

The background image is an aerial photograph of a dense urban residential area, likely a neighborhood in New York City. The scene is filled with numerous brick apartment buildings of various heights, interspersed with green trees and some larger commercial or institutional buildings. In the far distance, a bridge spans a body of water under a hazy sky.

# Urban Boundary Layer Observations & Analysis Research Update

Presented: 10/22/2021

# Project Updates

## Completed

- New visualization method (see following slides)

## In process

- Parameter grouping by wind direction and stability in progress (see Slides 10-11)
- Function to identify sea breeze times
- Parallelization for handling large data files (~ 1 TB)
- Data quality measures in process
- AMDAR flight data in process

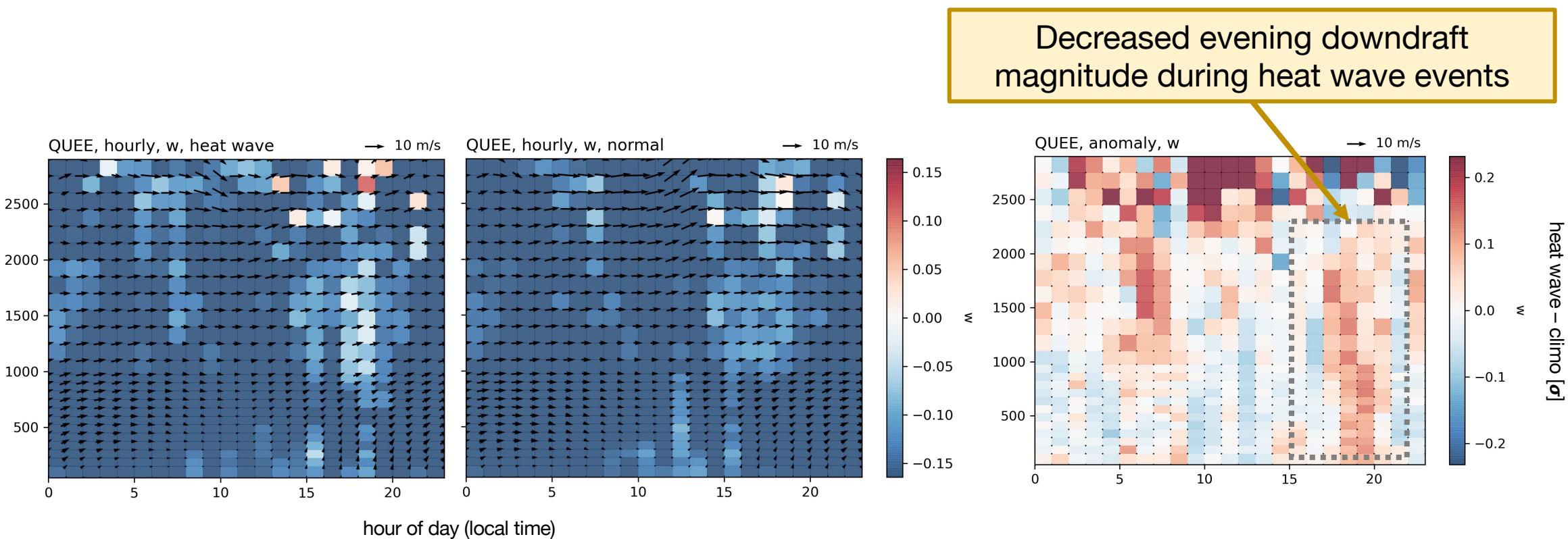
# Project Updates – Heat Wave Climatology

- Methodology
  - New visualization type (see next slides for examples)
    - Objective: show wind vectors over scalars to connect atmospheric motion to scalar distribution/structure/transport
  - Derived quantities:
    - Mean horizontal wind

1. National Weather Service, New York. <https://www.weather.gov/okx/excessiveheat>

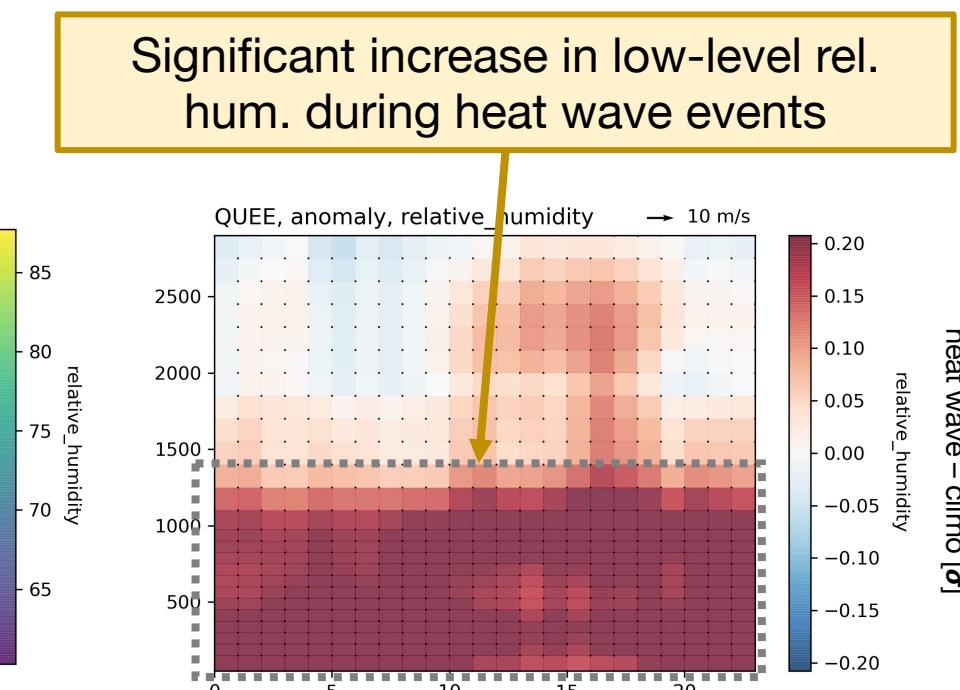
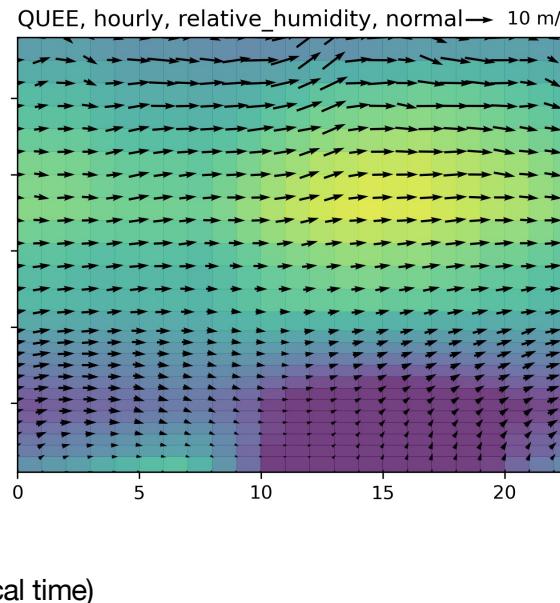
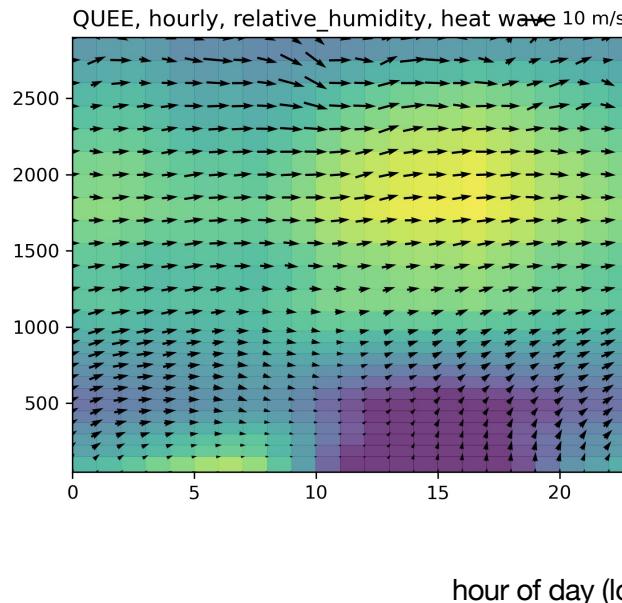
# Project Updates – New Visualization Method

- Example of results: wind vectors plotted over vertical velocity (w)



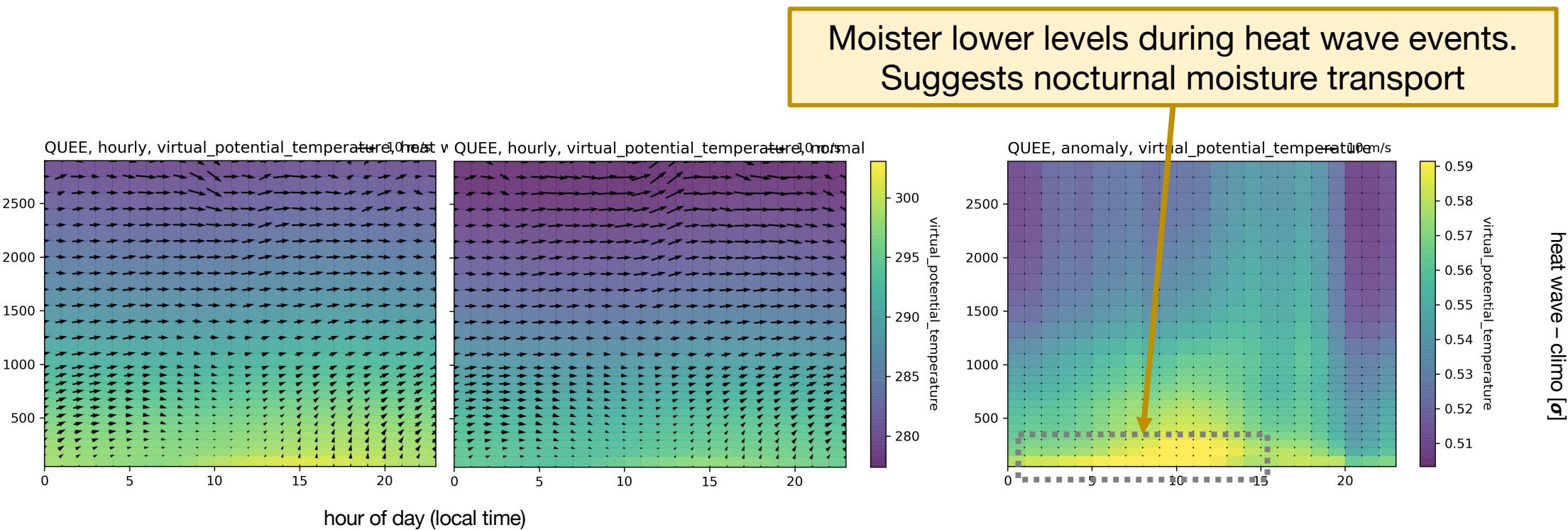
# Project Updates – New Visualization Method

- Example of results: wind vectors plotted over relative humidity



# Project Updates – New Visualization Method

- Example of results: wind vectors plotted over virt. pot. temp.



# Backup

# Project Overview

- Objective: address gap in literature concerning the atmospheric boundary layer in urban areas
- Methods:
  - (1) synthesize observations from various sources to compile data on surface, surface layer, and mixed layer properties;
  - (2) use analytical methods to obtain derived quantities
- Outcome:

# Project Schedule (as of 09/20)



## Objective

- Identify research gaps

## Status

- Completed

## ECD

- 08/20/2021

## Research gap(s)

- Sea-breeze effects during heat waves
- Effects of soil moisture on UBL in heat waves
- Nocturnal UBL properties during heat waves
- Effect of surface forcings on eddies
- BL height during heat waves

## Objective

- Construct xArray Dataset (Python structure)
- Employ parallelization for big data handling

## Status

- In process

## ECD

- 09/22/2021

## Data sources

- NYS Mesonet
- CCNY instruments
- AMDAR

## Objective

- Stability grouping
- Heat wave identif'n
- Wind direction

## Status

- In process

## ECD

- 10/08/2021 (iterative)

## Objective

- Spectral analysis (eddy analysis)
- Statistical analyses (surface forcings → UBL properties)
- Turbulence parameters

## Status

- To be completed

## ECD

- 10/29/2021 (iterative)