



# Regional Ensembles for Wind, Surge, Rain and Severe Weather Tropical Cyclone Hazard Products

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# Storm Surge Watch/Warnings

- P-Surge model provides probabilities of exceedance
  - SLOSH ensemble with statistically generated track, intensity, wind structure variability
- First guess for surge watch/warnings
- Collaboration between NHC and WFOs via AWIPS
- Final product is gridded watch/warning
- Graphical and text products, auto-trigger of emergency alerts
- Future enhancements
  - Using dynamical model input for wind forcing
  - Ocean model improvements



# Wind Watch/Warnings

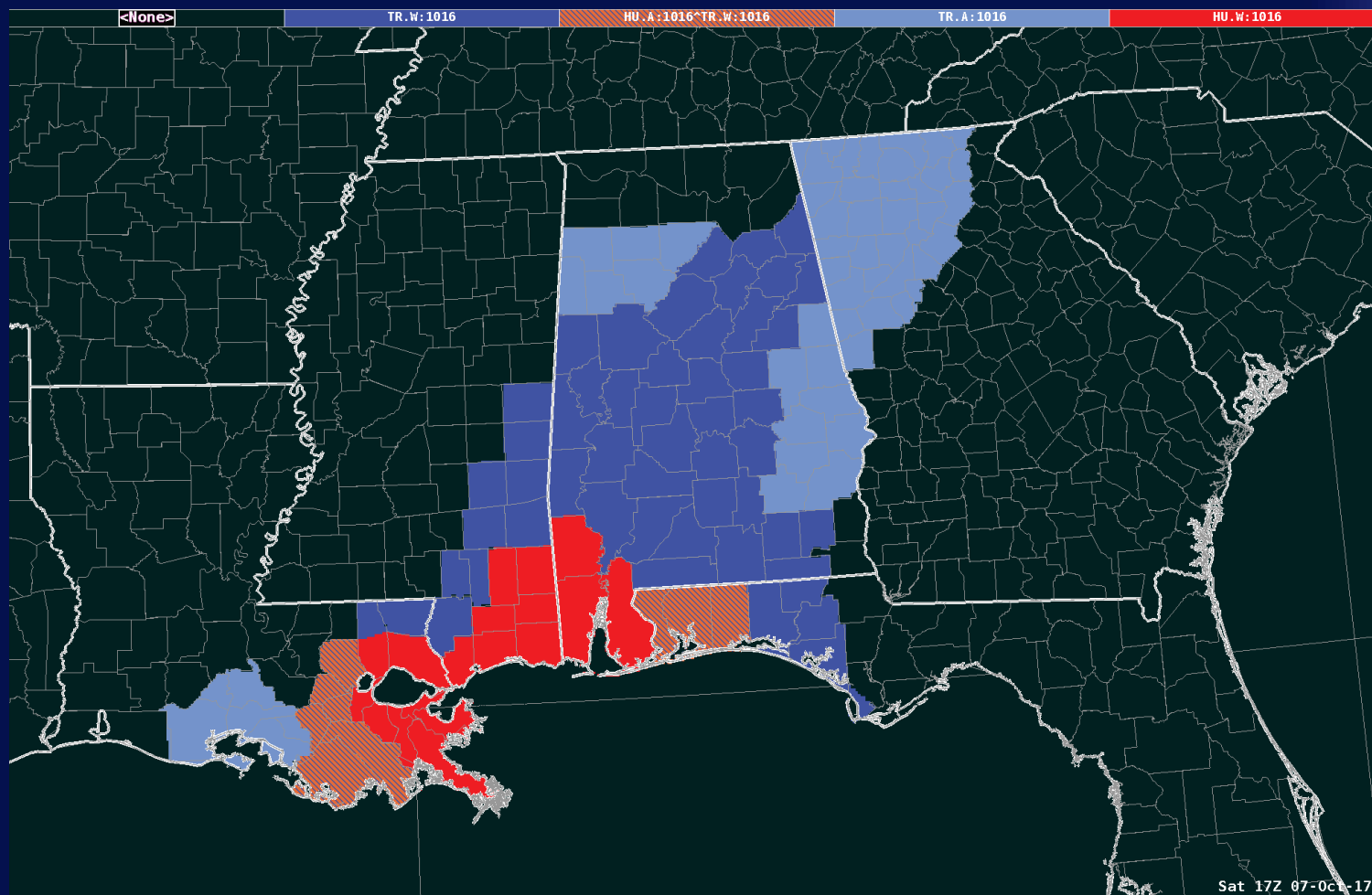
- Coastal watch/warnings based on NHC official track/intensity/structure forecast and uncertainty
  - No direct use of wind speed probability (WSP) model
- Inland wind watch/warning from WFOs
  - WSP model, NHC official forecast, TCM wind tool, local knowledge
- Combined watch/warning grid in AWIPS
- Future enhancements
  - AWIPS tool for NHC-WFO collaboration
  - First guess from WSP model
  - Better use of dynamical model ensembles in WSP model
  - Inclusion of wind gusts



# AWIPS Wind Watch/Warnings for Hurricane Nate

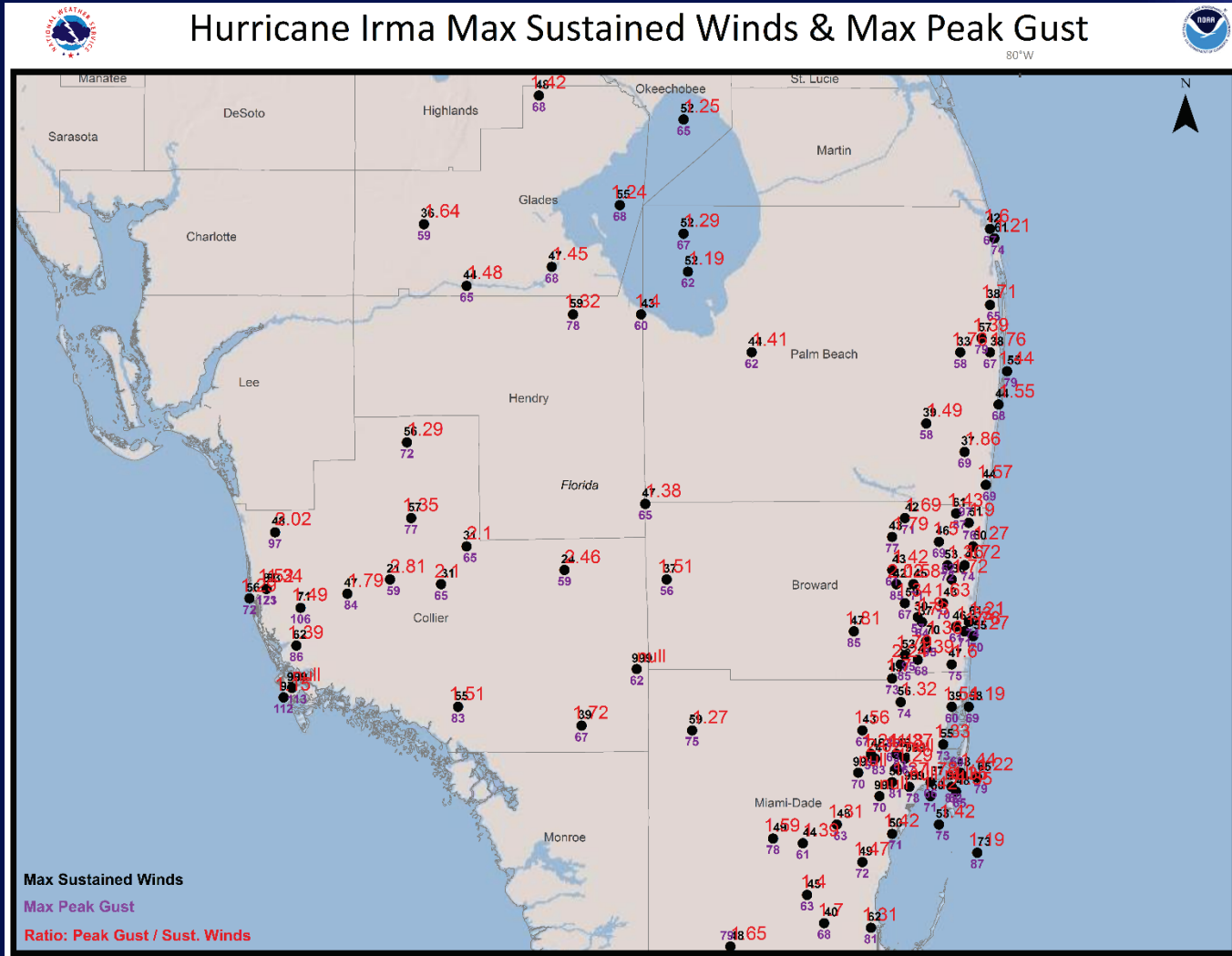


TS Warning    Hurr Watch    TS Watch    Hurr Warning





# Gust Factors for Hurricane Irma



NHC Rule:  $Gust = 1.22 * Sustained\ Wind$



# Rain and Severe Weather



- Rainfall
  - WPC provides deterministic & probabilistic precip guidance
    - 63 member ensemble (SREF, ECMWF, NAM, GFS, CMC)
  - Hydrological models from RFCs/NWC
  - WFOs issue flood watch/warnings
- Severe Weather
  - Tornado threat (not much hail due to low mid-level lapse rates)
  - Similar to high shear, low CAPE cool season events
  - NCEP/SPC provides probabilistic outlooks and severe weather watches, WFOs issue warnings
  - SREF used for uncertainty in mesoscale environment
  - High Resolution Ensemble Forecast (HREF) system also used
    - CAM approach
  - HREF and SREF are under-dispersive
- How can we incorporate regional hurricane ensembles? 6