CATASTROPHIC STORM SURGE MODELING

Michael Young

Senior Director,

Model Product Management, Americas Climate

FCHLPM Workshop

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AGENDA

History of Surge Hazard Technology

Challenges in Surge Modeling

Recommendations for FCHLPM Standards

SURGE MODEL APPROACHES

Empirical /Statistical

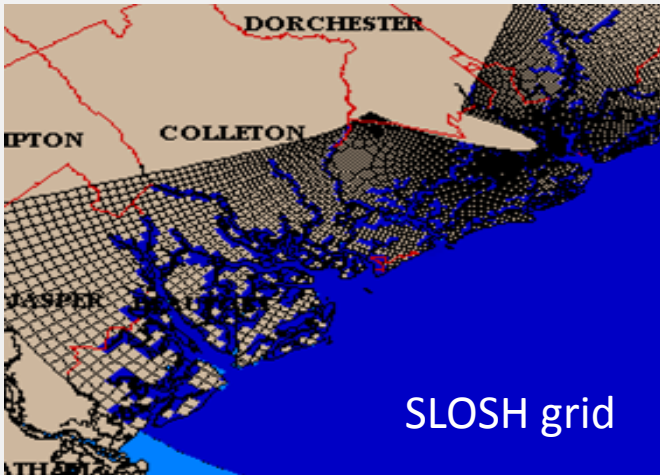
- Attempt to link Surge to Wind Intensity at landfall
- Doesn't account for surge development over life of storm
- Difficult to deal with complex coast-lines, bays, and barrier islands

SLOSH

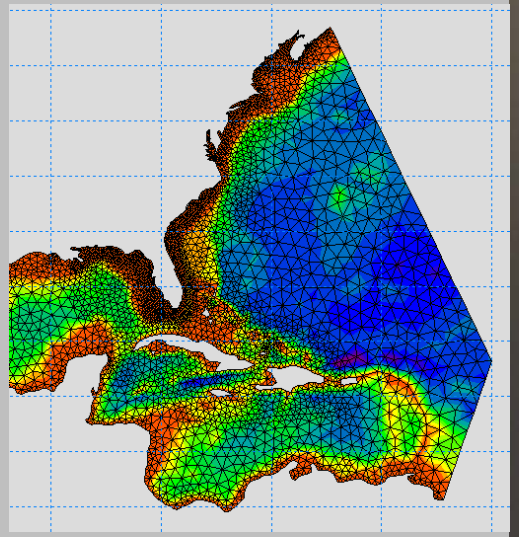
- Not certified for FEMA flood modeling studies
- Simplified equations
- Grid resolution decreases away from central point-limited to specific basins

Numerical Modeling

- Only 2 modeling platforms certified for FEMA flood mapping
- MIKE 21 and ADCIRC



SURGE REQUIRES SUPERCOMPUTING RESOURCES



MIKE FM Hydrodynamic Model from Danish Hydrological Institute

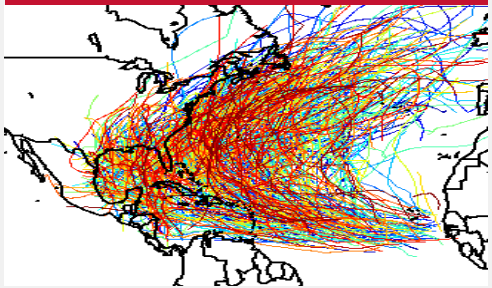
500 CPUs +
60 Terrabytes
of disk space

For each hurricane simulation, generating the surge is more computationally intensive than generating the onshore wind field

"MIKE 21 system has been used worldwide over the last 20 years for over 400 studies, including those in the United States"

RMS SURGE MODEL METHODOLOGY

Track Set



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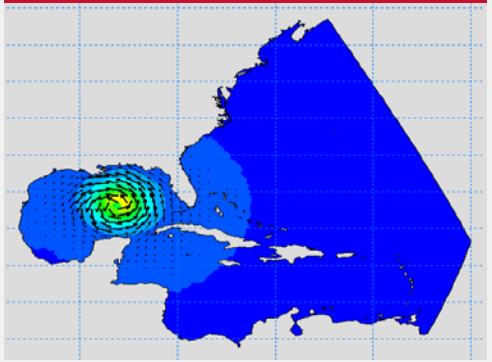
Wind Field



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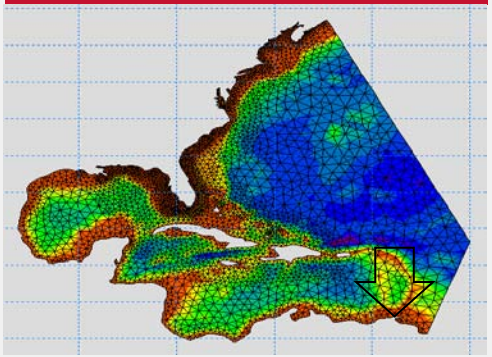
Regional Surge Model



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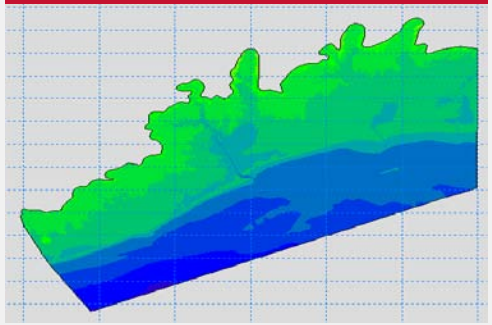
Local Surge Modeling



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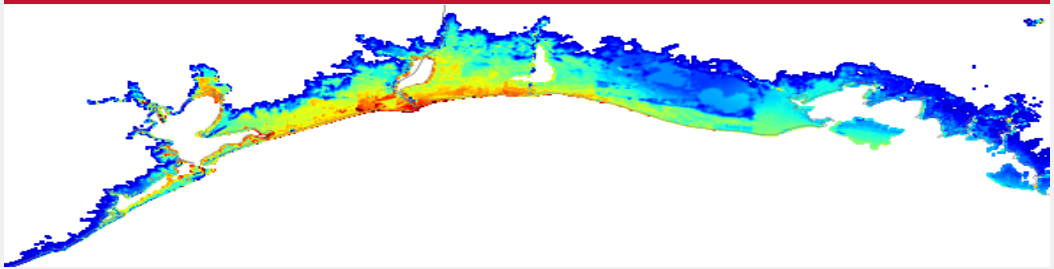
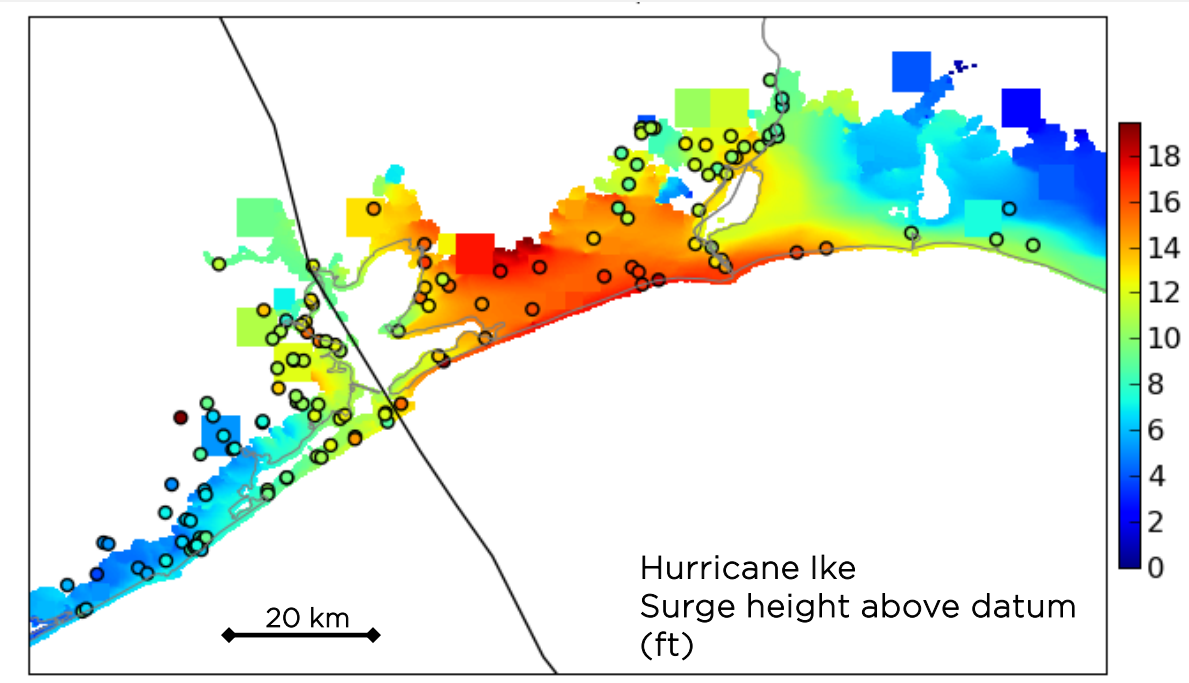
Surge Footprint



KEY EVENTS IN THE GULF: IKE, KATRINA, RITA, IVAN

Validation

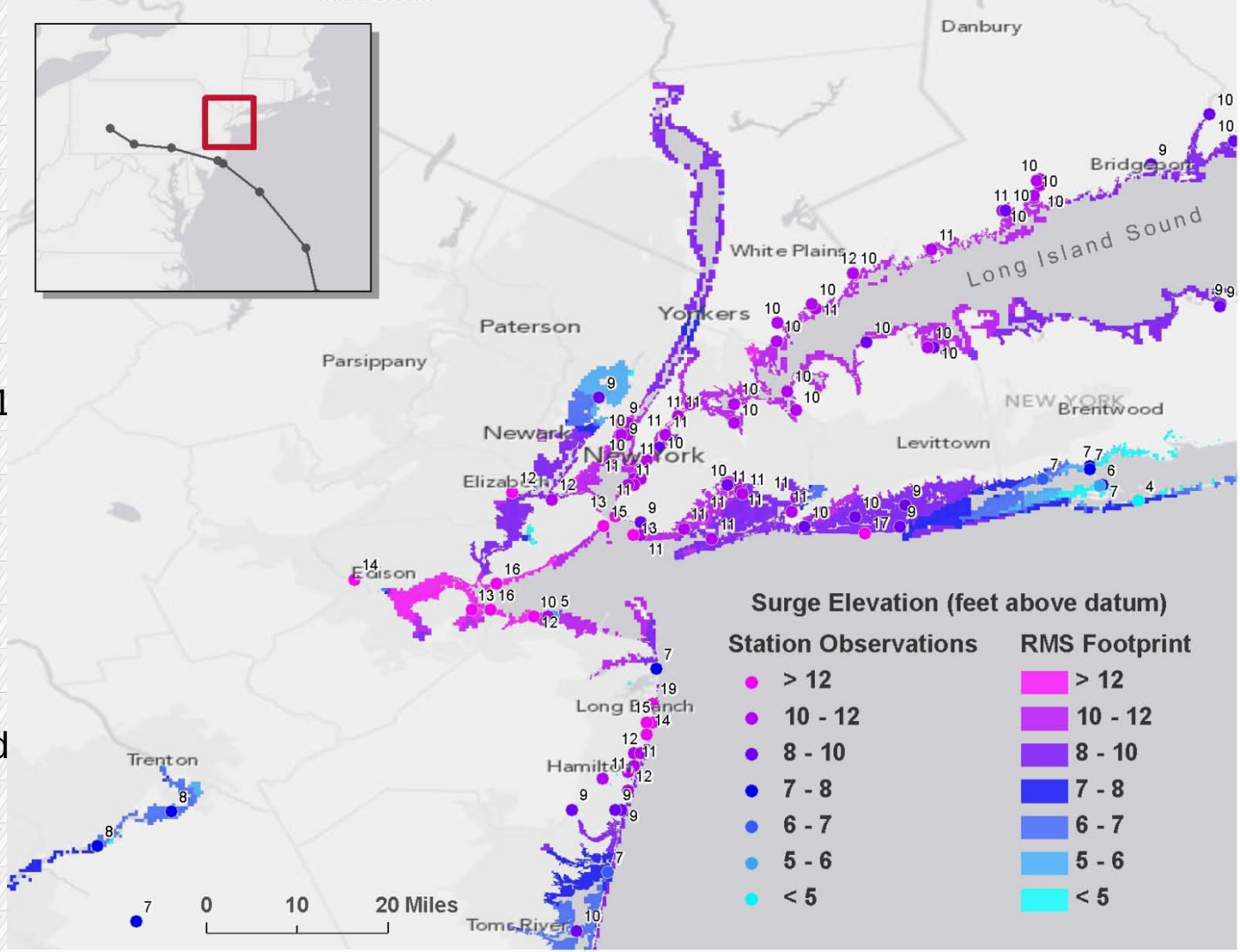
- Of last 100 years, only about 30 events have measurable storm surge.



VALIDATION OF SANDY FOOTPRINT

Output from MIKE21 model

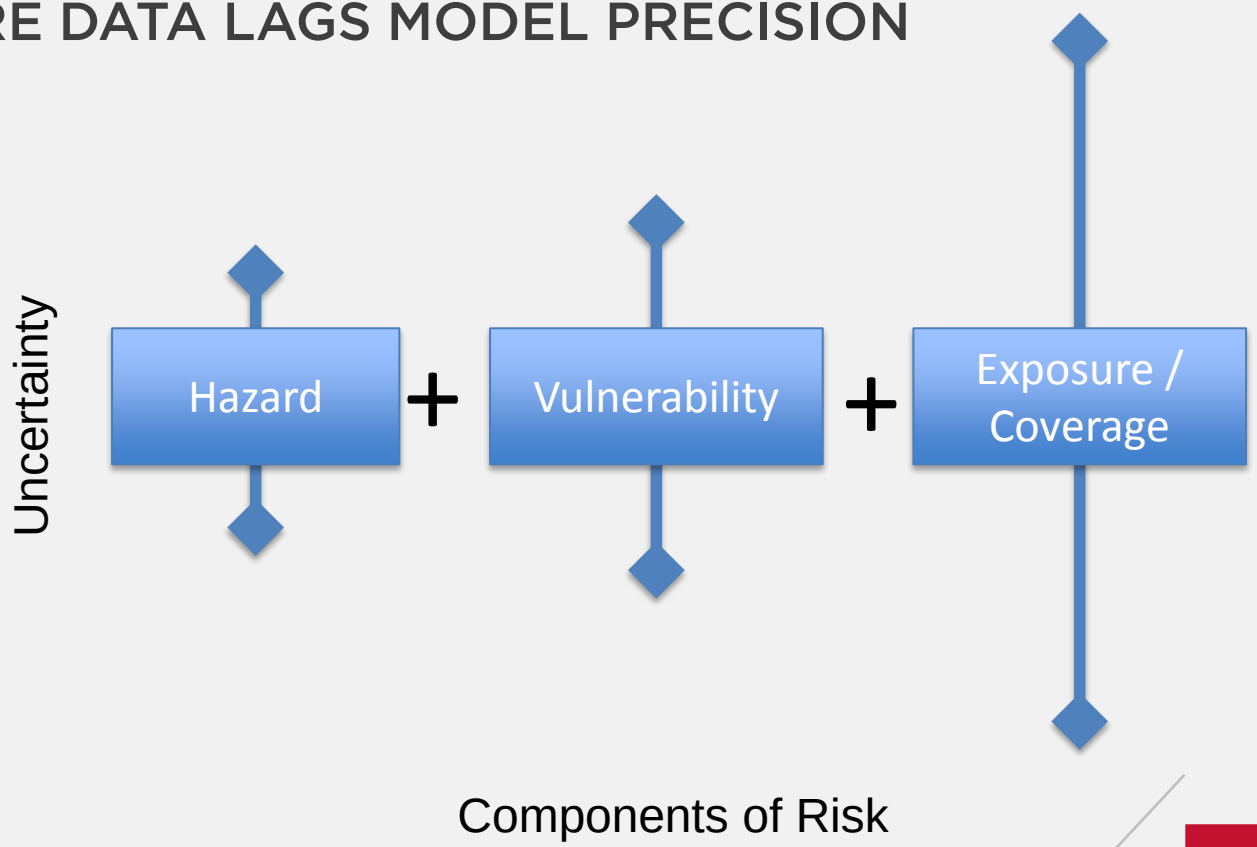
Older Cat modeling surge methodologies cannot handle complex inlets, estuaries etc around NYC



SURGE EXPOSURE DATA LAGS MODEL PRECISION

With High Res Surge Modeling, most of the uncertainty in risk is related to

- unknown elevations
- unknown insured coverage

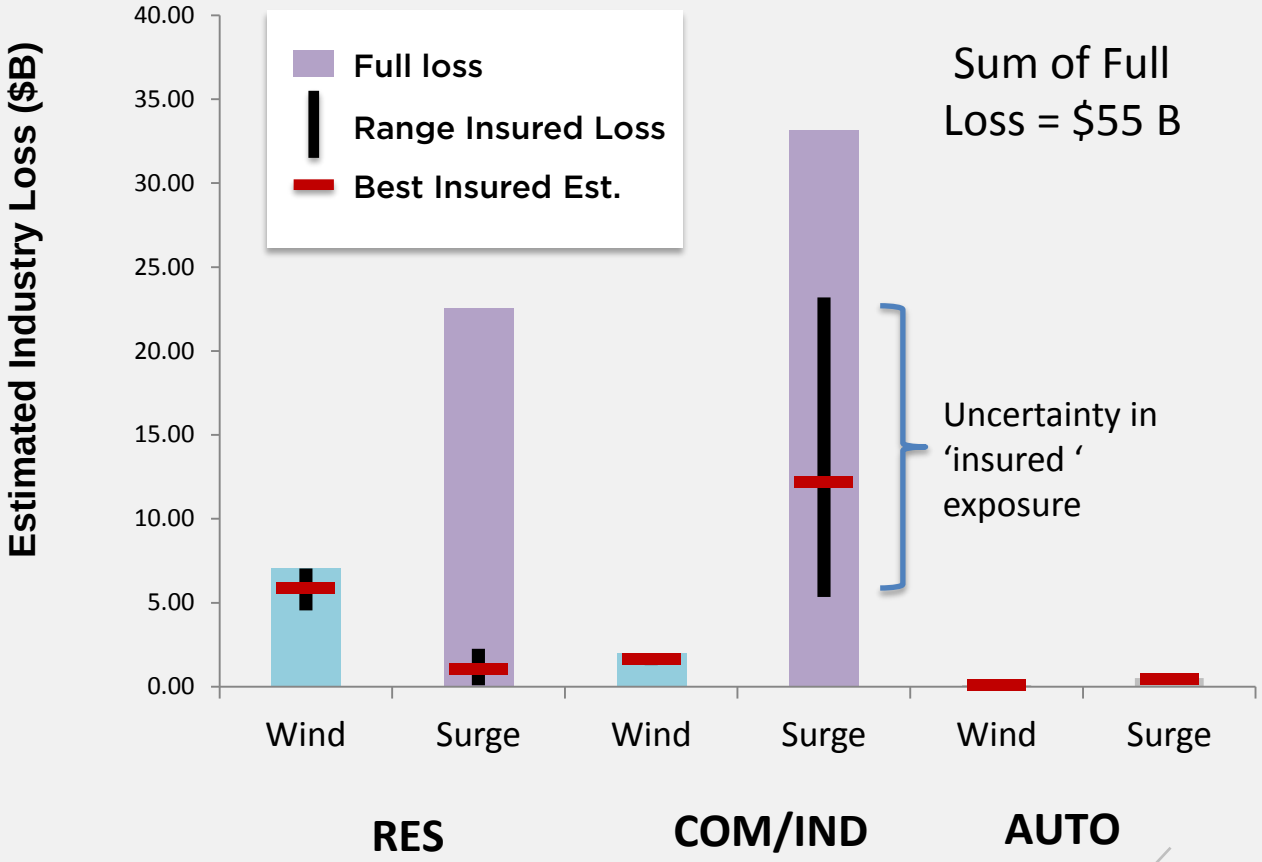


WHAT PROPORTION OF LOSSES ARE INSURED?

Assumed **30-40%** of the underlying modeled ground up surge damage is insured

RMS Best Estimate

$20-25 B



SURGE MODELING STANDARDS IN FCHLPM PROCESS?

- Surge Modeling is as complex as wind modeling
  - Hazard Model
  - Vulnerability Model
  - Financial Model
- Lack of Insurance Data for validation
  - Limited number of ‘surge events’ for validation.
    - 30 events verses ~200 in 100 years
  - Residential surge loss largely covered by NFIP
    - Private companies do not have ‘surge’ claims
    - Privacy concerns prevent sharing NFIP claims at location level
  - FHCF data call must be higher resolution

SURGE MODELING STANDARDS IN FCHLPM PROCESS?

- Recommend complete set of parallel standards for Surge
  - Not like Demand Surge which can be adequately treated with simple models
  - Doubling the number standards will double:
    - Size of submission
    - On-site audit time
    - Commission review time.