Experimental Probabilistic Hurricane Inundation Surge Height (PHISH) Guidance

DRBC Flood Advisory Committee

John Kuhn - NWS/OCWWS
Anne Myckow (NWS/MDL), Arthur Taylor (NWS/MDL)
SLOSH

• Sea, Lake and Overland Surges from Hurricanes
  – Finite differencing model developed by the Meteorological Development Laboratory to predict storm surge
  – Overland flooding
  – Parametric wind model for forcing
  – Structured grid with finer resolution near shore, and coarser offshore
  – Models sub-grid features such as levies, barrier islands, and river channels

• Does not include
  – Tides, waves, river flow
    • Tides can be conservatively estimated by initializing the grid at high tide
SLOSH Products

- Historic Runs
- P-Surge
  - Probabilistic Storm Surge
  - Response (<48 hr of landfall)
- MEOW
  - Maximum Envelope Of Water
  - Readiness (48hr – 120 hr of landfall)
- MOM
  - Maximum Of the MEOWs
  - Planning / Mitigation (>120 hr of landfall)
Case Study: Hurricane Ivan

Top Left: Real-time deterministic SLOSH run for Ivan at advisory 54, about 10 hours before landfall
• Note large (~14ft) surge in Mobile, small (~3ft) surge for Pensacola

Bottom Right: Hindcast best track SLOSH results for Ivan
• Track forecast off by approx. 25 mi
• Note significant surge in Pensacola (~7 – 10ft), missed by the deterministic
Probabilistic Storm Surge Permutations

- Cross track error
  - sampled multiple times

- Along Track error
  - sampled three times (fast, med., slow)

- Intensity error
  - sampled three times (strong, medium, weak)

- Size error
  - sampled three times (small, medium, large)
Probability of Surge $\geq$ 5 feet (NGDV29)
Surge Height Exceeded by 10% of Ensemble Members (NGVD29)

Katrina adv 25
Rationale for PHISH

- **Psurge** provides information in terms of above a datum.
- PHISH reduces confusion among users with the various tidal and geodetic vertical datums by providing storm surge guidance in terms of feet above ground level (i.e., inundation).
Experimental PHISH Products

<table>
<thead>
<tr>
<th>Probability (0-20 feet)</th>
<th>Exceedance (10-50%)</th>
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</thead>
<tbody>
<tr>
<td><strong>Cumulative</strong></td>
<td></td>
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<tr>
<td>Probability of inundation exceeding 0 through 20 feet above ground level, at 1 foot intervals, will occur from the advisory release time until some specified time after the advisory release time (e.g. 0-6 hours, 0-12, 0-18, etc.)</td>
<td>10% through 50% chance, at 10% intervals, of the displayed inundation being exceeded from the advisory release time until some specified time after the advisory release time (e.g. 0-6 hours, 0-12, 0-18, etc.)</td>
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<td><strong>Incremental</strong></td>
<td></td>
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<td>Probabilities of inundation exceeding 0 through 20 feet above ground level, at 1 foot intervals, will occur during the specified time period in reference to the advisory release time (e.g. 0 - 6 hours, 6-12, 12-18, etc.)</td>
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PHISH Availability

• Available whenever a hurricane watch and/or warning is in effect for any portion of the Gulf or Atlantic coasts of the continental United States.

• Updates to the product are generally produced one hour after the issuance of routine NHC tropical cyclone advisories (03, 09, 15, and 21 Coordinated Universal Time - UTC).

• Products online at: http://www.nws.noaa.gov/mdl/phish
  - KMZ format displayed on a interactive Google map background. Also available as a static PNG file.
  - Download formats: KMZ, Shape file, GRIB2
Storm Surge $\geq 3$ Feet Above Ground Level
Hurricane Irene Advisory 24
Surge Height Exceeded by 10% of Ensemble Members - Hurricane Irene Advisory 24
Future Work

• SLOSH + Tides >> PHISH + Tides
• Use more recent basins
  – Shift all basins to NAVD88
• Inundation maps with 30m DEMs
  – Possible routes:
    • User subtracts DEM from p-surge exceedance product
      – Won’t work for probability products
    • Provide PHISH products at high resolution
      – Large amount of data transmission (May need paradigm shift)
Feedback

• Feedback on PHISH can be provide through an NWS Survey at:
  

  OR

  John.F.Kuhn@noaa.gov
  Arthur.Taylor@noaa.gov
Questions?