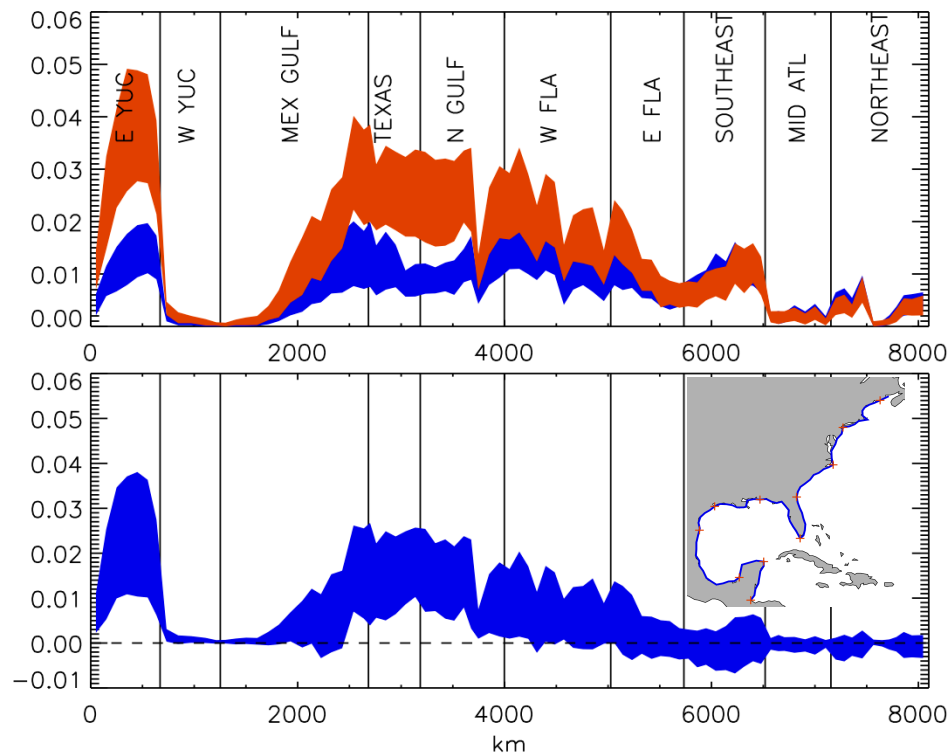# Hurricane Wind and Inundation Risk on the US Northeast and New York City

NASA NCA Support
PI: Timothy Hall, NASA GISS, NY; Co-Is: Philip Orton and Alan Blumberg, Stevens Institute Technology, NJ

Hall and Yonekura, J. Clim., 2012, submitted

Work completed: Stochastic model for North Atlantic hurricanes includes influence of SST and ENSO on storm formation, propagation, and intensity. Estimate US landfall rates with uncertainty as function of SST.
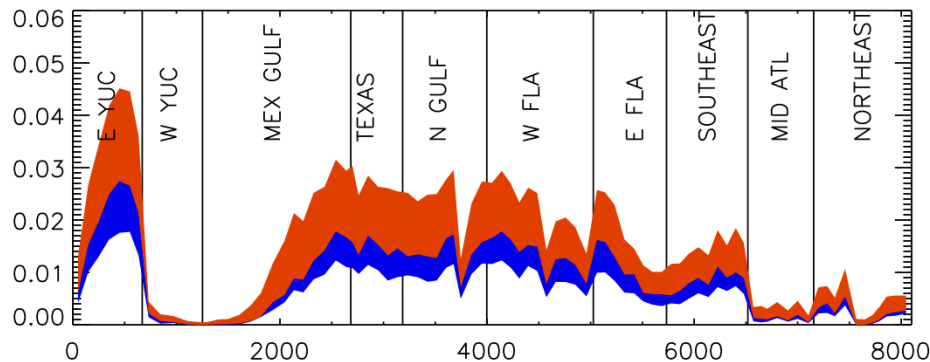
Recent developments:

1. Use delSST instead of SST

2. Exclude short-lived TCs
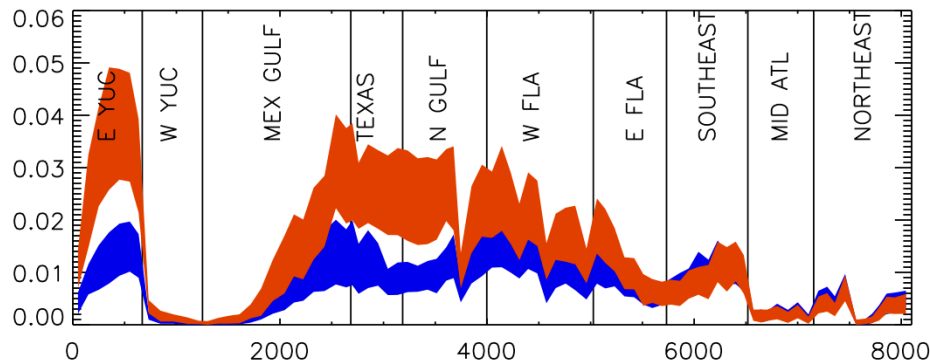
3. New version of intensity model

Conclusions: Significant increased major hurricane landfall on US Gulf coast with SST or delSST. No increase on US east coast.

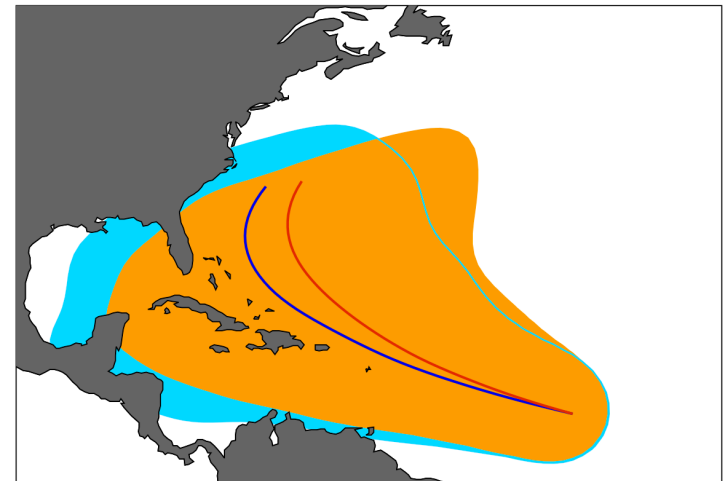# Why is US east coast buffered from increased storminess?

Only genesis sensitive to SST

Tracks, intensity also genesis sensitive to SST

MDR track shift with SST

When only genesis component of model sensitive to SST then find landfall increase all along coast. However, small but significant shifts in tracks with SST buffer US east coast. In warm years tracks from MDR don't reach as far west on average, reducing landfall rates.

sECOM NY-area hydrodynamic model

1. Overland grid: Construction of a new grid for the sECOM surge model. The grid will extend seamlessly from water to land in order to accommodate flooding and the potential of merging of storm surges and inland waterway flooding. ***This work is progress towards reaching our stated project goal for 2012 of a new model grid.***

2. *Validation*: We have tested sECOM performance by comparing simulations of historic events to gauged sites and overland high water marks. So far, we have assembled all the data required to validate the model grid: wind and atmospheric pressure data for the worst 30 historical extra-tropical cyclones (e.g. nor'easters), and 4 historical TCs that have impacted the NYC area since 1940. We have also assembled high water mark and tide gauge data for the validation process. ***Testing and validating the new developments in the sECOM model is a stated project goal of our project.***

Orton, P., N, Georgas, A. Blumberg, and J. Pullen, 2012. Detailed modeling of recent severe storm tides in estuaries of the New York City region, *J. Geophys. Res.*, doi:10.1029/2012JC008220.

The Impact Angle of Hurricane Sandy's New Jersey Landfall

Hall and Sobel, *Nature*, submitted, 2012.
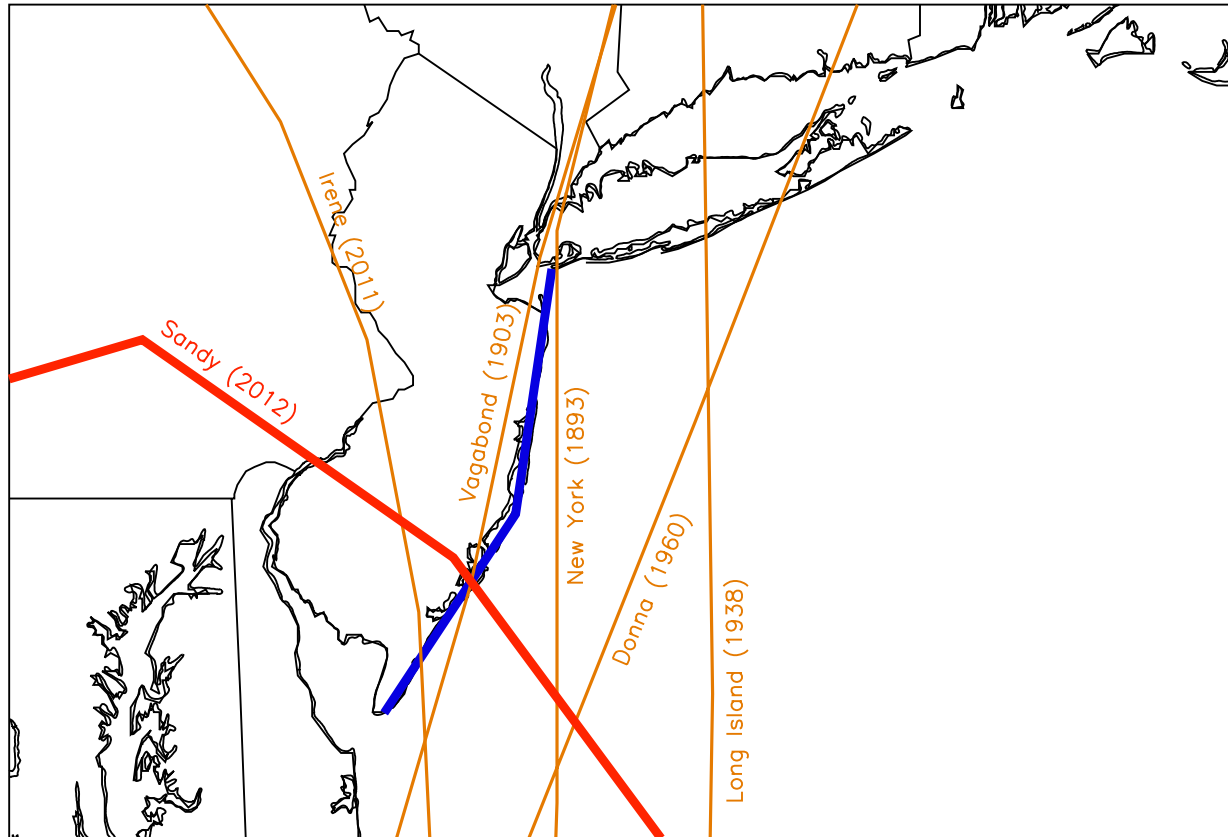
No TC in historic record hit NJ as close to perpendicular. Impact angle one factor determining storm surge. *Sandy tidal surge: 13.9 ft on Manhattan, Battery Park*

Question: How frequent is Sandy-like track under long-term average climate conditions?
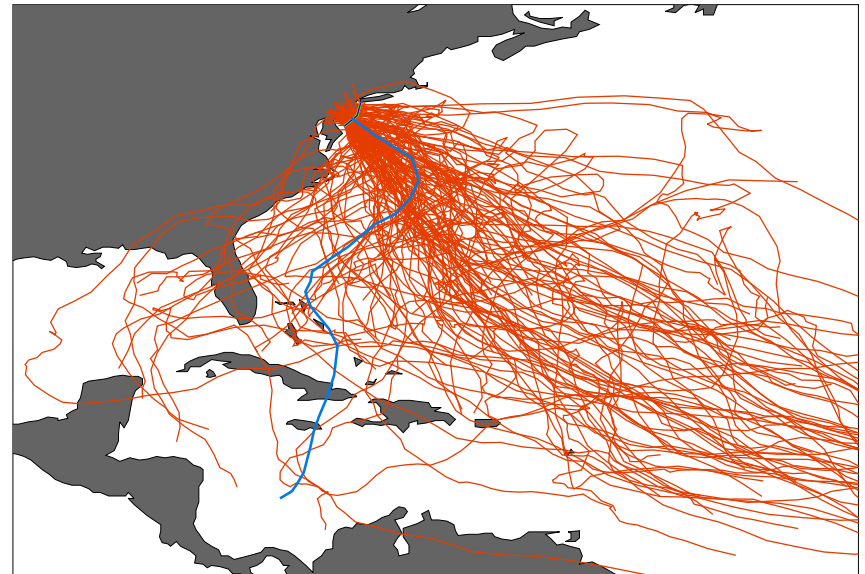
Question:
How frequent is Sandy-like track under long-term average climate conditions?
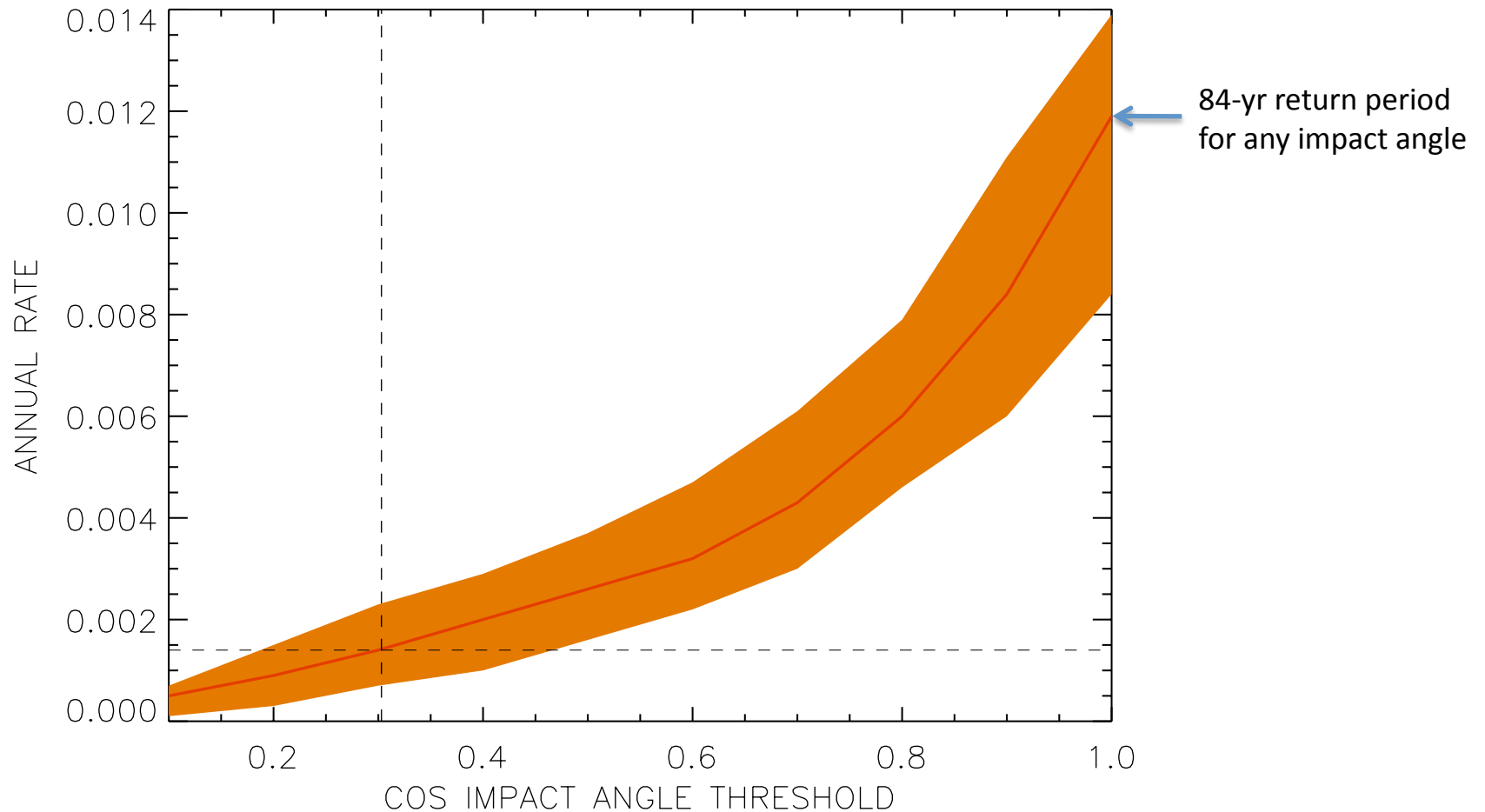
All NJ cat1+ landfalls
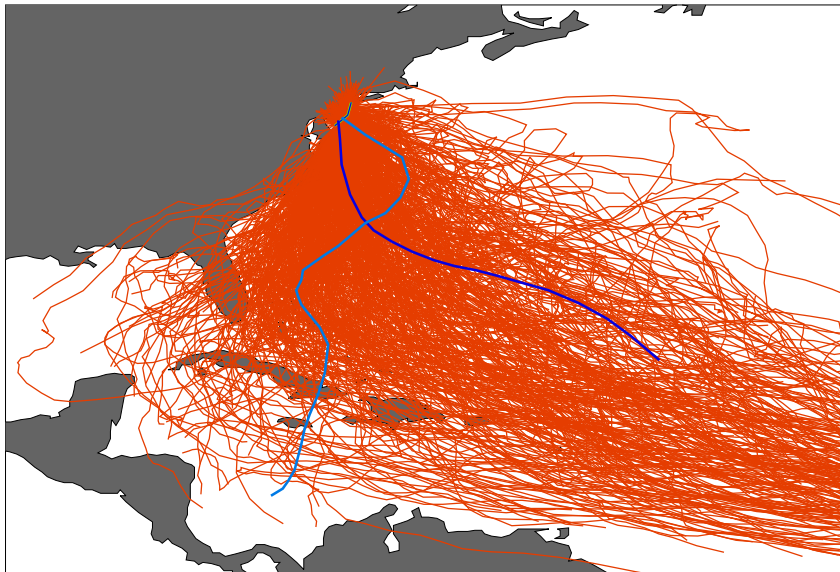
All NJ cat1+ landfalls within 30 of perpendicular

Use stochastic model to obtain synthetic set of TCs hitting NJ CAT1+ with angle thresholds successively closer to perpendicular. Use long-term average climate conditions.

Annual NJ hurricane landfall rate as function of impact angle

84-yr return period for any impact angle

NJ landfall at least Sandy's intensity and at least as close to perpendicular at rate 0.0014 yr^{-1} (0.0007-0.0023 at 95%) :

Sandy impact: 714-year event