Operational Storm Surge Modeling/Forecasting at the National Hurricane Center

HURRICANE EVACUATION ROUTE

NOAR

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Operational Perspective





Forecast Uncertainty







Hurricane Advisory – Approximately 12 hr. before landfall



Surge Based on NHC -12 hr. Advisory



Actual Hurricane Track 30 mi. E of -12 hr. Advisory Forecast Track





RMW = 6 mi.



RMW = 25 mi., "Average" Size

Ensemble Products



 Worst case by storm category



- MEOW
 - Worst case by scenario
- Probabilistic
 Storm-specific





NHC's Operational Timeline

	Time	Task/Duty
	T+0:00 (i.e. 0000, 0600, 1200, and 1800 UTC)	Forecast process begins
	T+1:00	New hurricane model guidance (ATCF trackers) available
	T+1:00-2:00	Working official forecast available from hurricane forecasters, initial storm surge simulations begin
	T+2:00	NWS coordination call, initial storm surge guidance due
	T+2:30-3:00	Final storm surge simulations and guidance due, psurge initiated
14 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	T+3:30	Psurge runs complete, product disseminated
	T+3:00-6:00	Briefings, decision support

Bottom line: storm surge models must run within the operational timeline to be useful

Operational Modeling Requirements



- Properly incorporates meteorological uncertainty
 - ensemble or probabilistic
- Meets varying user needs
- Meets operational time constraints
 - provides an answer in minutes not hours
- Applicable over multiple storms and all areas
- Can be operated within current operational infrastructure
- Results can be easily disseminated through current operational channels/mechanisms
- Must be robust/stable!

NHC Storm Surge Unit



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SLOSH



Model Details:

- Explicit finite difference scheme
- 2-D
- Includes inland inundation (wetting/drying)
- Arakawa B grid
 - Can use polar, hyperbolic, or elliptical grids
 - Telescopic grids centered on area of interest allowing highest resolution near center
 - Sub-grid scale elements such as barriers and gaps

SLOSH does not explicitly resolve:

- Breaking waves/wave run-up (experimental SLOSH + SWAN being evaluated)
- Astronomical tide
 - Experimental SLOSH + tide currently being tested
- Normal river flow and rain

Concluding Remarks

- Deterministic approaches do not account for hurricane forecast uncertainty (track, intensity, size, forward speed) and are therefore of limited use for real-time forecasting at NHC
- NHC wishes to produce total water level forecasts but currently lacks necessary guidance to do so
 - Addition of waves especially desired but computationally expensive
- Timeliness is critical
 - Models must run in minutes, not hours, to fit within current operational time constraints

Storm Surge Does Not Fit Into a Single Box

Storm surge/inundation



Atmospheric Sciences

Oceanography

17

SLOSH in the Pacific

1010

Oahu

Kauai



Hawaii





Home

Decision Support Wedge





ADCIRC & SLOSH

