utility. In Philadelphia, the Energy Office organized a number of cool roof workshops and developed a citywide bid for reflective roof materials, which will provide local departments with the option of purchasing energy saving roof material. In Tucson, a cool roof was installed and monitored on a prominent city building, and similar projects are in the works. San Jose is building off its cool roof incentive program to include heat island reduction strategies in the local green building program for city facilities. (For Atlanta's activities, see Ben Taube's report-out above.)

Ryan said that city officials attending ICLEI's meeting expressed their appreciation for the continued leadership of the Policy Adoption and Peer Exchange Initiative. They said the ICLEI forum provides a valuable opportunity for information sharing and momentum building. ICLEI and EPA are exploring ways to build on the success of the initiative.

The Environmental Council of Concrete Organizations

Ann Dougherty, of the Environmental Council of Concrete Organizations (ECCO) and the Portland Cement Association, talked about the services offered by ECCO. The group is a member-based clearinghouse for information about the environmental attributes of concrete and concrete products. Current members

include: American Concrete Pavement Association, Cement Association of Canada, Portland Cement Association, and American Concrete Institute, among others.

Among the services ECCO provides are a speaker series and an online library to make information on concrete's environmental performance available to a wider audience. Ann encouraged call participants to contribute studies and other literature to the online database, which currently contains nearly 2,500 bibliographic references and abstracts, and 25 summary papers. The database includes information on the relationship between heat islands and light colored paving materials, but ECCO would like to expand its offerings in this area.

The ECCO Speakers Bureau was launched in March, 2001. The aim of the bureau is to match experts in the environmental aspects of concrete and concrete products with people and organizations that need related information. Ann suggested that municipalities and other groups interested in heat island mitigation could benefit from the expertise of ECCO's speakers. For more information, contact Ann or see www.ecco.org to download speaker-request forms.

EPA's Heat Island Mitigation Strategies Guidebook

Eva Wong, of the EPA, thanked the call participants for submitting their comments on the first three draft chapters of the guidebook (cool roofing, cool paving, and trees and vegetation). Eva noted that the remaining draft chapters will be distributed later than initially planned. In the near future, she will distribute a revised schedule that will

ensure that reviewers have adequate time to provide comments. Eva also pointed out that this initial round of reviews has been directed towards UHIPP callers to provide immediate feedback on the initial draft chapters. The entire, revised draft guidebook will be sent through an official, formal, comprehensive review process, which may allow reviewers another opportunity to provide comments. The entire draft guidebook will most likely be distributed for review this winter.

American Meteorological Society Meeting

Eva Wong also spoke briefly about the American Meteorological Society (AMS)'s Fourth Symposium on the Urban Environment from May 20-24, 2002 in Norfolk, VA. Eva said the proceedings to this conference, which include numerous references to the relationship between air quality and meteorology and heat islands, are an excellent resource for interested call participants. See the AMS website for more information:

<http://www.ametsoc.org/AMS/meet/F/AINST/norfolk02.html>

Eva submitted a paper to the conference with Drs. Larry Kalkstein and David Sailor. Their paper asked the following questions related to heat mortality in Philadelphia: (a) Does the number of oppressive air mass days decrease in the downtown area due to heat island reduction measures; (b) Does the severity of the remaining oppressive days generally diminish; and (c) Is there a marked reduction in estimated heat-related mortality under the UHI mitigation measure. The paper was presented by Dr. Sailor.

The next conference call is TBD. Stay tuned for the date, call-in number, and access code.
