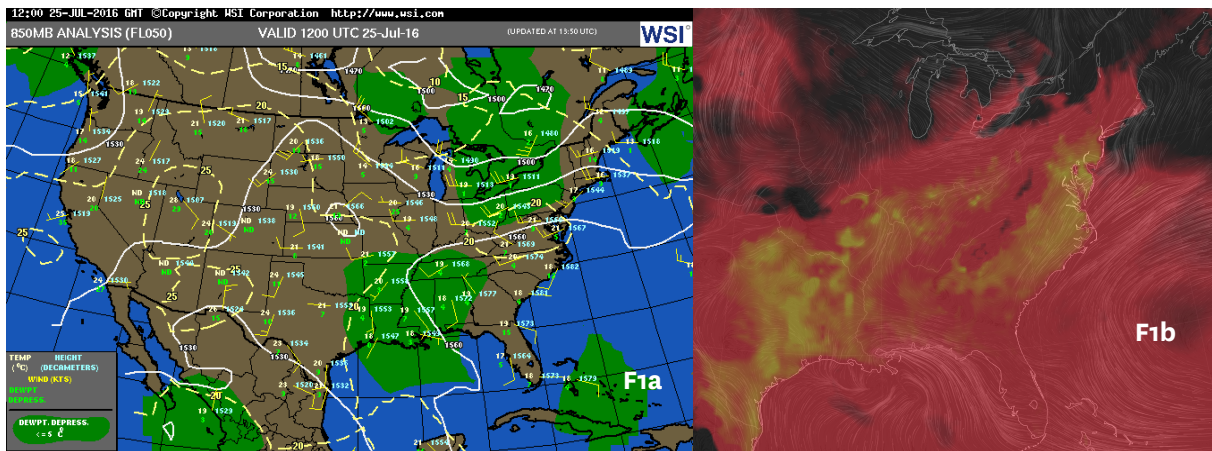


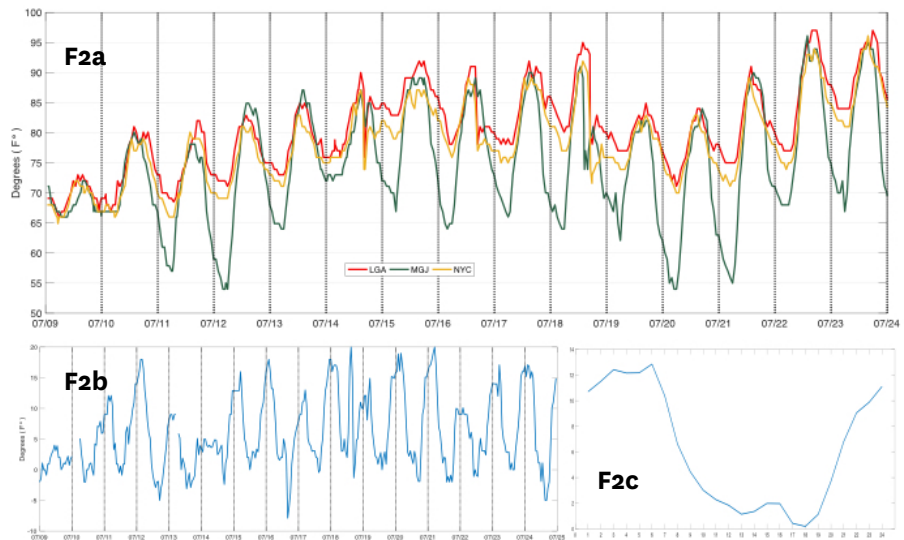
New York City Heat Campaign Synopsis 2

July 9-24, 2016

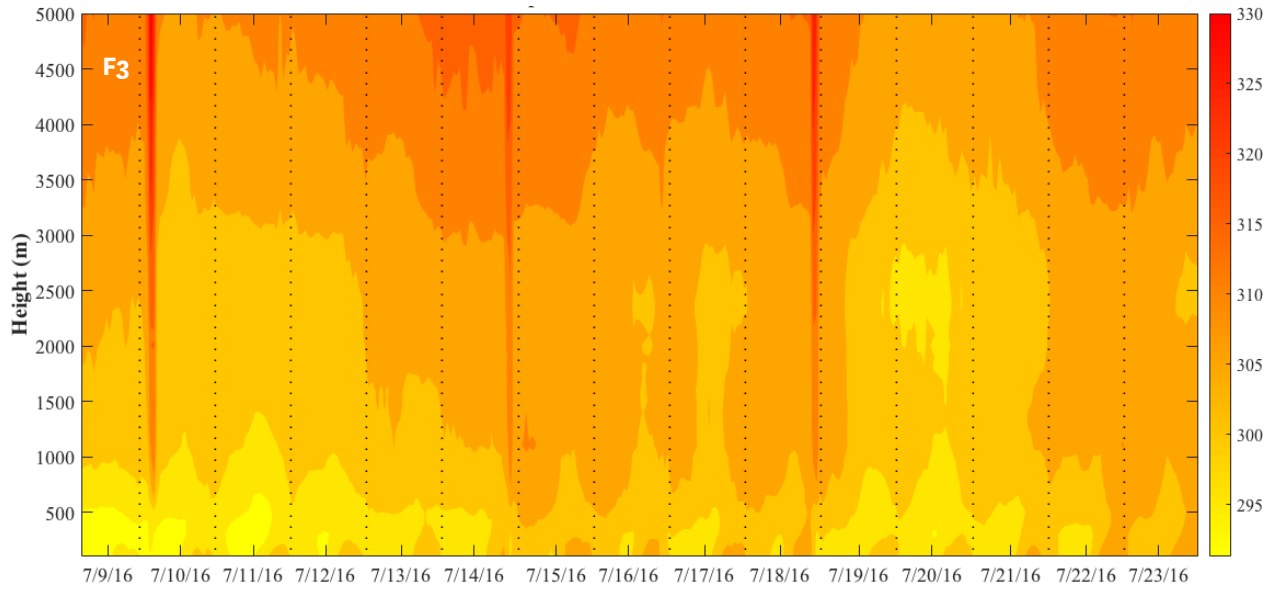
We are currently in the middle of a severe heatwave; much of the US, the North East, Mid Atlantic, Midwest and South East are experiencing extreme heat conditions. The 850 MB conditions (F1a) show an upper level ridge over Mid West and two other ridges over New England and North East region. Heat emergency was declared in 26 states and the daily highs were 5-10°F above normal in most places. The high humidity made the surface conditions worse, which is visible in the Misery Index plot (F1b) from nullschool.net.



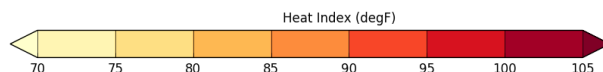
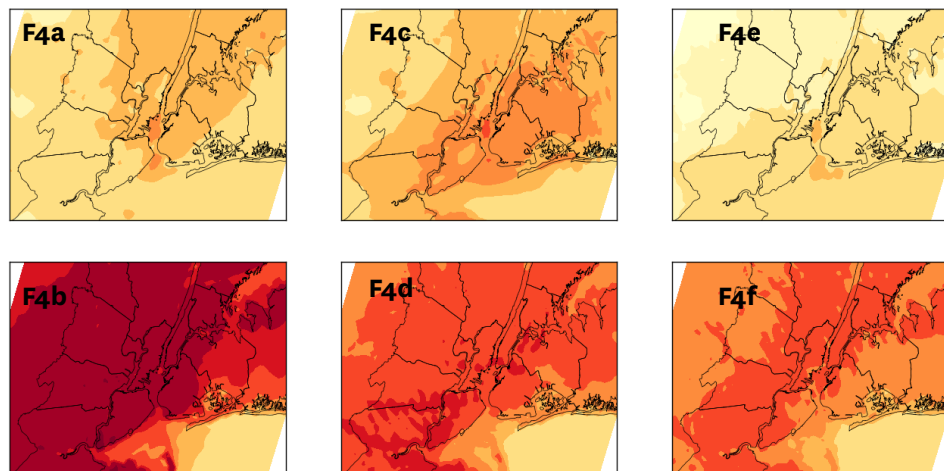
Urban Heat Island: During this period the near surface air temperature in much of NYC was on average 2-12°F higher than the nearby rural area. Figure below (F3a) compares the 2-m temperature from the urban and rural stations and also the daily (F3b) and average UHI (F3c) experienced. Daytime maximums as high as 96°F was observed. The minimum temperature during 23rd July never dipped below 85°F. The temperature plot shows a consistent increasing trend between July 10th till July 18th. The daily maximum increased from 80°F to 96°F. After a short dip between July 19-20, the temperature started peaking again beginning July 21. A maximum UHI of around 20°F can be consistently seen on half the days observed. This is nearly 2.5 - 3.5 times the average UHI normally observed in NYC. The average daily UHI variability exhibits the usual hump shape with maximum values in the night and early morning hours and reaches a minimum during the mid afternoon periods.



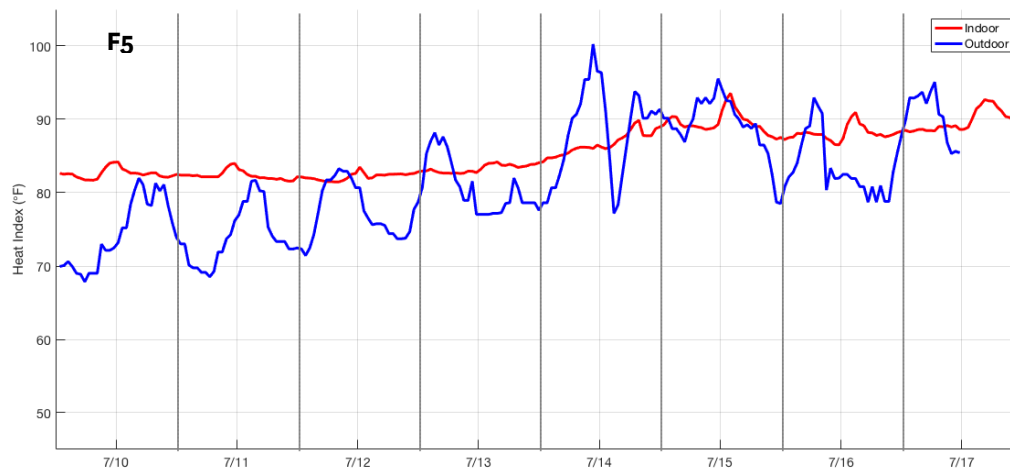
NYC Boundary-layer Observations: The thermal conditions of the atmosphere above the City was continuously monitored using a microwave radiometer located at CCNY campus (operated by NOAA-CREST@CCNY). Fig 3 shows virtual potential temperature contours from ground to 5km beginning July 9 to July 23. During July 15th to 18th, when the 2-m air temperature were around 90°F during the midday and afternoon periods, high temperatures are visible in the lower portion of the boundary layer. This is also visible on July 22nd and 23rd as the heatwave sets in. During non-heatwave days, the temperature in the PBL is at least 10K cooler.



Heat Index: F4a (July 25 4am), F4b (July 25 3pm), F4c (July 26 4am), F4d (July 26 3pm), F4e (July 27 4am) and F4f (July 27 3pm) show spatial variability in heat index forecasted by the uWRF model. On 25th the heat index over much of NYC and nearby areas exceed 105°F. During the nighttime period, a clear variability in the spatial distribution is visible (F4c). While much of NYC experiences HI of around 85°F, the nearby regions cool much faster. The thunderstorm event on the evening of 25th also leads to a relatively milder heat index on July 26th and 27th.



Indoor-Outdoor Heat Index: WNYC together with ADAPT NY and ISeeChange are conducting a citizen science program called **Harlem Heat Project** to study how people in North Manhattan experience heatwaves (particularly residents who do not have air conditioning). As part of this project, several temperature and humidity sensors are placed in different houses in Harlem. Figure F5 compares indoor heat index to outdoor (measured at LGA). Unlike the outdoor conditions, the indoor values do not exhibit a diurnal cycle and the values are steady and consistent. On average the values were close to 83°F between July 10th to July 17th. During July 15th-18th, the values increase rapidly and reach a maximum of around 92°F. The lack of diurnal variability and the consistency indicate the indoor conditions are predominantly dictated by storage heat flux.



Summary: The analysis reveals several intensive heat episodes throughout July. The average UHI value clearly captures the synergistic interaction between heatwaves and urban processes. The UHI is amplified by nearly 2.5-3.5 times its average summer value. The model forecasts capture the spatial variability in heat index, particularly in the nighttime values. Furthermore the indoor sensors reveal the thermal comfort level inside apartments. The indoor conditions are in general much worse especially during the nighttime. This raises an important issue, does the city have to treat summer cooling on similar terms to winter heat and guarantee economically vulnerable communities relief from extreme heat?

Harlem Heat Project: www.wnyc.org/series/harlem-heat-project

Authors: Dr. Prathap Ramamurthy & Dr. Jorge Gonzalez

Other Contributors: Dr. Fred Moshari, Dr. Mark Arend, Luis Ortiz, Harold Gamaro & Yoribaldis Olivo

Support: NOAA-CREST & CCNY