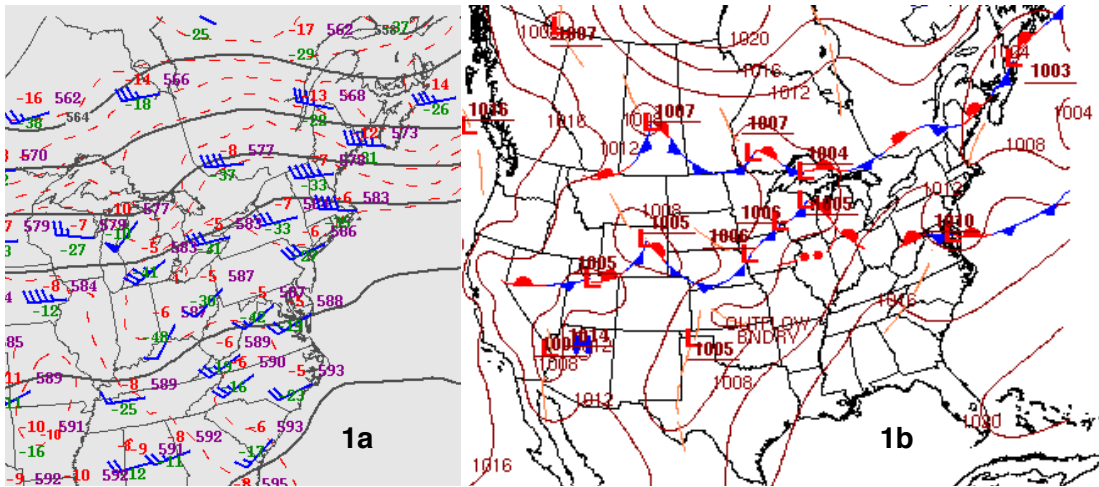


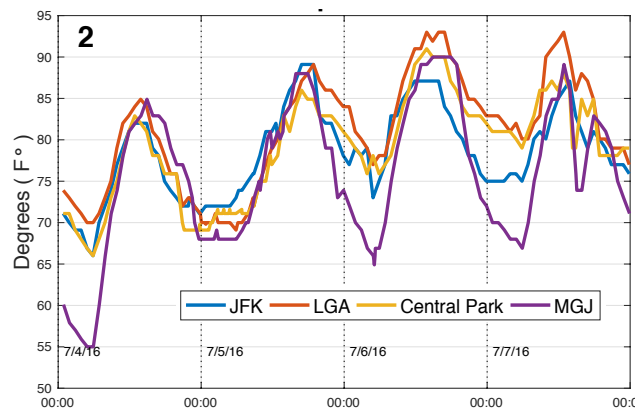
New York City Heat Campaign Synopsis

July 5-7, 2016

This was the first heatwave of the year and the following is an initial analysis from our summer heat campaign here at CCNY. On July 6th a mild upper level ridge is visible at 500 mb (fig 1a) and at sea level we could see a thermal trough (fig 1b). The ridge is the primary driver bringing hot air from aloft and leads to the development of the trough.

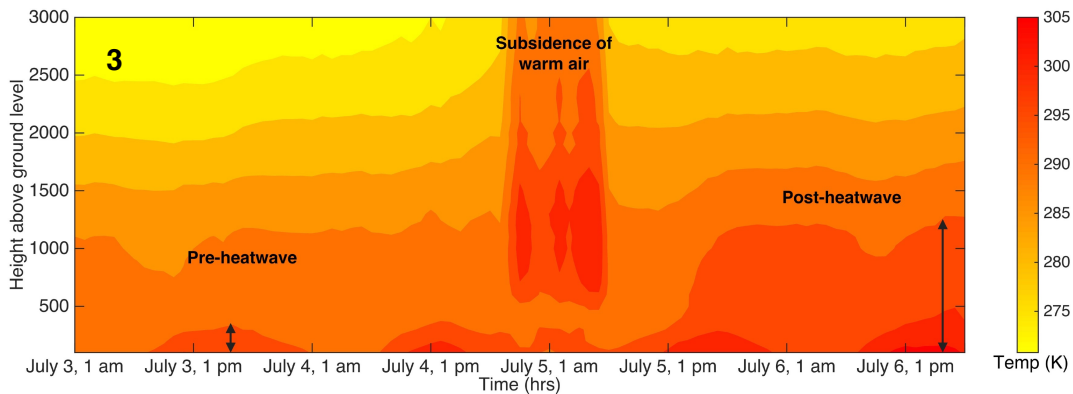


As expected the near surface air temperature soared during the next 3 days. Fig 2 compares air temperature recorded at 4 National weather service's automated weather stations beginning July 4th. While JFK, LGA and central Park stations are located in the City, MGJ is a rural reference site from NJ. LGA recorded the highest temperature during the midday hours, with peak values close to 94°F on July 6th and 7th. There was clear evidence of the amplification in urban temperature during the nighttime. As MGJ experienced a low of 65°F, the stations in the city the temperature ranged between 81-75°F. **The urban heat island intensity was close to 12-15°F during the nighttime.** It is interesting to note that the NWS forecast a high of 90-91 °F, which was close to the rural temperature. It should also be taken in to account that JFK and Central Park values are not the ideal representation for NYC as the former is heavily influenced by sea breeze, the latter is surrounded by vegetation. In most neighborhoods in NYC, the air temperature would be closer to that recorded at LGA or higher.

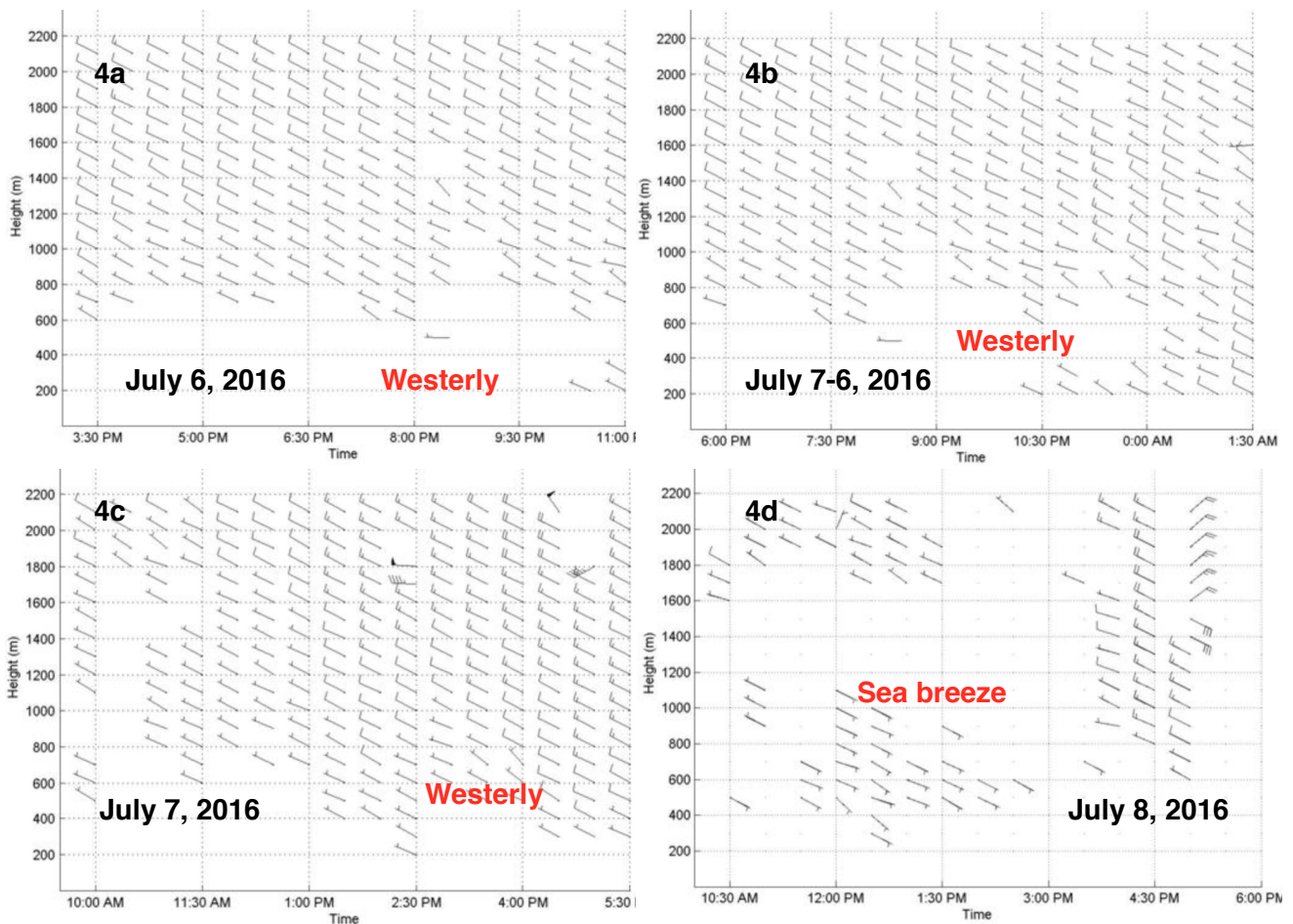


NYC Boundary-layer Observations: The thermal conditions of the atmosphere above the City was continuously monitored using a microwave radiometer located at CCNY campus (operated by NOAA-CREST@CCNY). Fig 3 shows temperature contours from ground to 3km beginning July 3, 1 am local time to July 6, 7 pm. Prior to the heatwave on July 3rd and 4th, the near surface temperature was close to 296 K (72°F). However post heatwave the lower 1 km atmosphere was at

considerably higher temperature. The microwave radiometer also captured the subsidence of warm air. A blob of hot air mass can be seen descending between midnight of July 4 and early morning hours of July 5. This has an immediate effect on the thermal state of the lower



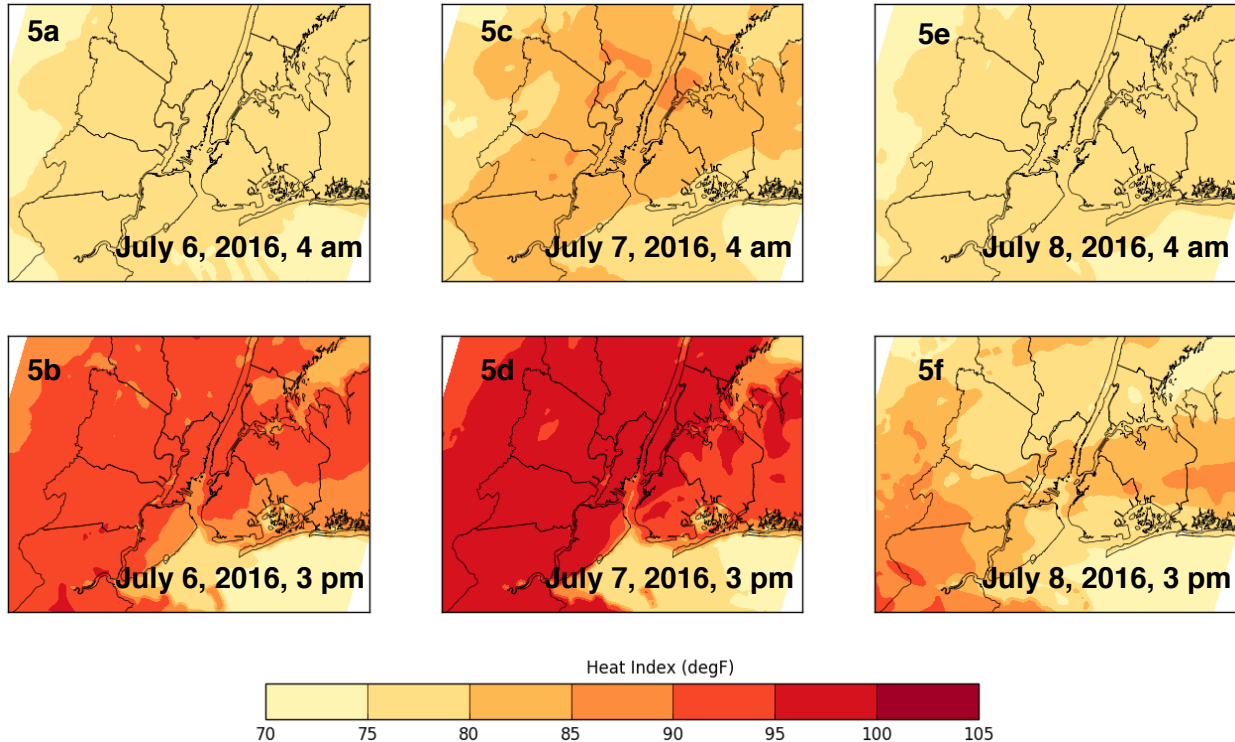
During the heatwave episode, extremely low wind speeds were witnessed. Fig 4 shows a series of snapshots, of wind barb profiles observed using a wind radar over the Liberty Science Center in NJ (operated by NOAA-CREST@CCNY).



Throughout the heatwave, the winds were steadily from the west-north west with no variability. The winds were extremely mild on July 6th- 7th; the wind speed averaged around 2.5 m/s even at 1

km above ground level. The surface wind speeds were extremely low contributing to the severe heat condition. On July 8th, post heatwave day around 12 pm a clear south easterly winds are visible in the lower 1 km indicating coastal winds, which is typical to NYC during regular days.

Heat Stress: During the event much of NYC experienced severe heat stress. The panel plots below show the spatial distribution of the physiological heat index from July 6-8. The figures are from a high-resolution forecast data using urban weather prediction model done here at CCNY. The spatial resolution of these forecasts is 1 km and the model is customized to the complex morphology of NYC. In comparison the regular weather forecast done by National Weather Service is much coarser at 4 km and does not use any urban parameterization.



On July 7th the heat index in NYC and Eastern NJ spiked to nearly 105°F, indicating extremely severe conditions. Even during the early morning hours on July 7th, the heat index in much of the City was between 80-85°F. A clear difference is discernible between July 6-7 and July 8 (post heatwave); the City cooled considerably with the heat index value lower by nearly 10°F.

Summary: NYC experienced its first heatwave of the season between July 5- July 7, 2016. Temperature in excess of 92°F was observed, which was compounded by high humidity. The City issued a heatwave warning for July 7, when the heat stress soared above 102°F. Ground observations also indicate a strung nighttime UHI of around 12-15°F. Although most of the thermal and wind observations indicate a typical heatwave case, this event was rather complex. On July 7th afternoon an intense downpour lasted for around 30 minutes between 230-3 pm; the Central Park station registered 0.1” of precipitation. This could be a very localized event induced by urbanization. The ground conditions were also very wet during this period as the City received nearly 3” of rainfall during the past 10 days. More on this will be revealed by further analysis. Thought this Summer our groups will be monitoring the surface and atmospheric conditions over NYC continuously.

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Support: NOAA-CREST & CCNY