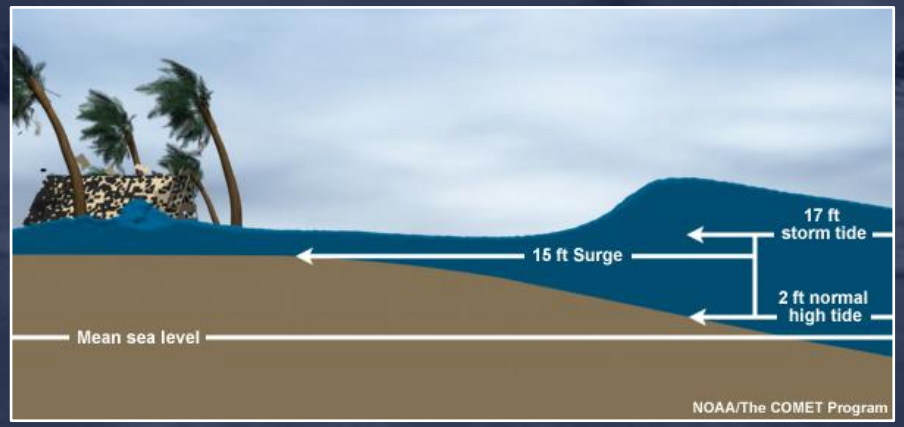
SLOSH

- Sea, Lake, and Overland Surges from Hurricanes
- A computerized numerical model developed by the National Weather Service (NWS) to estimate storm surge heights (and winds) resulting from historical, hypothetical, or predicted hurricanes



SLOSH
Strengths and Limitations

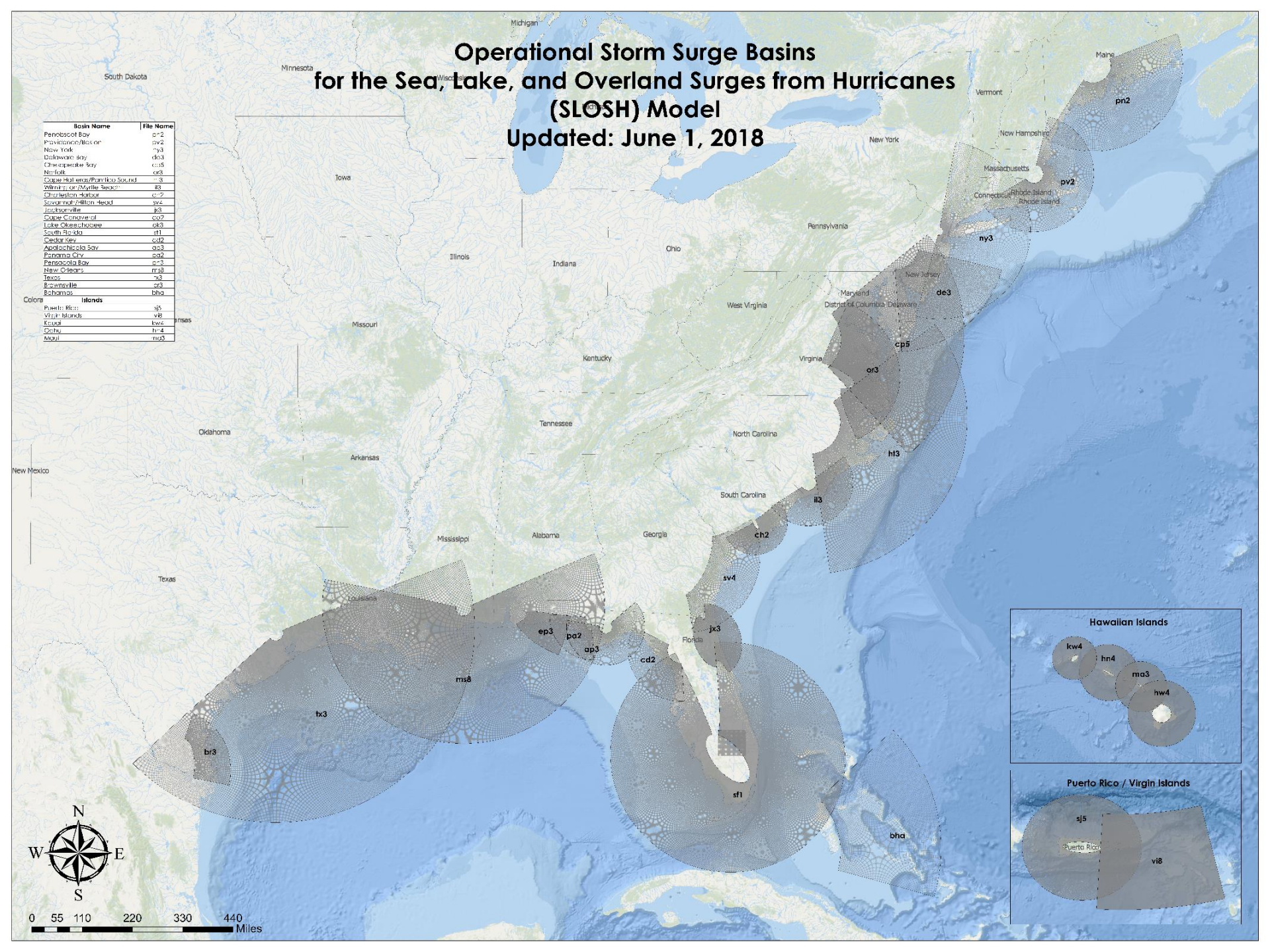
- **SLOSH does include:**
  - Flow through barriers/gaps/passes
  - Deep passes between bodies of water
  - Inland inundation (wet/dry cell)
  - Overtopping of barrier systems, levees, and roads
  - Coastal reflection (coastally trapped Kelvin waves)
  - Astronomical tide
  - Wave setup in U.S. island states and territories

- **SLOSH does not include:**
  - Wave run-up (efforts underway)
  - Normal river flow and rain

Operational Storm Surge Basins for the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) Model

Updated: June 1, 2018

Basin Name	File Name
Penobscot Bay	pn2
Providence/Boston	pv2
New York	ny3
Delaware Bay	de3
Chesapeake Bay	cp5
Norfolk	or3
Cape Hatteras/Pamlico Sound	... 3
Wilmington/Myrtle Beach	il3
Charleston Harbor	ch2
Savannah/Hilton Head	sv4
Jacksonville	jx3
Cape Canaveral	cd2
Lake Okeechobee	ok3
South Florida	sf1
Cedar Key	cd2
Apalachicola Bay	ap3
Panama City	pa2
Pensacola Bay	ep3
New Orleans	ms8
Texas	tx3
Brownsville	br3
Bahamas	bha
Islands	
Puerto Rico	sj5
Virgin Islands	vi8
Kauai	kw4
Oahu	hn4
Maui	ma3



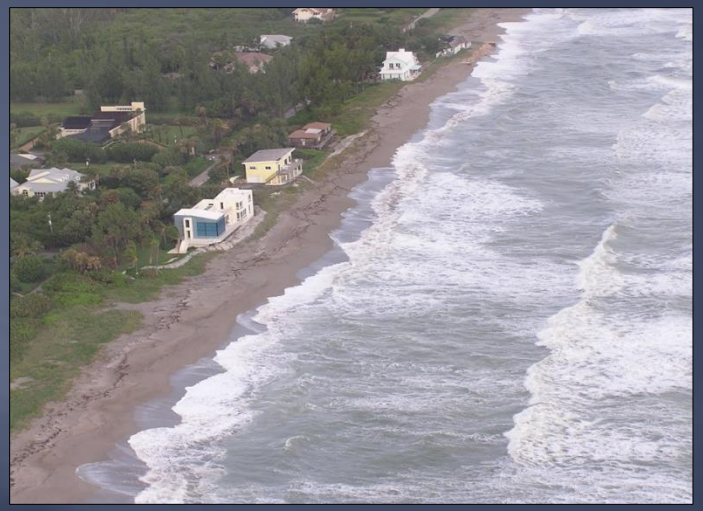
Forecasting Storm Surge

- All storm surge models are STRONGLY dependent on the accuracy of the meteorological input
- Meteorological uncertainty will dominate over storm surge model specifications (physics, resolution, etc)
- Be aware of different vertical datums
- Storm surge is only one component in the real water level rise

Total water rise = surge + tides + waves + freshwater flow

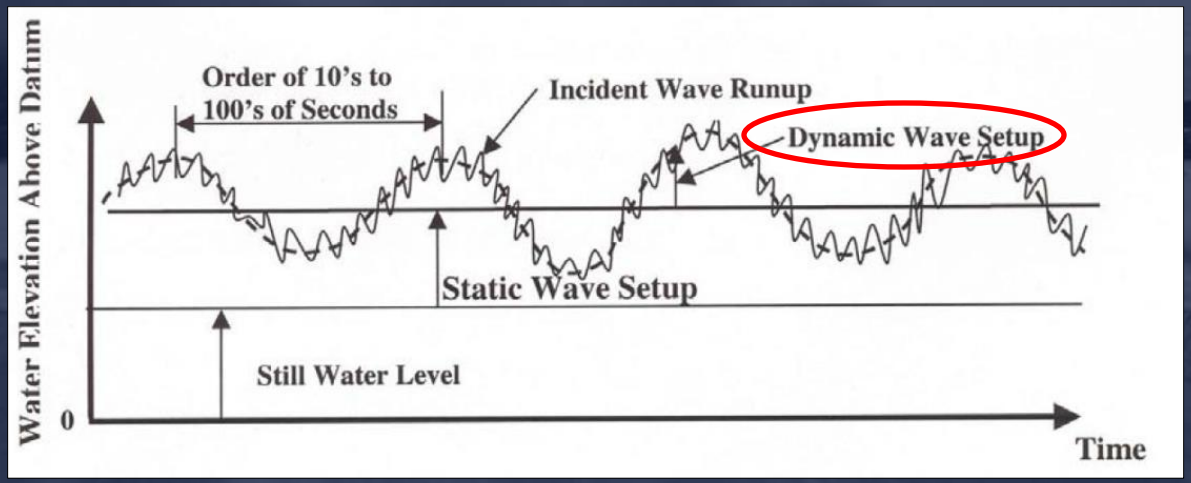
Effects of Waves on Total Water Level Rise

- Waves can be a significant contributor to the total water level rise and cause substantial damage to property
- Waves-effects can be grouped into two main categories:
  - Wave setup
  - Wave runup
- Not all wave models can resolve both wave setup and wave runup
- Waves are not as important in all regions (bathymetric profile)



Wave Setup

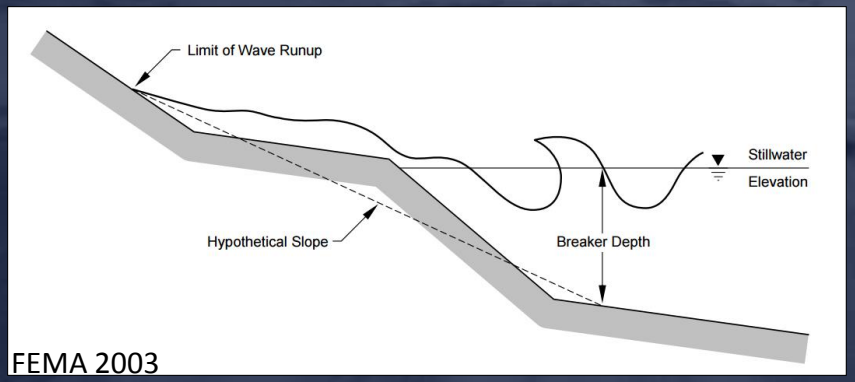
- Wave setup is comprised of two components:
  - Static/mean: transfer of breaking wave momentum to the water column (averaged over a time period)
  - Dynamic/fluctuating: nonlinear transfer of energy and momentum (wave groups/infragravity waves)



FEMA 2003

Wave Runup

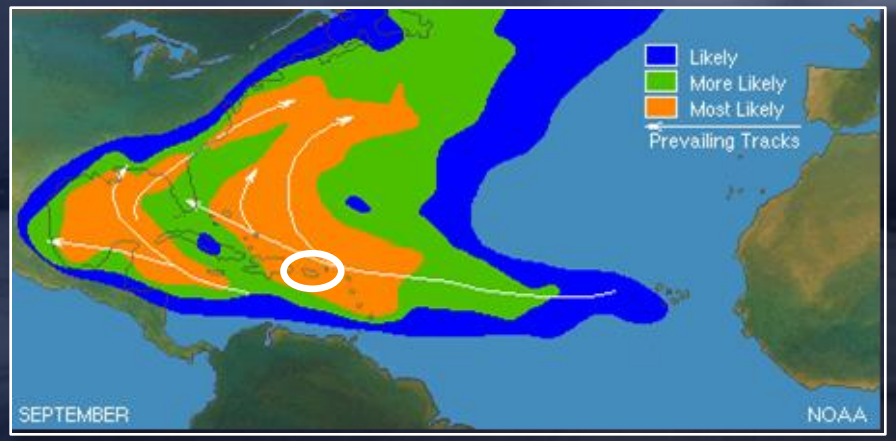
- Maximum vertical extent of wave uprush (swash zone) above the still water level (tide and surge)
- Extremely complex phenomenon that is difficult to model
  - Function of the local water level, incident wave conditions and beach characteristics (slope, permeability, reflectively, roughness, etc.)
  - Individual wave crests and slowly varying wave groups (infragravity waves) can penetrate well beyond the still-water inundation
- Important to coastal engineering, structural analysis and vulnerability, and beach/buff erosion, etc.



FEMA 2003

NOAA/IOOS Modeling Testbed

To extend the present **operational surge forecasting** capability from mild-sloped coastal areas such as the US East and Gulf of Mexico coasts to **steep-sloped areas** such as Caribbean and Pacific islands, and study the **contribution of waves**. Identify models or techniques to transition to NOAA's **National Hurricane Center** and **local WFOs**.

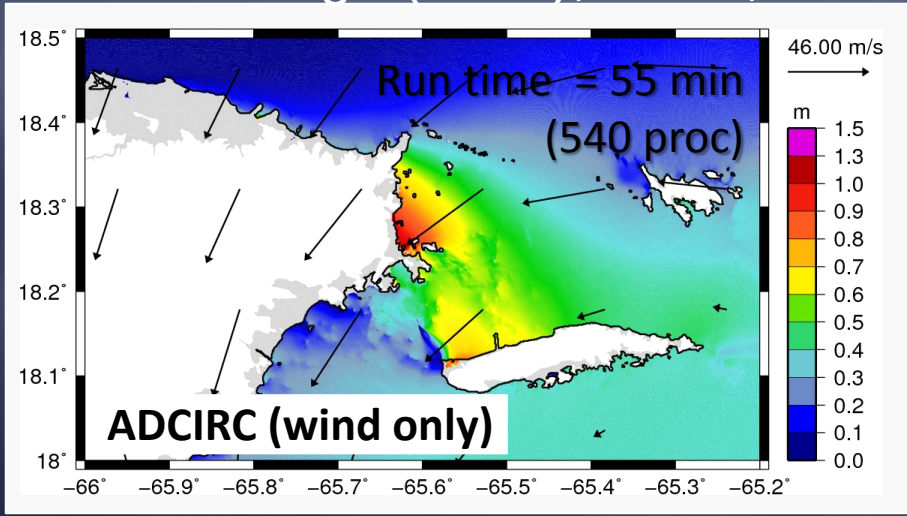


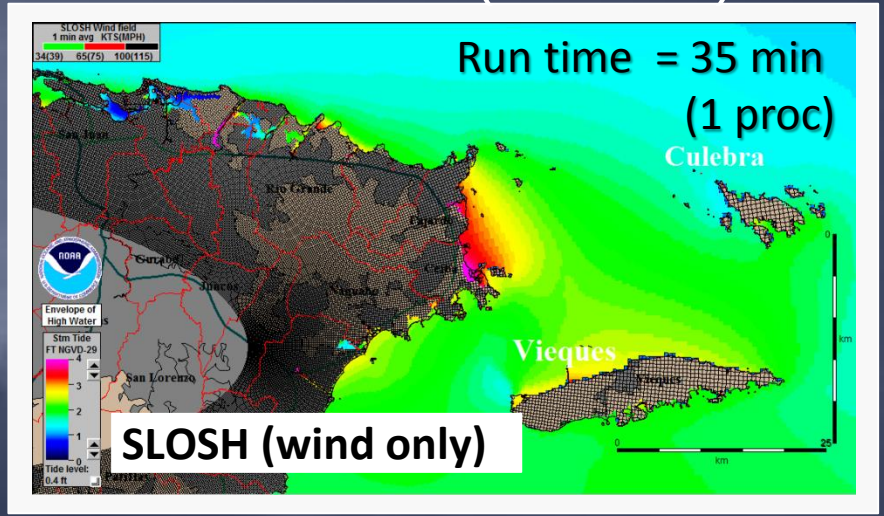
www.nhc.noaa.gov/climo

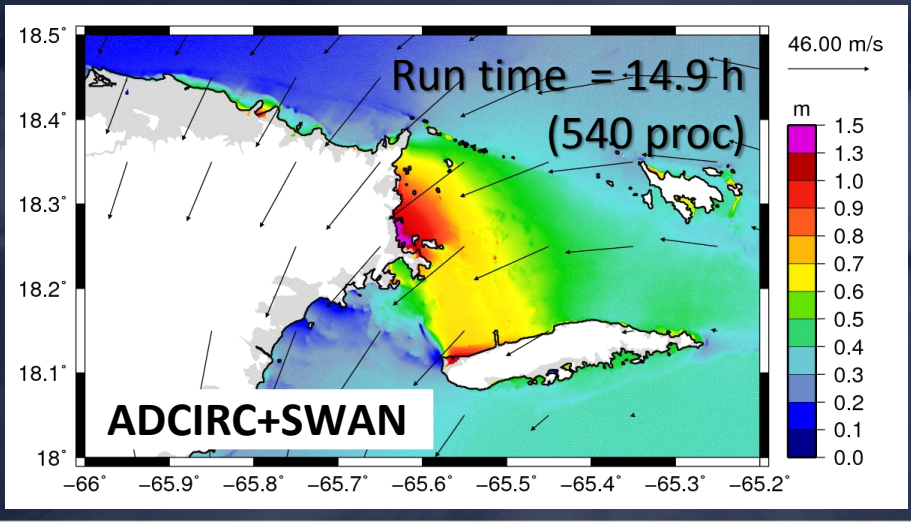
www.caricoos.org

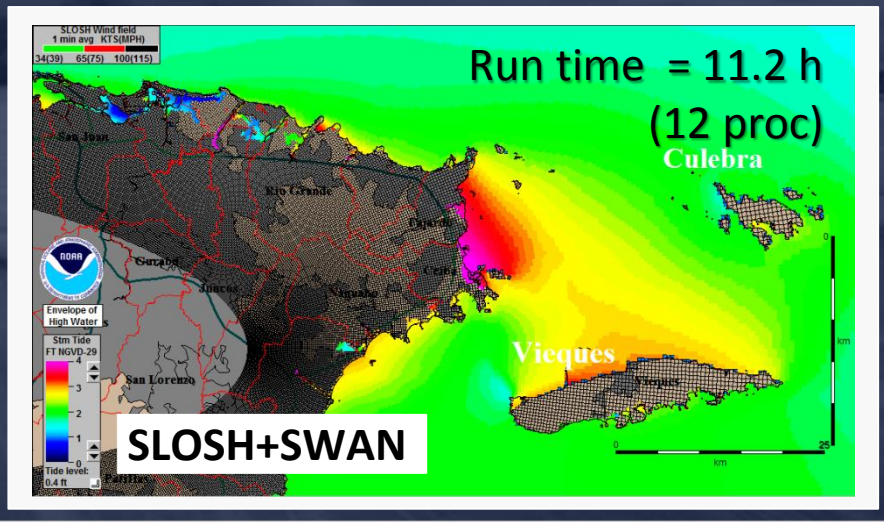
Computational Efficiency is Key

H. George (1998), Cat 4, landfall NE Puerto Rico (48 h sim)









Ensemble Guidance

Pre-Computed

MEOWs

Maximum Envelopes Of Water

MOMs

Maximum Of the MEOWs

Real-Time

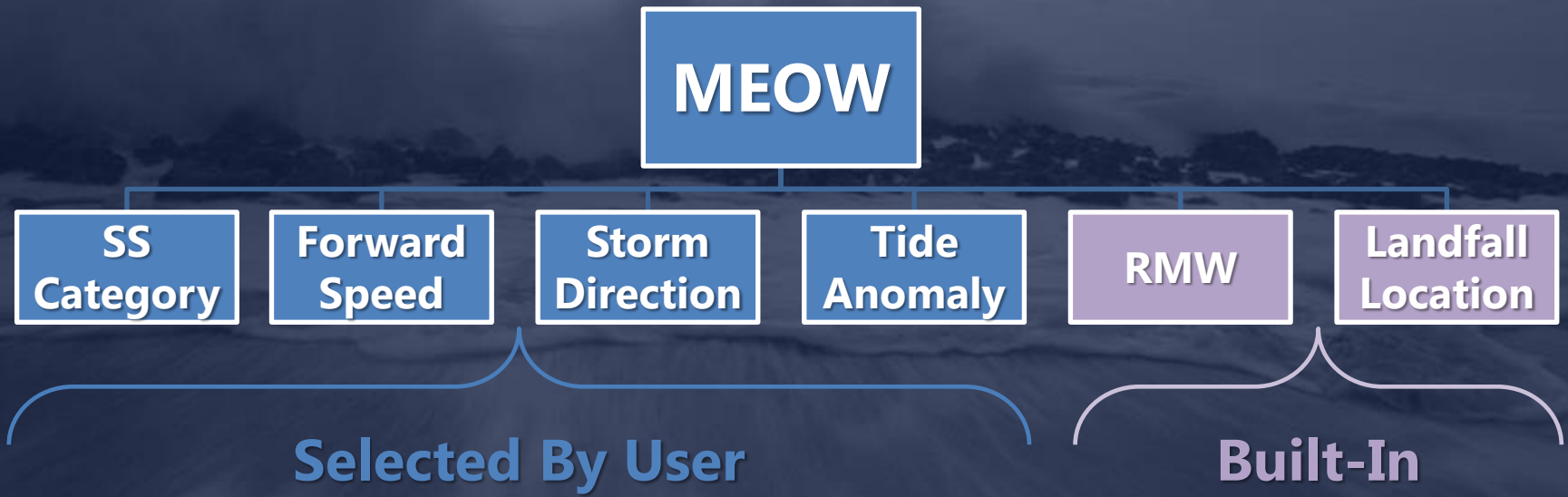
P-surge

Probabilistic Storm Surge

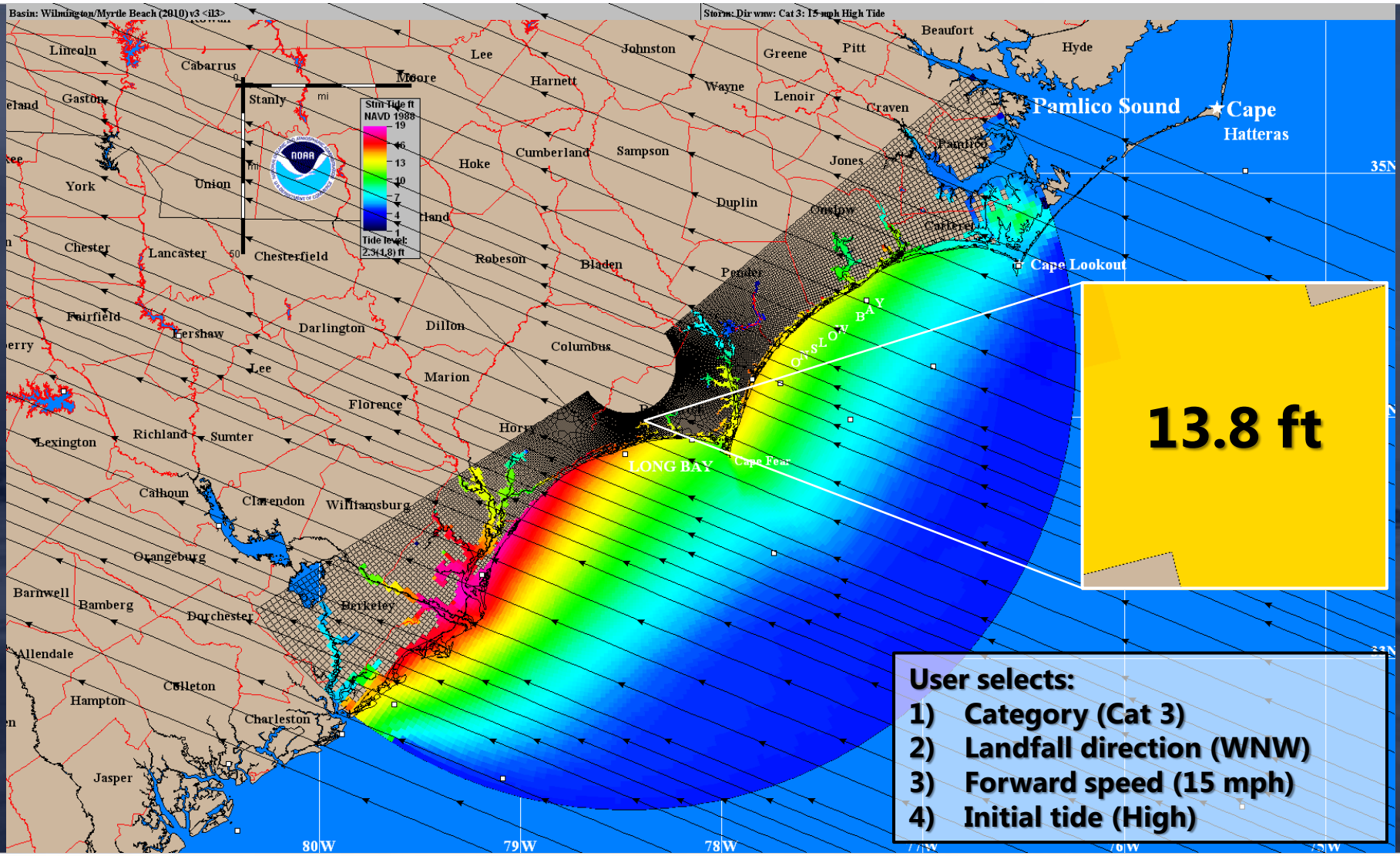
MEOW
Maximum Envelope Of Water

Maximum Envelope of Water (MEOW)

- Products available in HVX (replaces SLOSH Display Program [SDP])
- Composite of the maximum storm surge for all surge simulations for a given set of parameters (by basin)
- Used as guidance for planning and operations

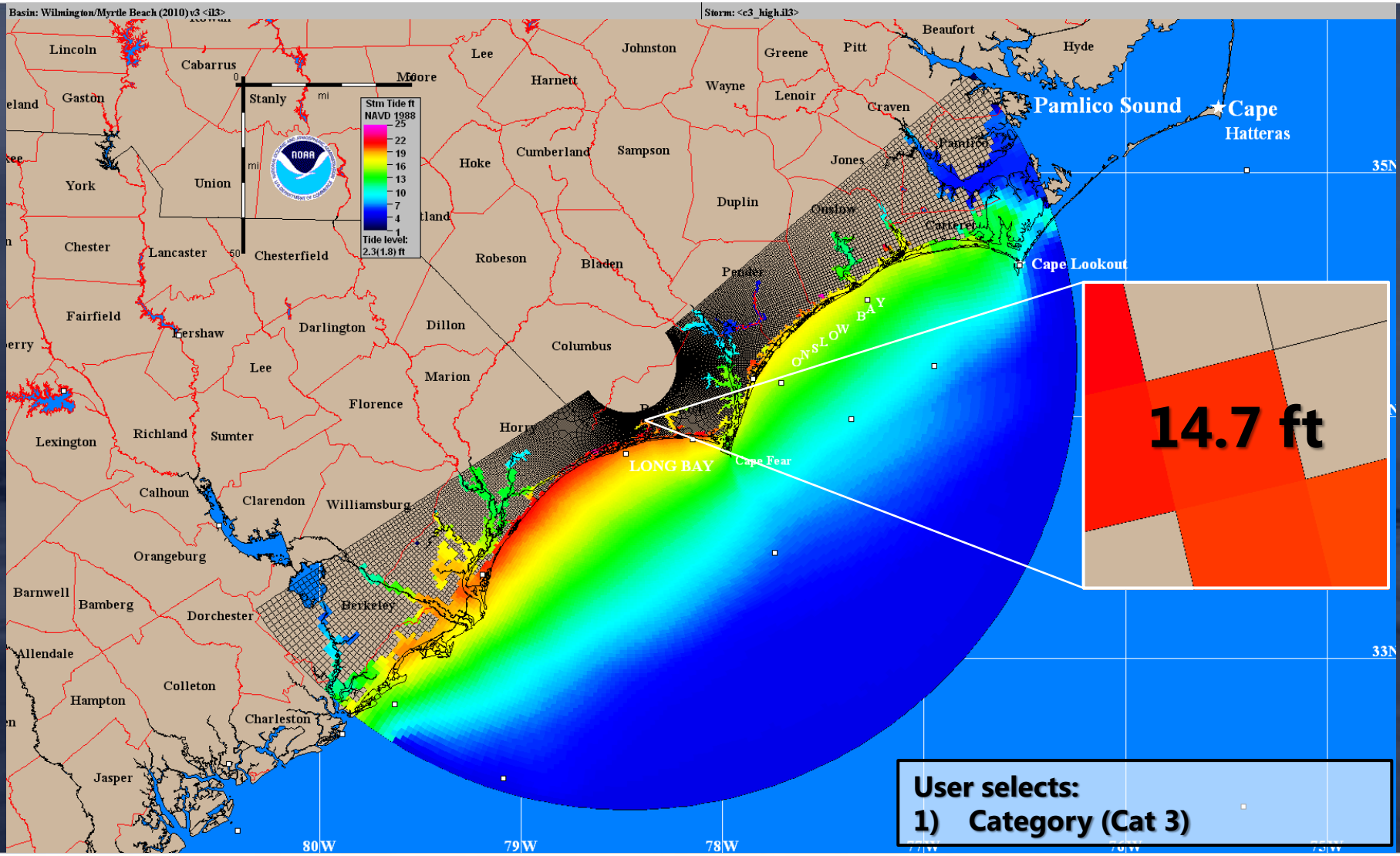


Maximum Envelope of Water (MEOW)




MOM
Maximum Of the MEOWs

Maximum of the MEOWs (MOMs)



When to Use MOMs and MEOWs?

Neither MOMs nor MEOWs should be thought of as a "forecast" since they are a composite of storms

- should be considered as *risk* maps

MOMs: Used to design evacuation zones and when uncertainty is high

MEOWs: Use when you can narrow down to specific scenarios