

# Impact of Surface Current Measurements on NY Harbor Water Levels



*Hugh Roarty  
Ethan Handel  
Tim Stolarz  
Josh Kohut  
Scott Glenn*





# Outline

- Introduction to HF radar
- Tidal Currents in Raritan Bay
- Long term statistics 2012-2024



# High Frequency Radar

CODAR Tx/Rx ANTENNA  
GREAT KILLS PARK, NY







UMASS DARTMOUTH



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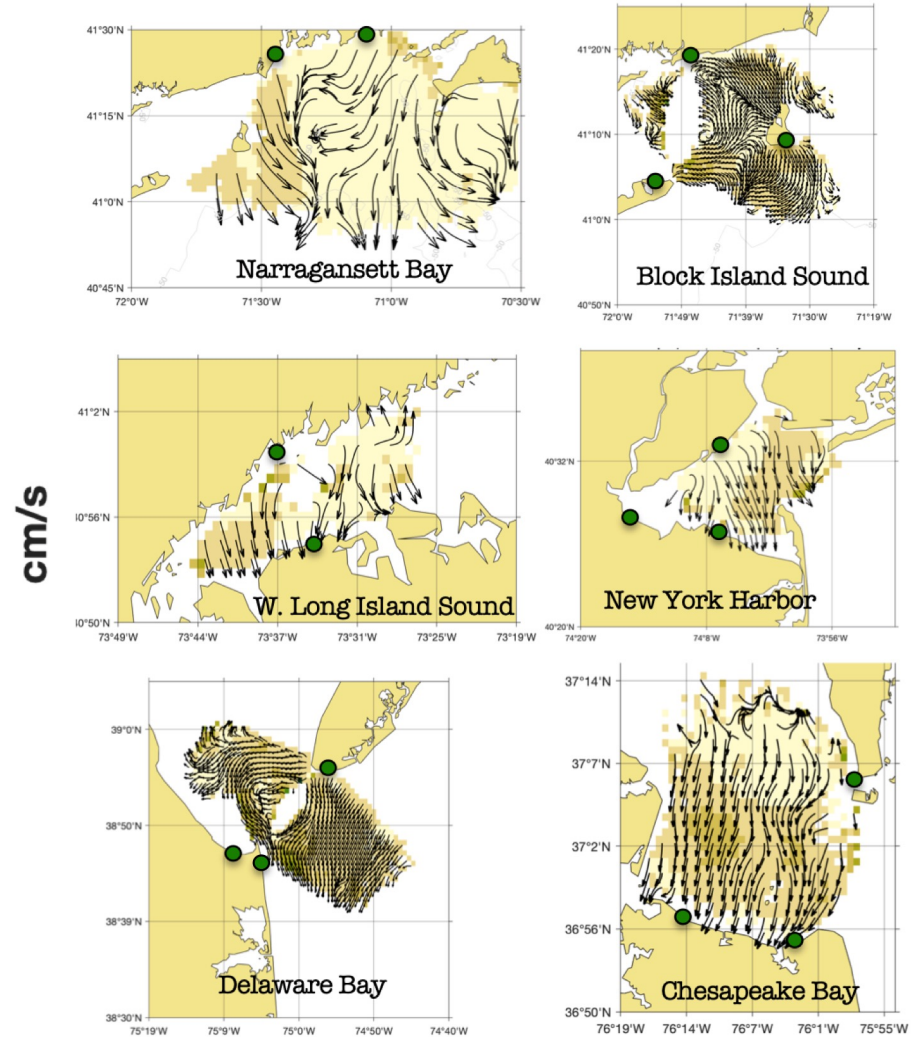
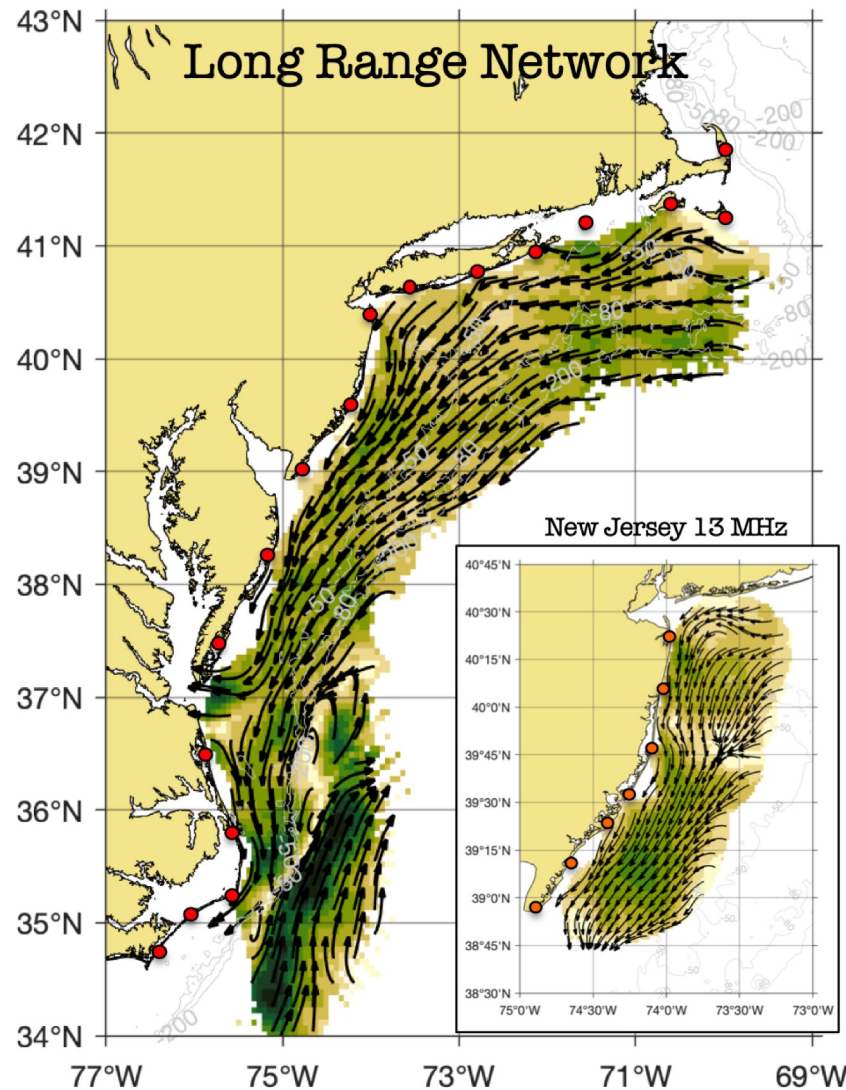


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# Mid Atlantic Surface Current Network



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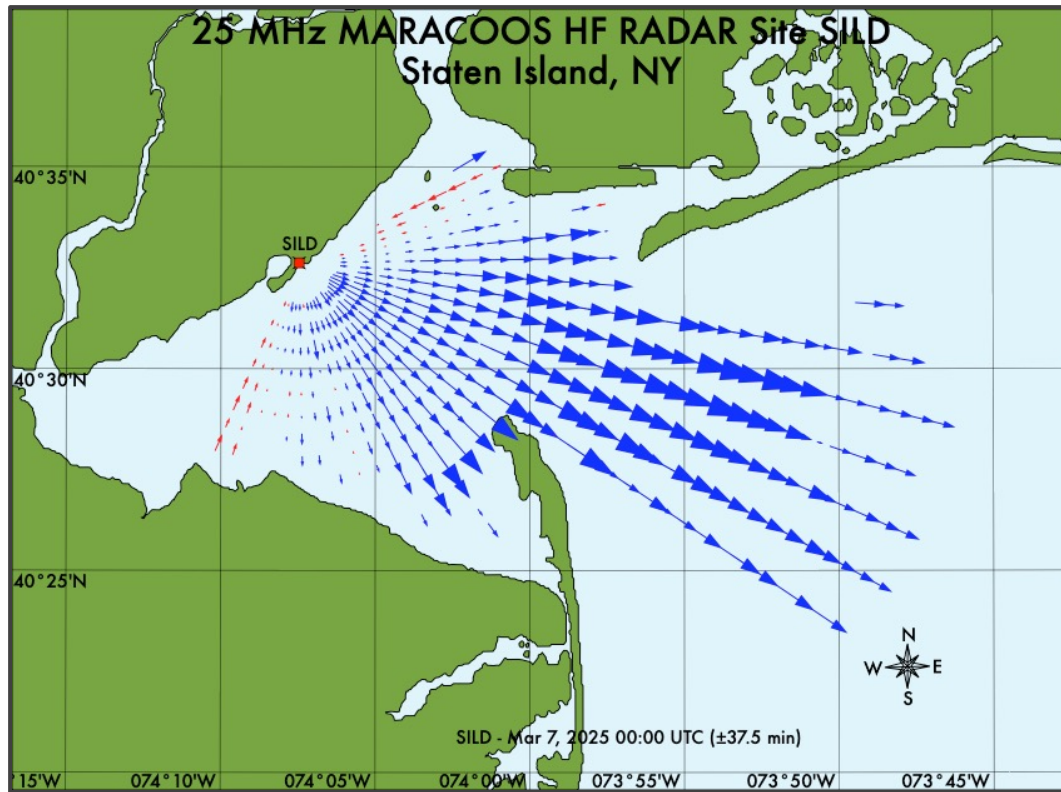
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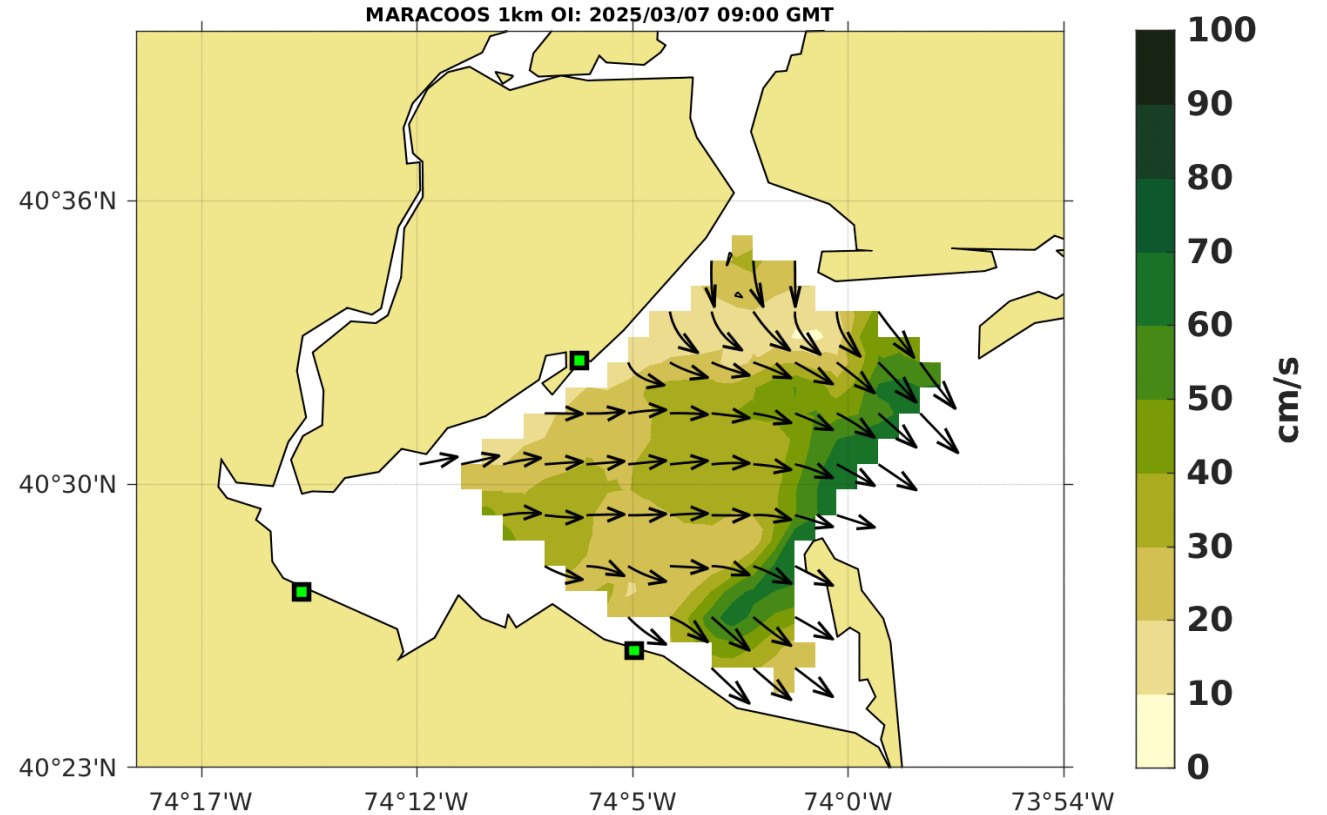


# Surface Currents from SeaSonde HF Radar

## Radial Map of Currents

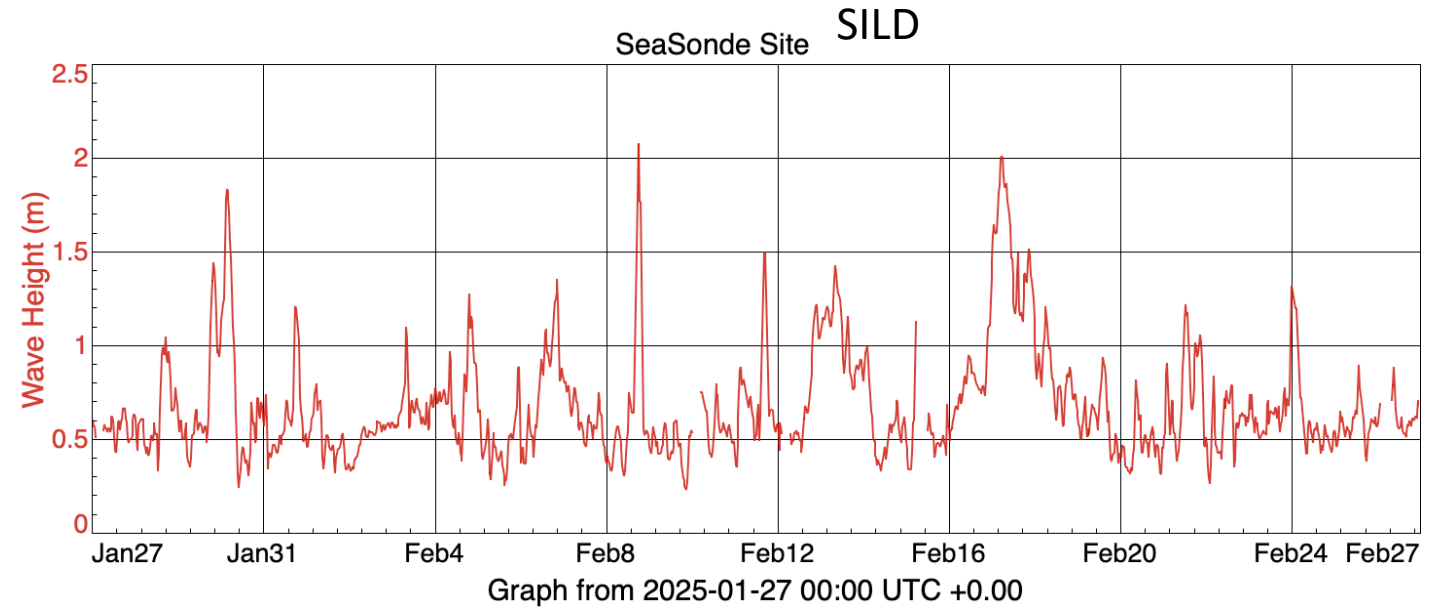
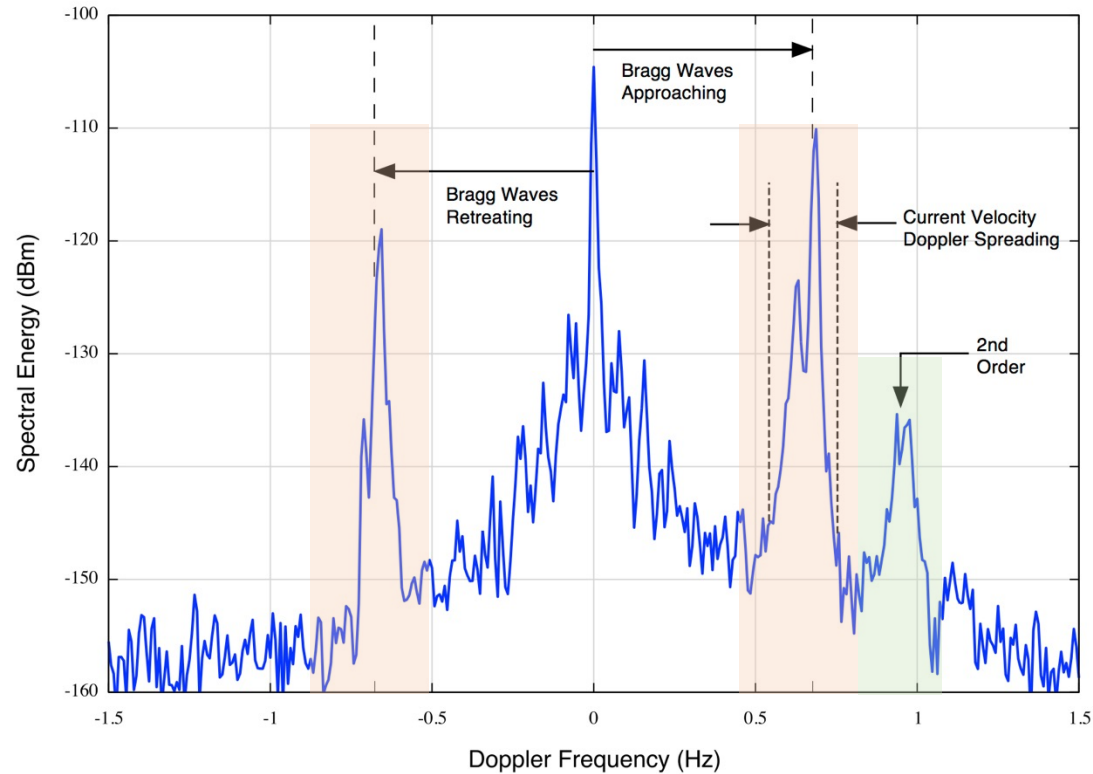


## Total Map of Currents





# Surface Waves from SeaSonde HF Radar

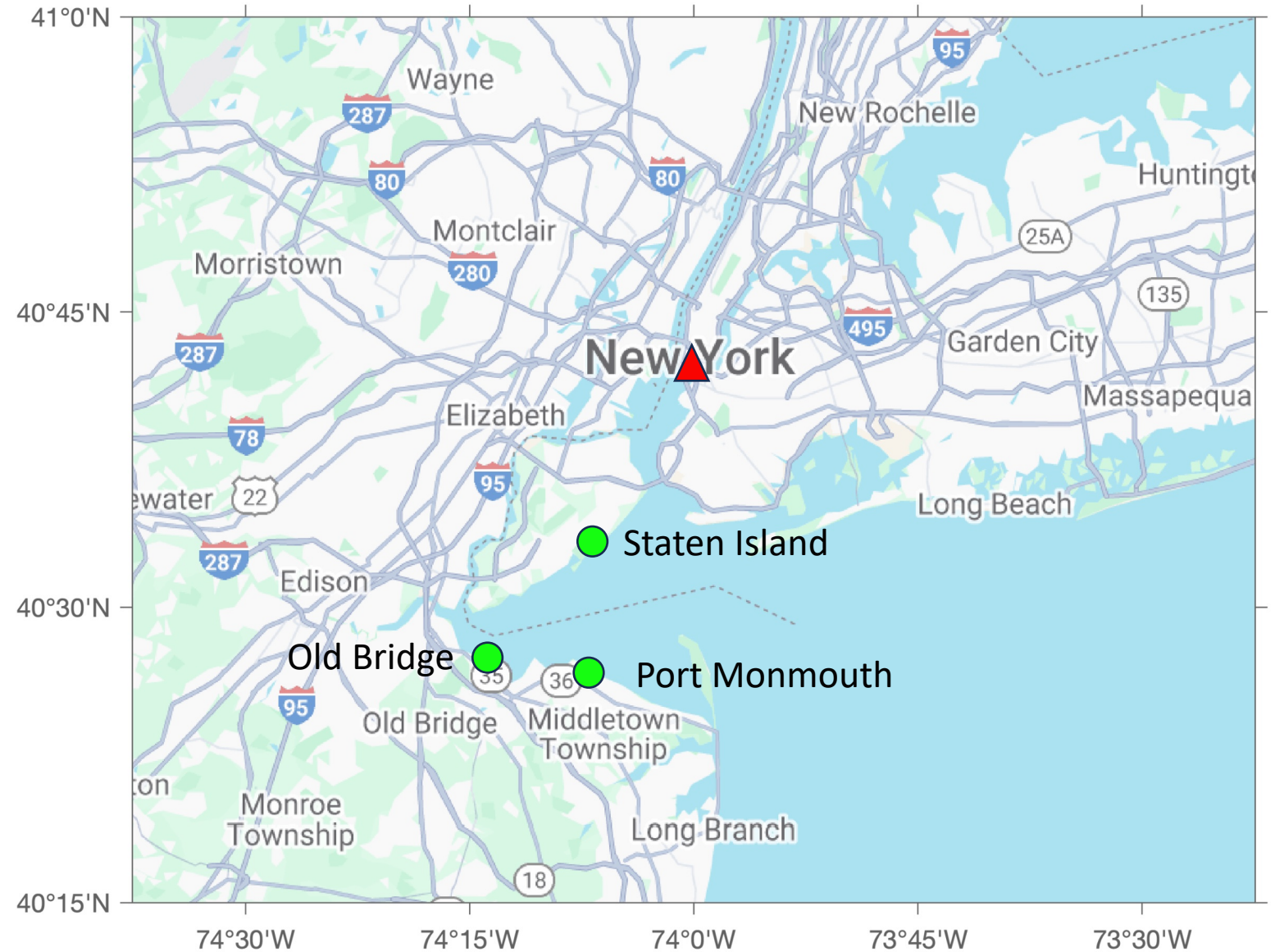


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# Study Area

- Staten Island - 2006 January
- Port Monmouth - 2012 March
- Old Bridge - 2015 October
- ▲ Water Level at Battery





# Tidal Currents



Hugh -  
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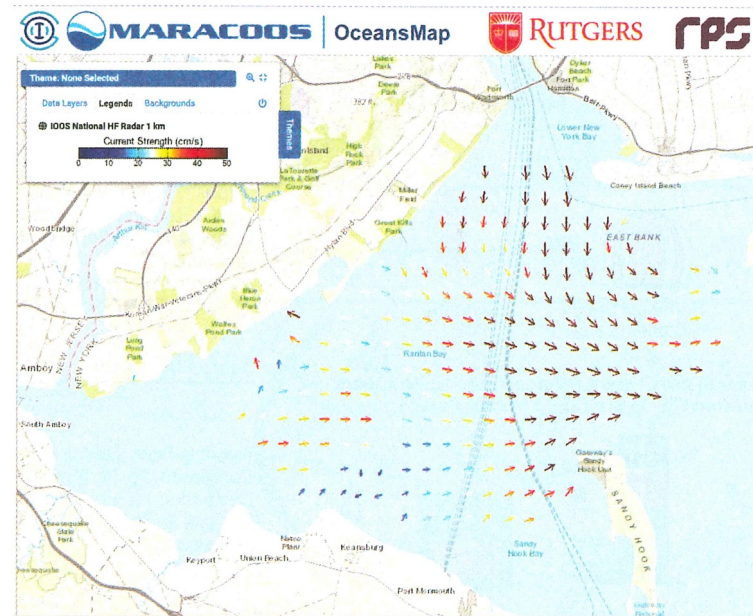
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## Measuring Currents With High Frequency Radar

by Hugh Roarty

Since 2004, the Rutgers University Center for Ocean Observing Leadership (RU-COOL) has used High Frequency (HF) radar to make detailed measurements of surface currents in Lower New York Harbor. The radar measures the speed of the water, much like a police radar measures the speed of passing cars. It transmits a radio signal that bounces off of ocean waves and then listens for the return signal (sea echo) to determine how fast the surface water is moving. A feature that makes HF radar unique is its ability to measure currents over large spatial areas near the coast. No other technology can do this! The radio signal travels along the surface of the ocean, so it is capable of “seeing” over the horizon, and some radars can collect data as far as 125 miles from shore. Very little power is used in the transmission, only 40 watts—the equivalent of a light bulb on the beach measuring currents 125 miles from the coast! The combined measurements of multiple HF radar stations make it possible to generate a map of surface currents that is updated roughly every hour.



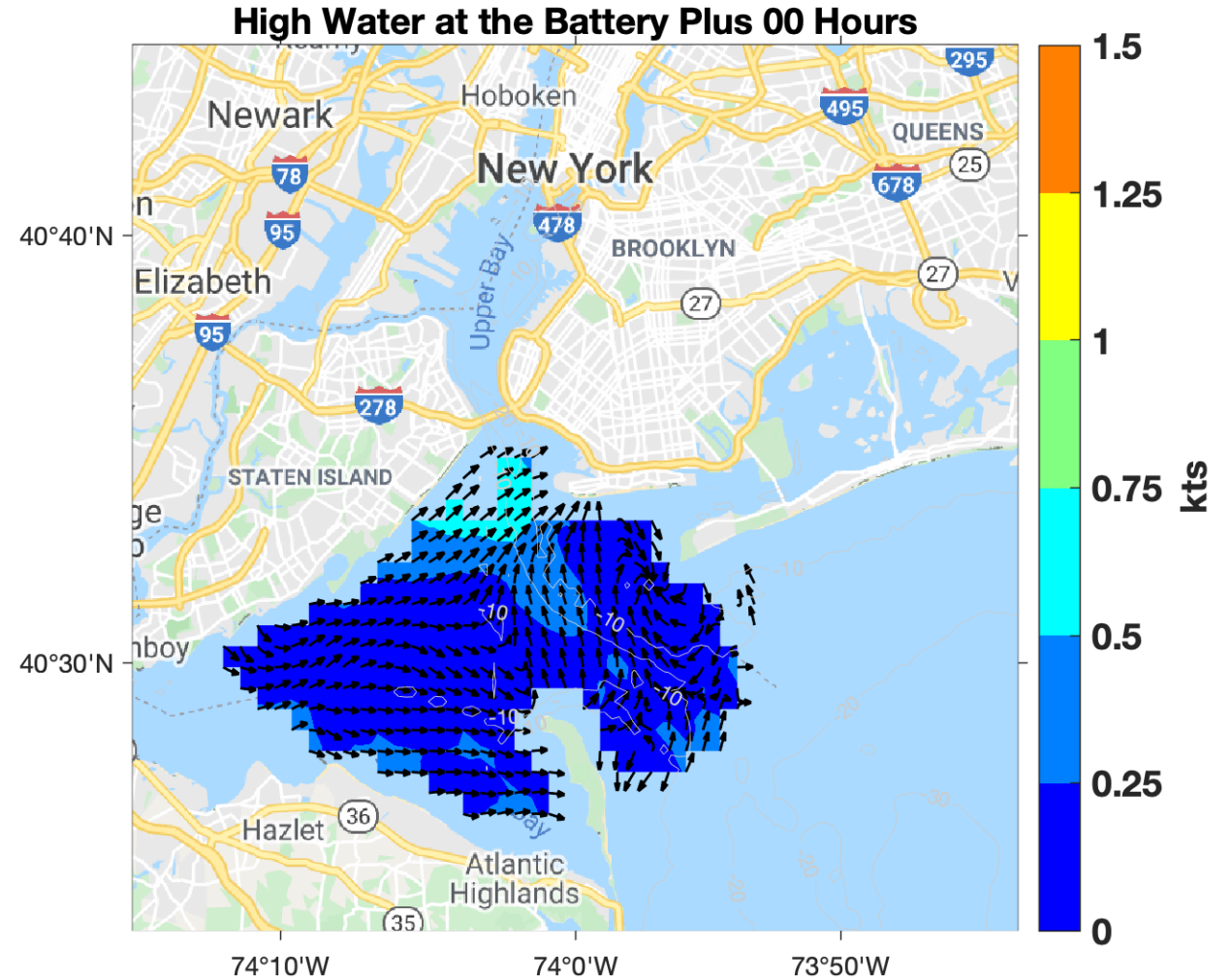
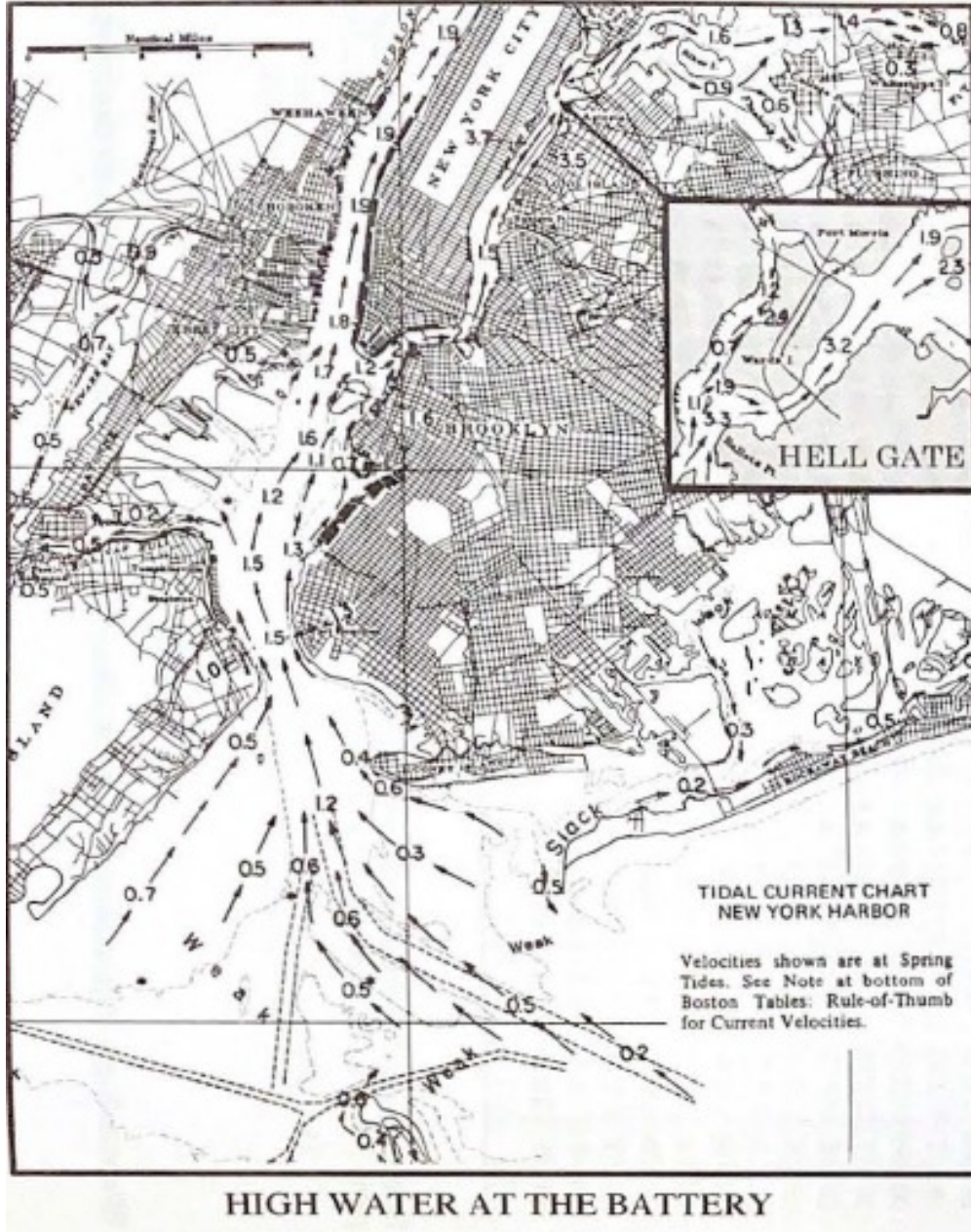
Near-time current predictions using HF radar for New York Harbor, accessible via <https://oceansmap.maracoos.org/>

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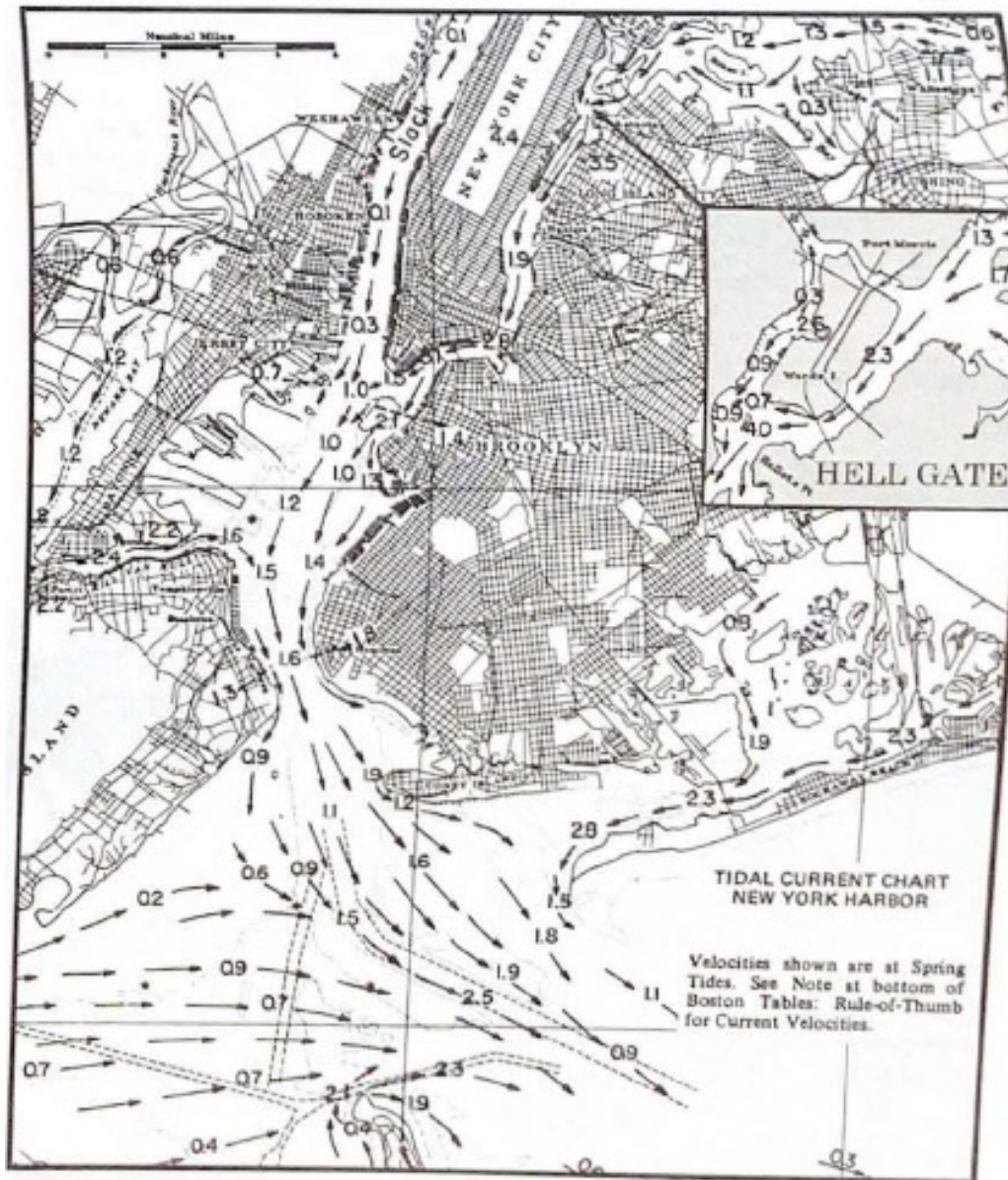
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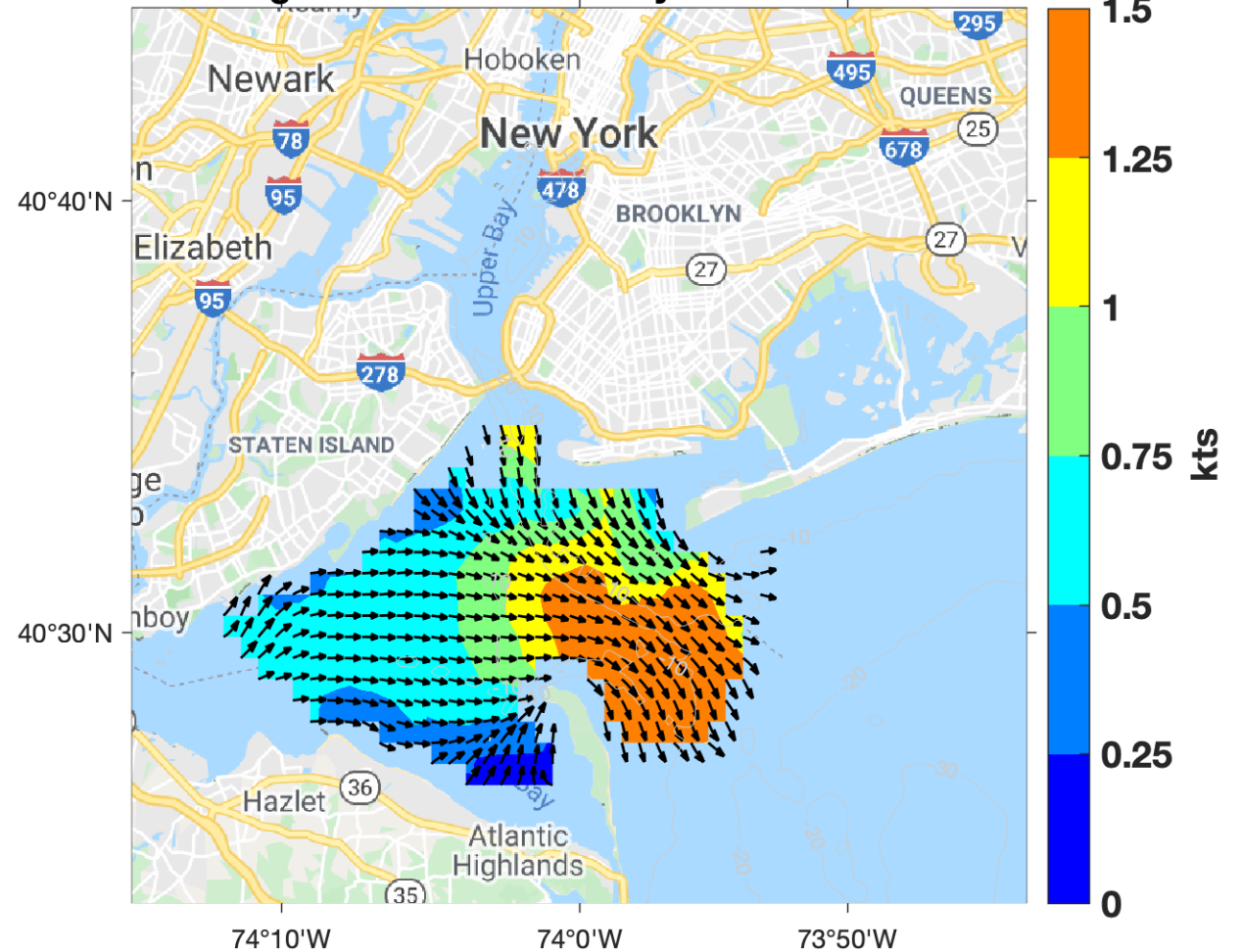




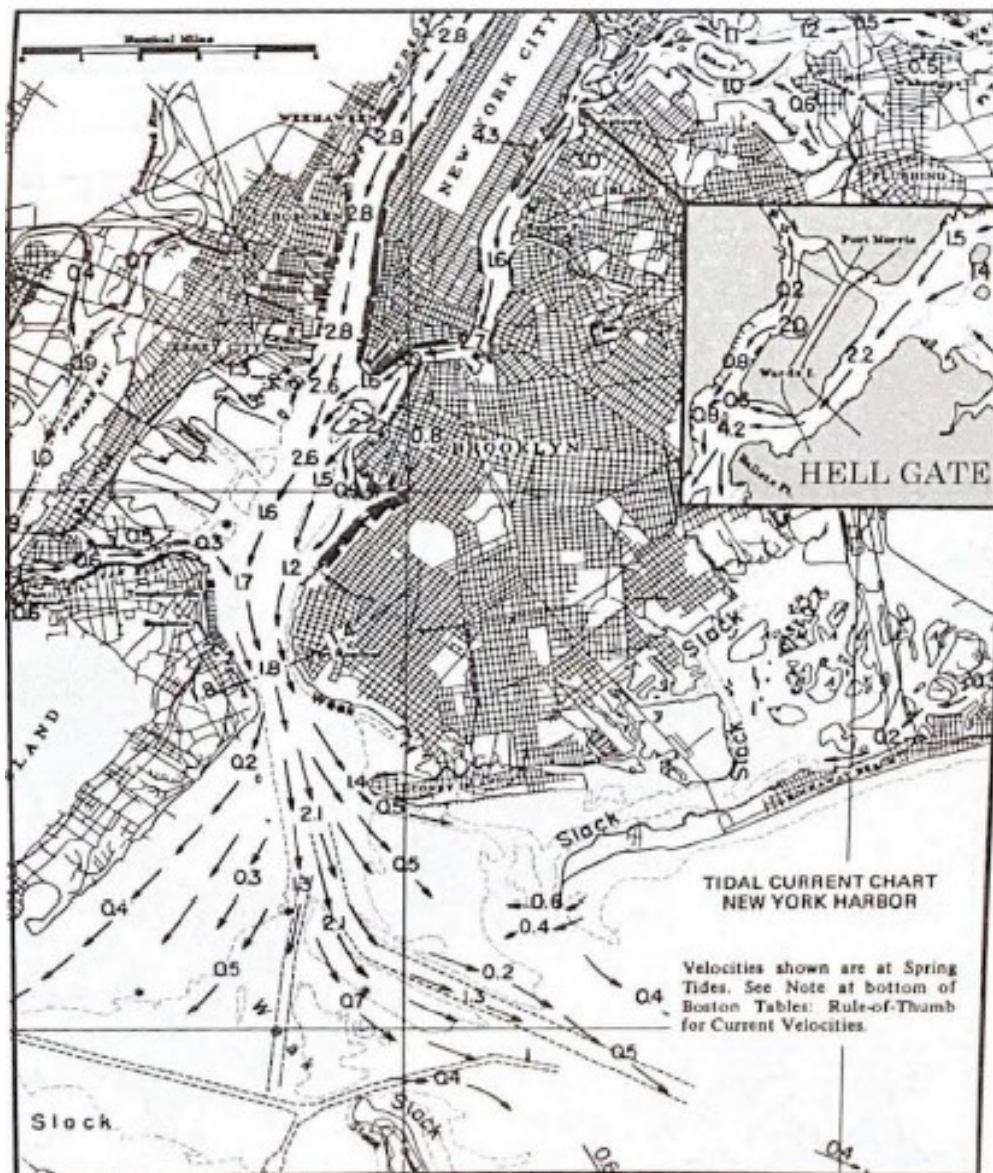


3 HOURS AFTER HIGH WATER AT THE BATTERY

## High Water at the Battery Plus 03 Hours

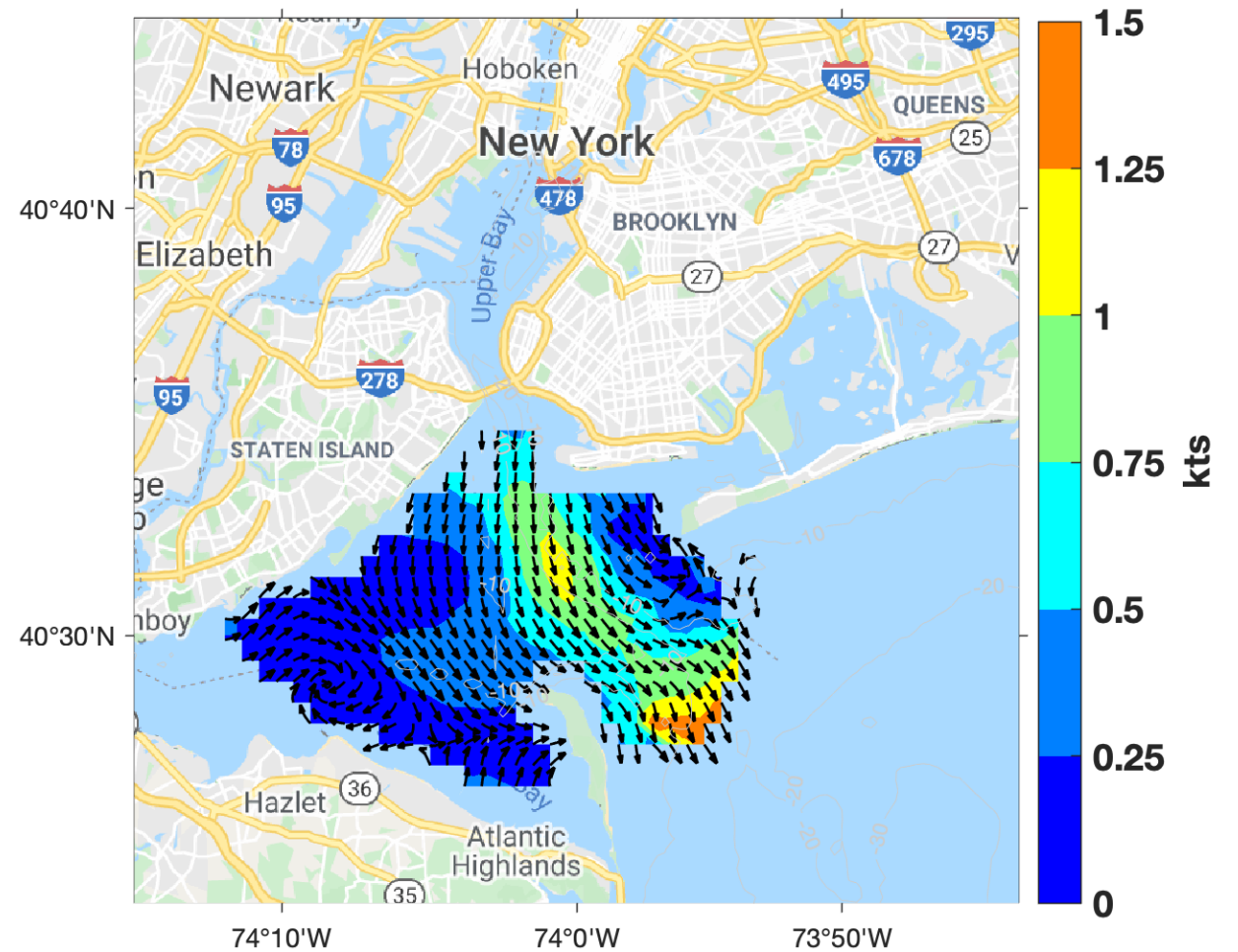




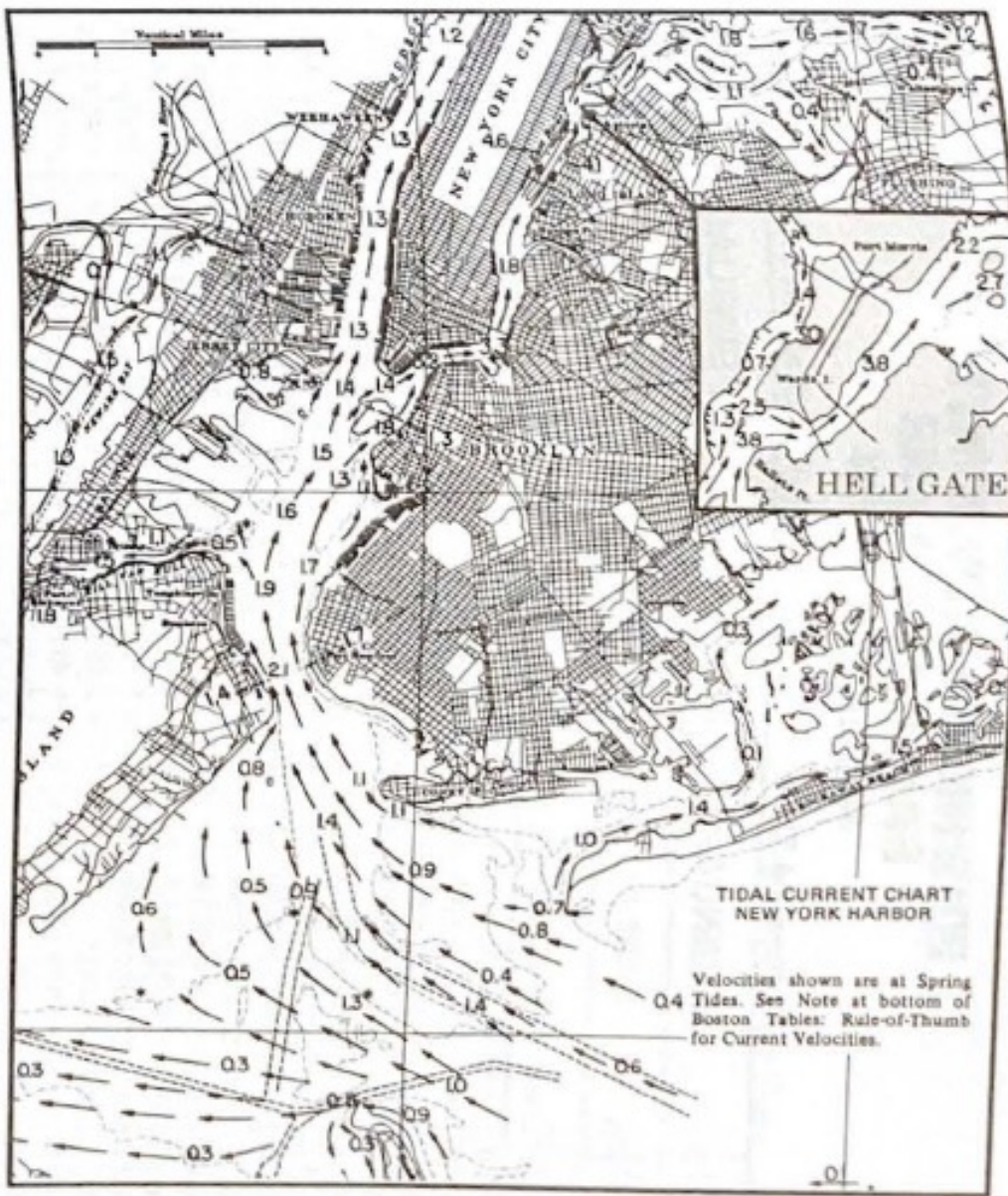


LOW WATER AT THE BATTERY

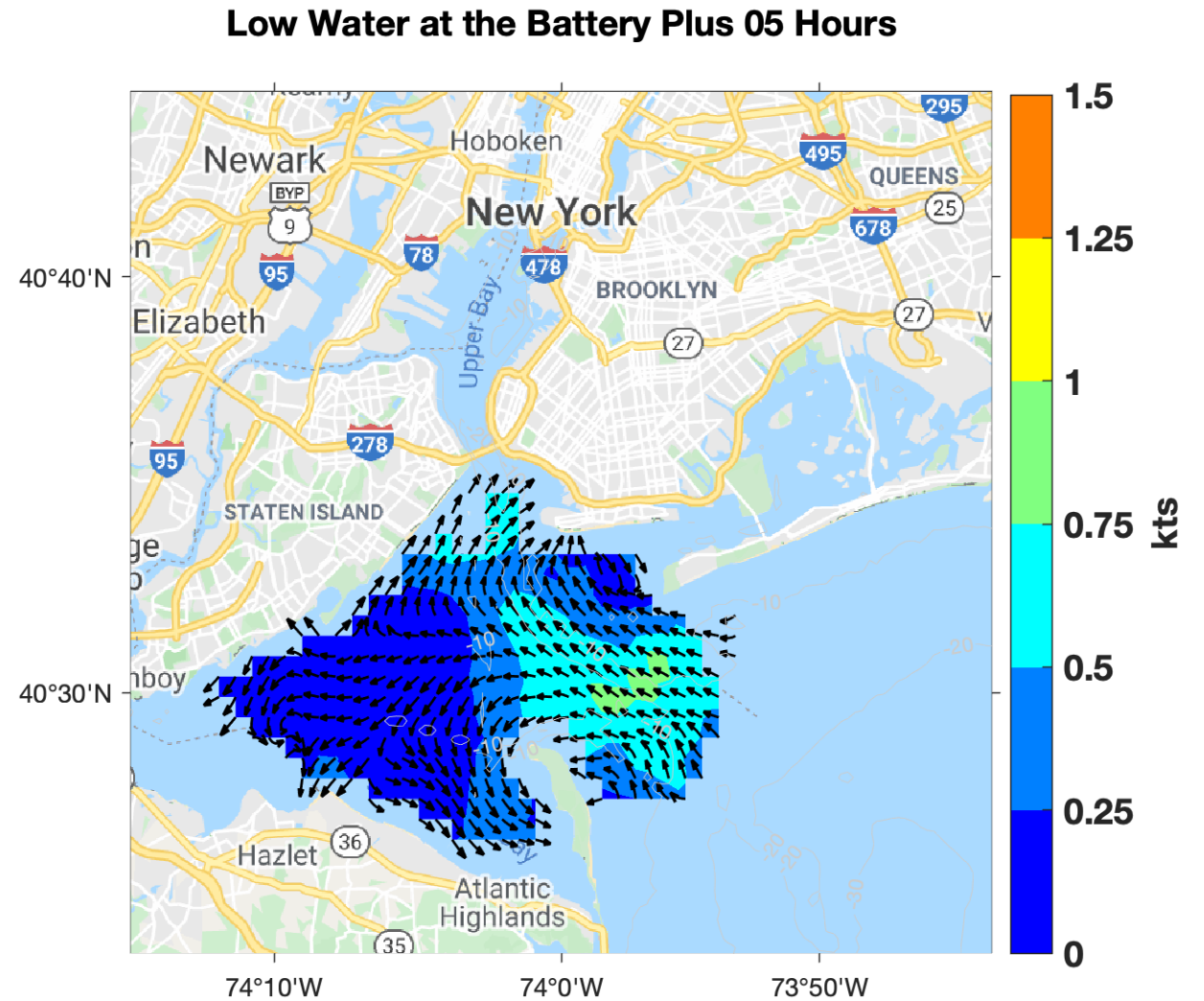
Low Water at the Battery Plus 00 Hours







### 5 HOURS AFTER LOW WATER AT THE BATTERY



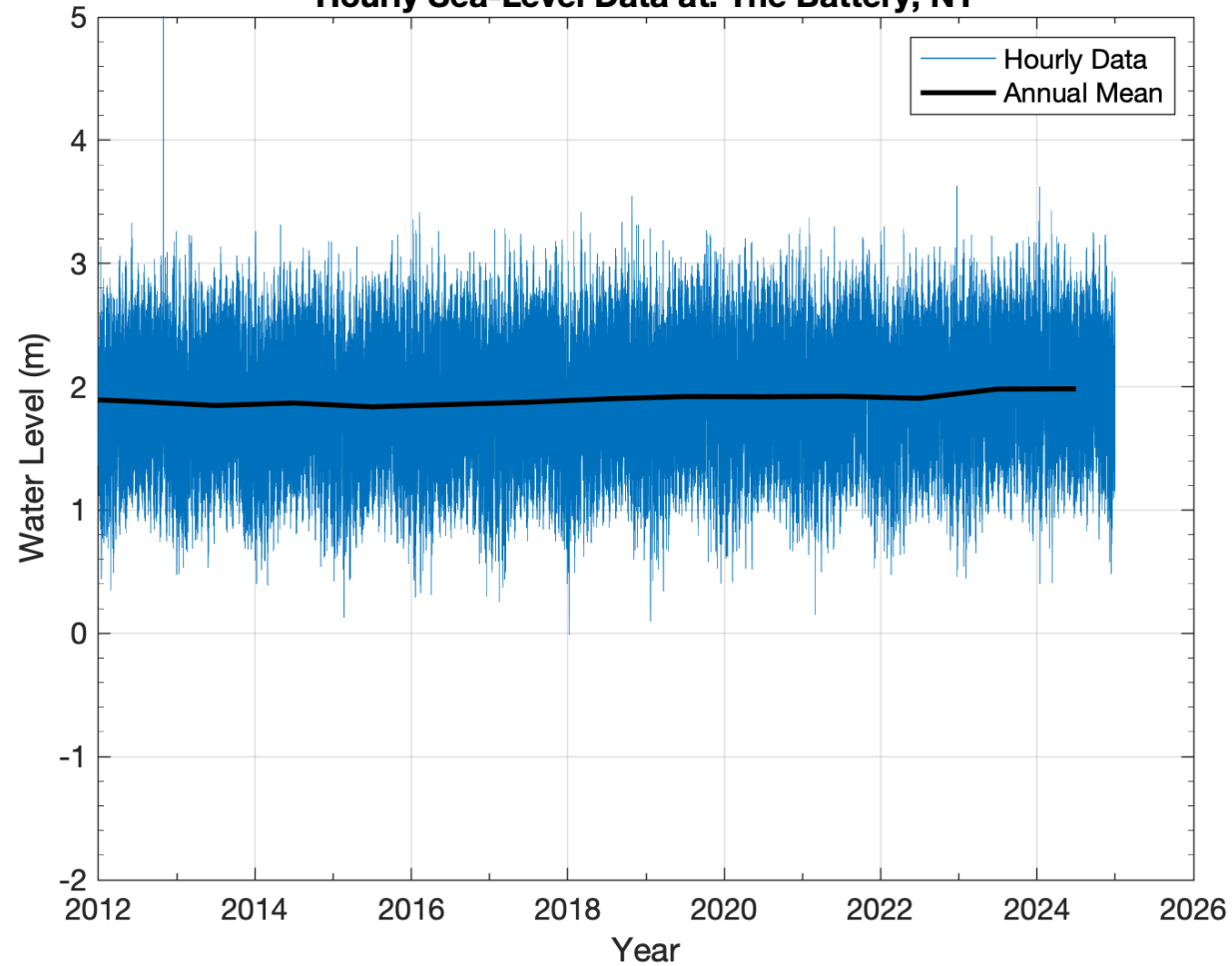
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# Statistics 2012 - 2024

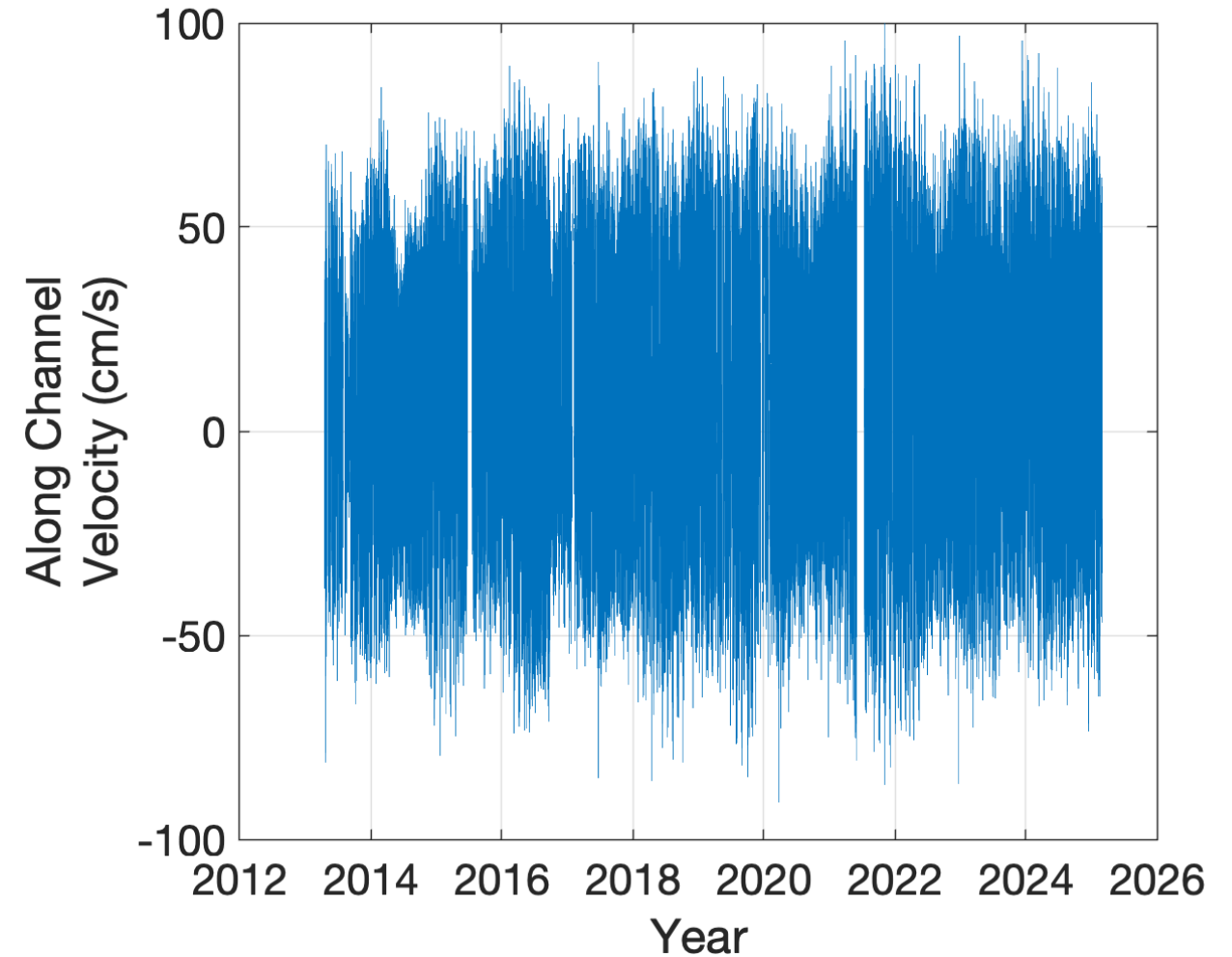
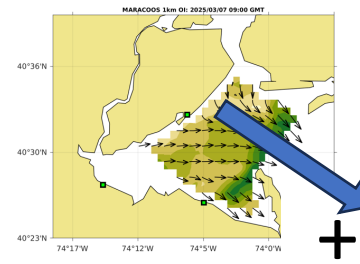


# Water Level

Hourly Sea-Level Data at: The Battery, NY

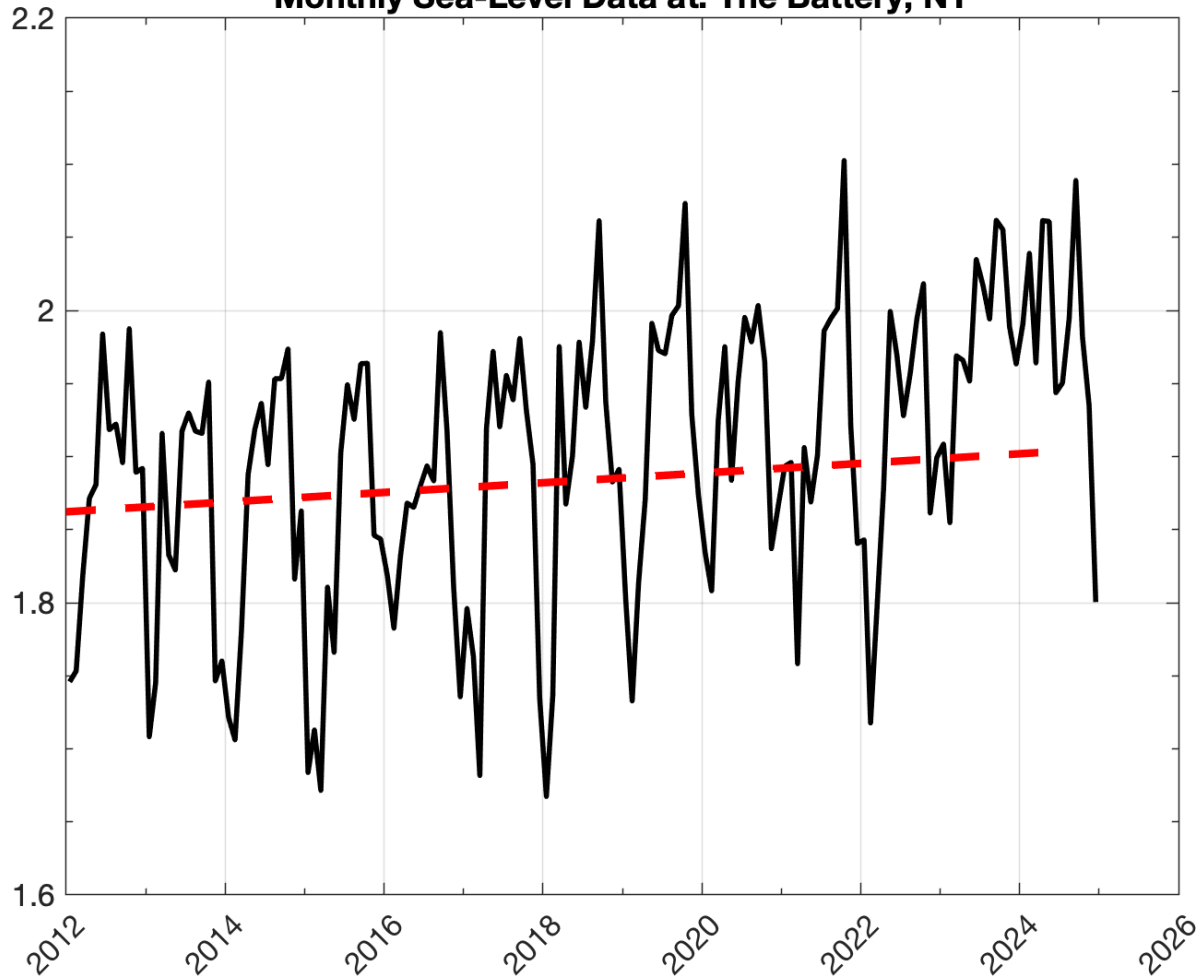


# Currents



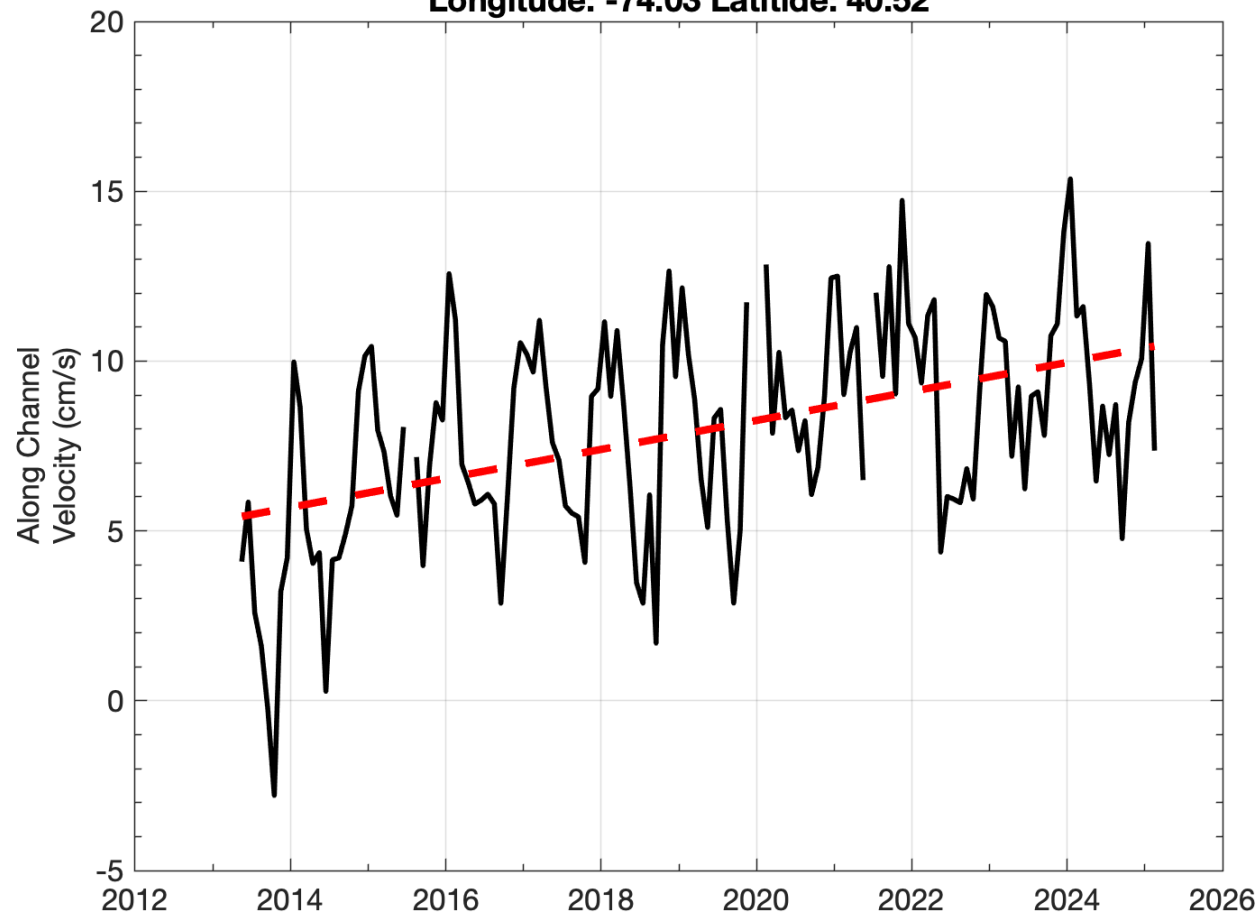
# Water Level

Monthly Sea-Level Data at: The Battery, NY



# Currents

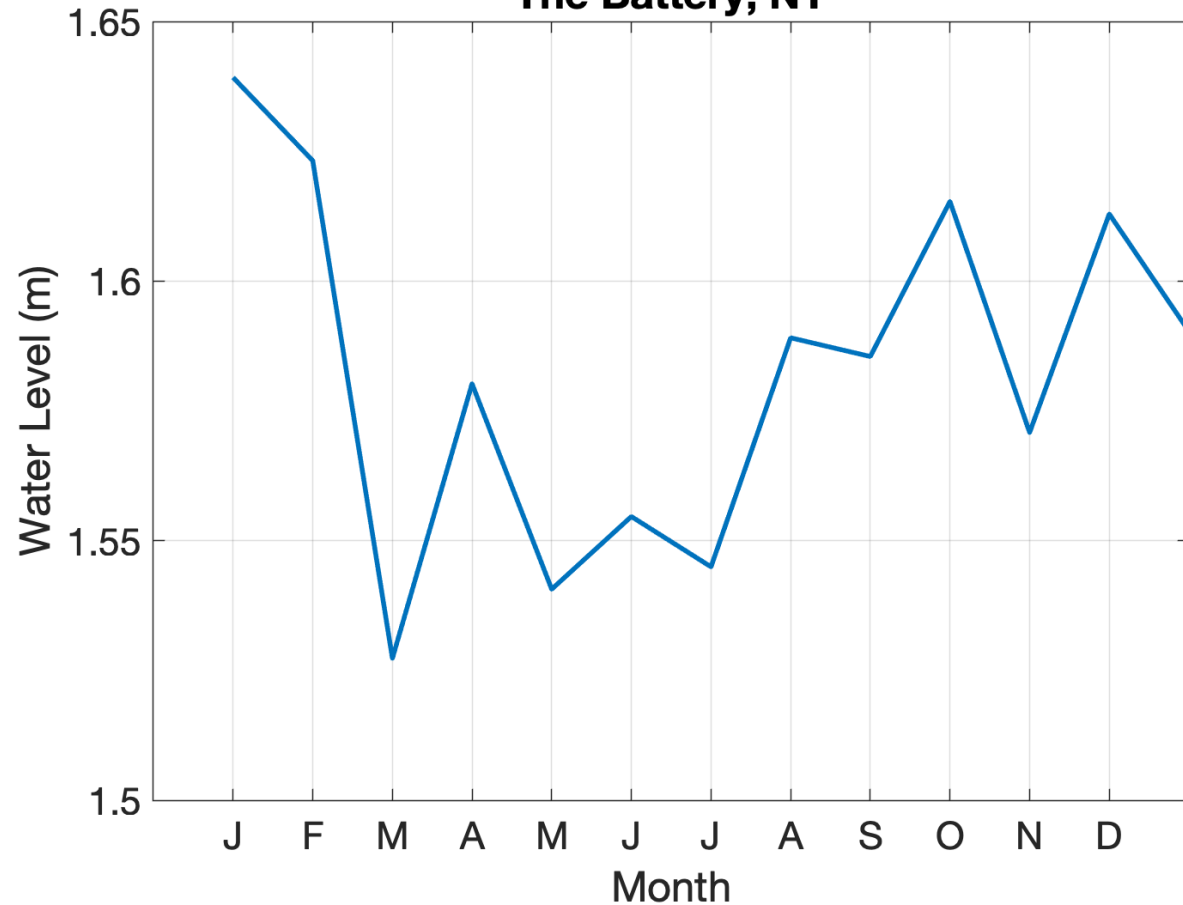
Along Channel Hourly Velocity Data at:  
Longitude: -74.03 Latitude: 40.52





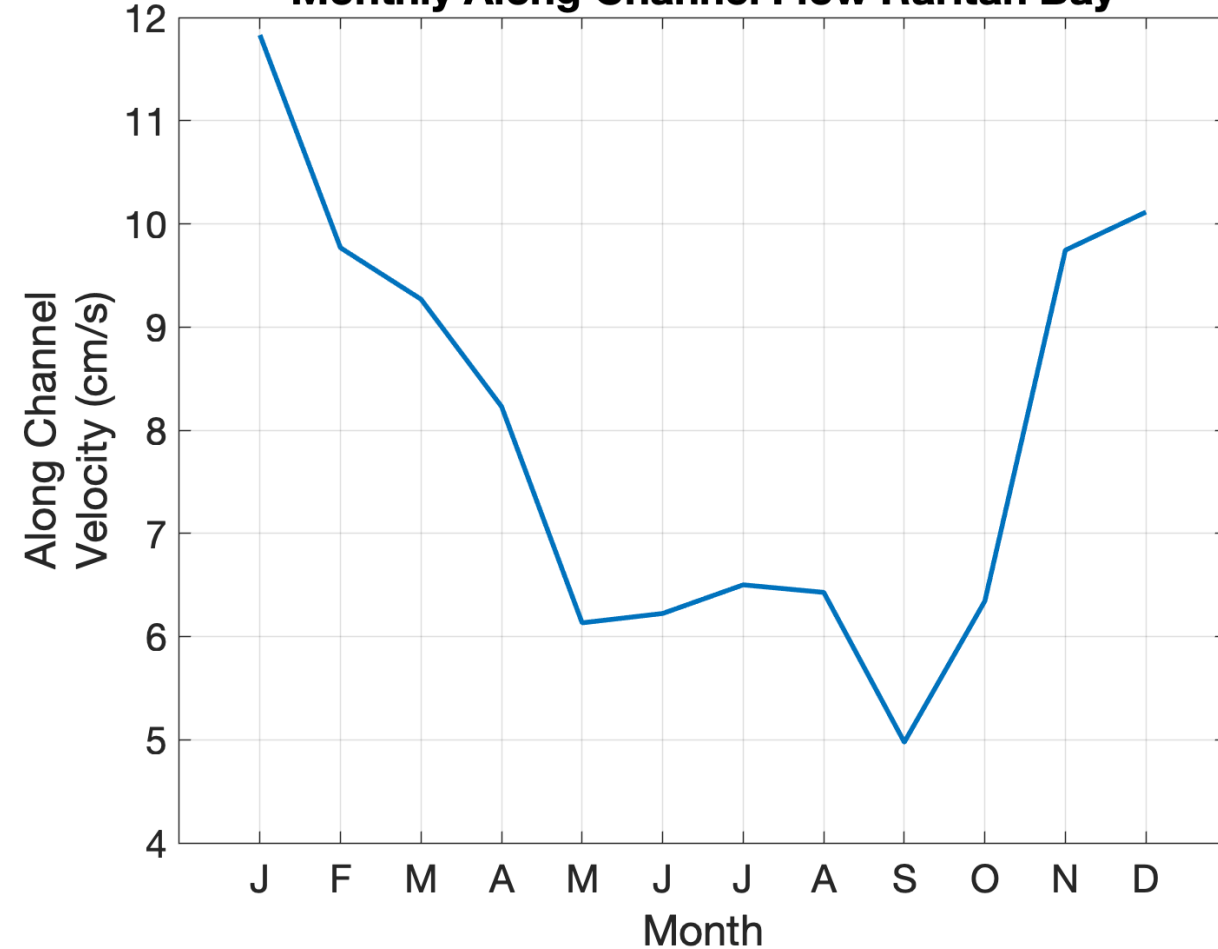
# Water Level

**Monthly Mean Water Level Data at:  
The Battery, NY**



# Currents

**Monthly Along Channel Flow Raritan Bay**



# Conclusions

- Provided introduction to HF radar
- Tidal Currents from January 2021 match Eldridge
- Current magnitude is increasing in Raritan Bay along with sea level at Battery



# Impact of Surface Current Measurements on NY Harbor Water Levels



*Thanks*

