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

SLOSH grid
SURGE REQUIRES SUPERCOMPUTING RESOURCES

MIKE FM Hydrodynamic Model from Danish Hydrological Institute

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

500 CPUs + 60 Terrabytes of disk space

For each hurricane simulation, generating the surge is more computationally intensive than generating the onshore wind field.
RMS SURGE MODEL METHODOLOGY

Track Set

Wind Field

Regional Surge Model

Local Surge Modeling

Surge Footprint
Validation

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

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

Hurricane Ike
Surge height above datum (ft)

20 km
VALIDATION OF SANDY FOOTPRINT

Output from MIKE21 model

Older Cat modeling surge methodologies cannot handle complex inlets, estuaries etc around NYC
With High Res Surge Modeling, most of the uncertainty in risk is related to:
- unknown elevations
- unknown insured coverage

Components of Risk
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 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
• 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:
    o Size of submission
    o On-site audit time
    o Commission review time.