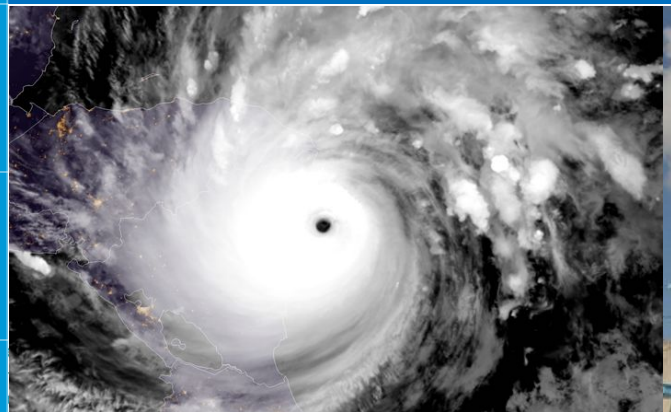
Roles of Ensembles in Probabilistic IDSS & Hazard Risk Communication at NHC

Wallace Hogsett
Science & Operations Officer

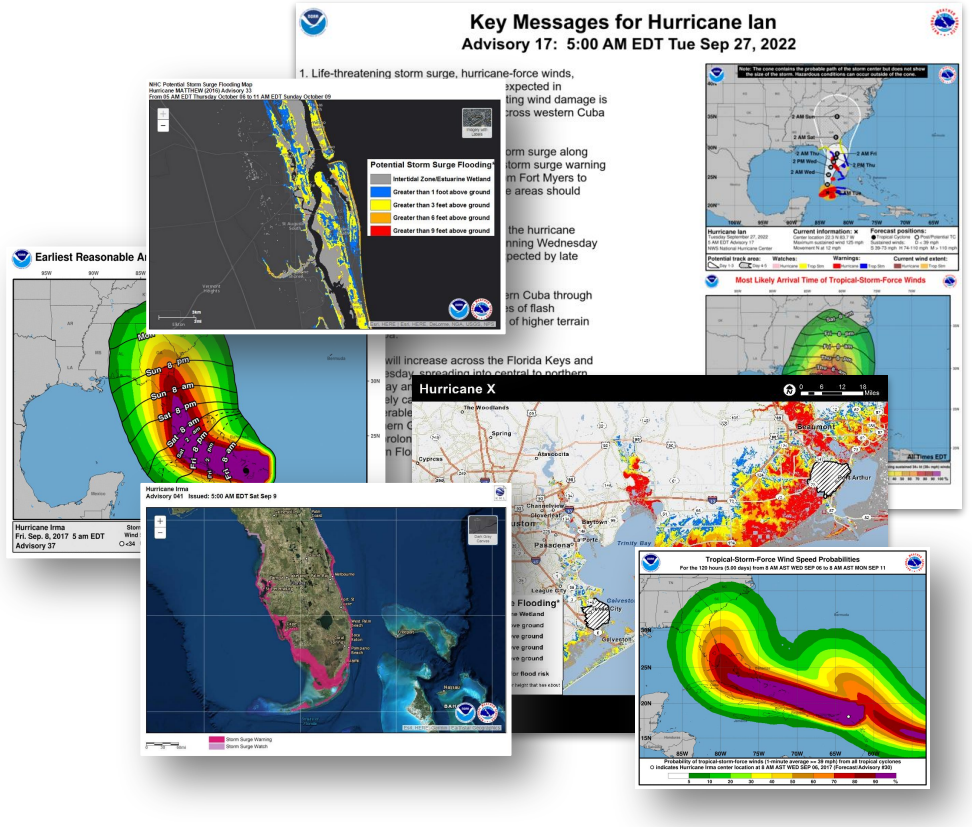
NOAA Ensemble Users Workshop
22 August 2023

NOAA
National Weather Service



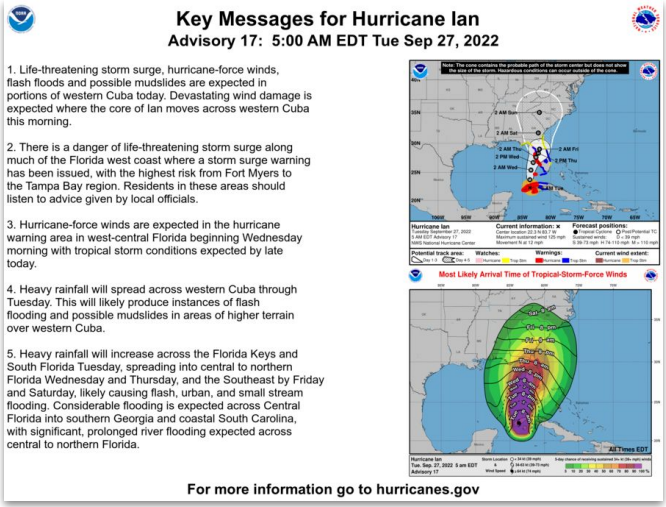
How Does NHC Communicate Hazard Risk Today?

- NHC produces numerous public-facing probabilistic IDSS products, all of which:
  - Leverage ensemble guidance
  - Communicate hazard risk in some fashion to partners and end users
  - Focus on wind, wave, and/or surge risk

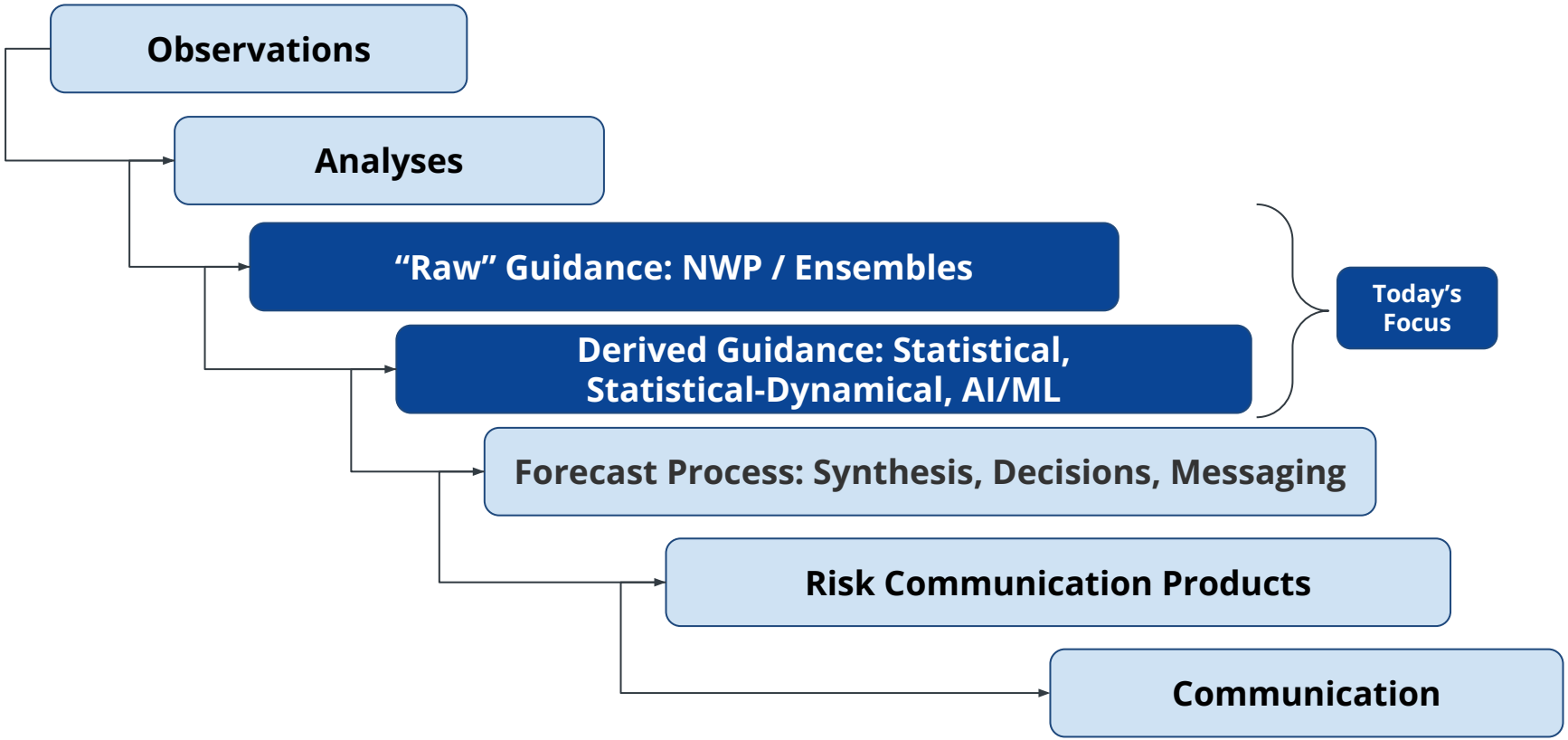


Critical Role of Ensemble Systems at NHC

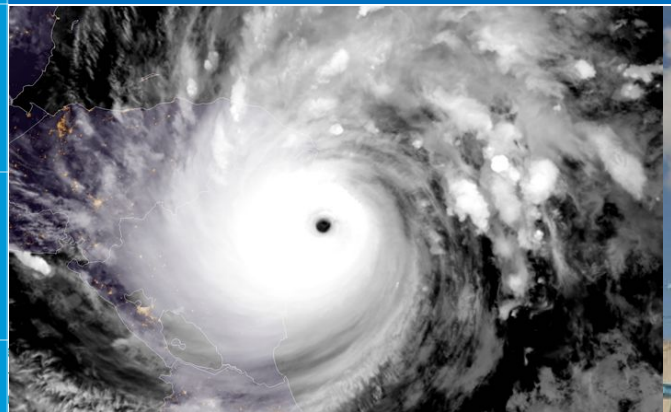
- NHC role: communicating hazard risk
- Risk = "*a possibility of harm or damage*"
  - How to quantify the "possibility"?
- Without probabilistic guidance on the hazard magnitude/timing/location, we cannot optimize risk communication
- **Ensemble systems are a fundamental requirement for effective hazard risk communication**



Hazard Risk Communication Value Chain

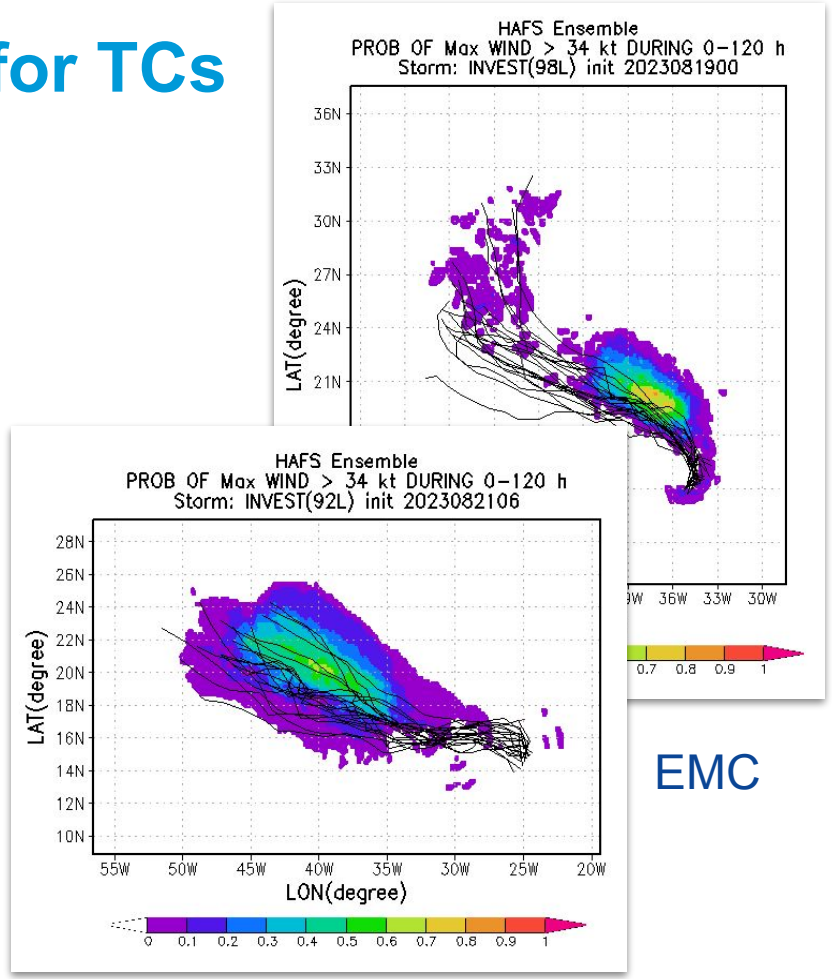


Emerging Ensemble-Based Tools & Applications



Mesoscale NWP Ensemble for TCs

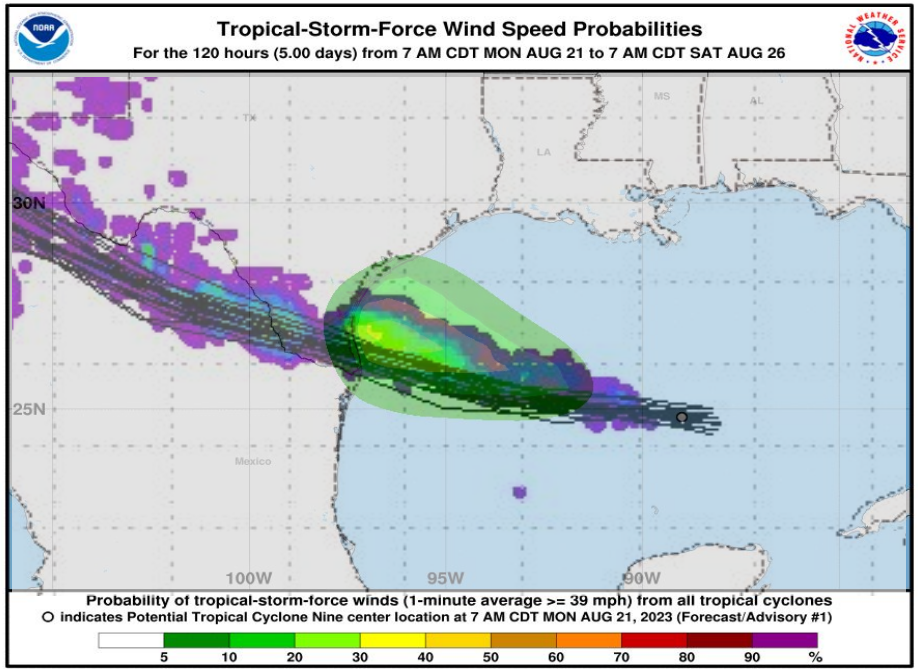
- Significant opportunity to improve hazard uncertainty & communication
  - Enables a shift from climatology-based probabilities to dynamic (asymmetries, size, etc.)
  - Implications for TC and marine hazards
- Skillful & reliable ensemble will allow more targeted messaging about hazards
- Currently working to demonstrate HAFS ensemble in cloud via Hurricane & Ocean Testbed (HOT)



EMC

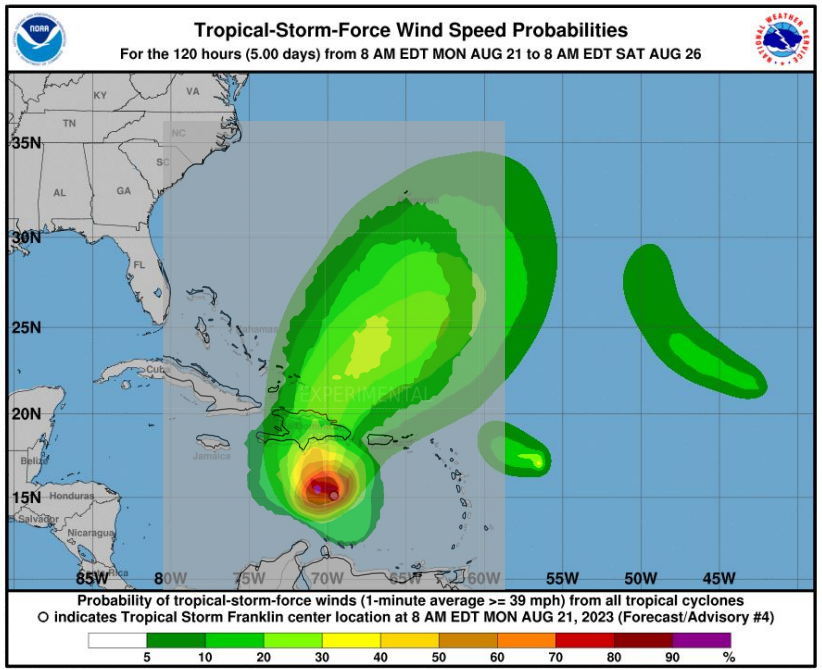
Opportunities to Refine TC Hazard Risk Products

AL09



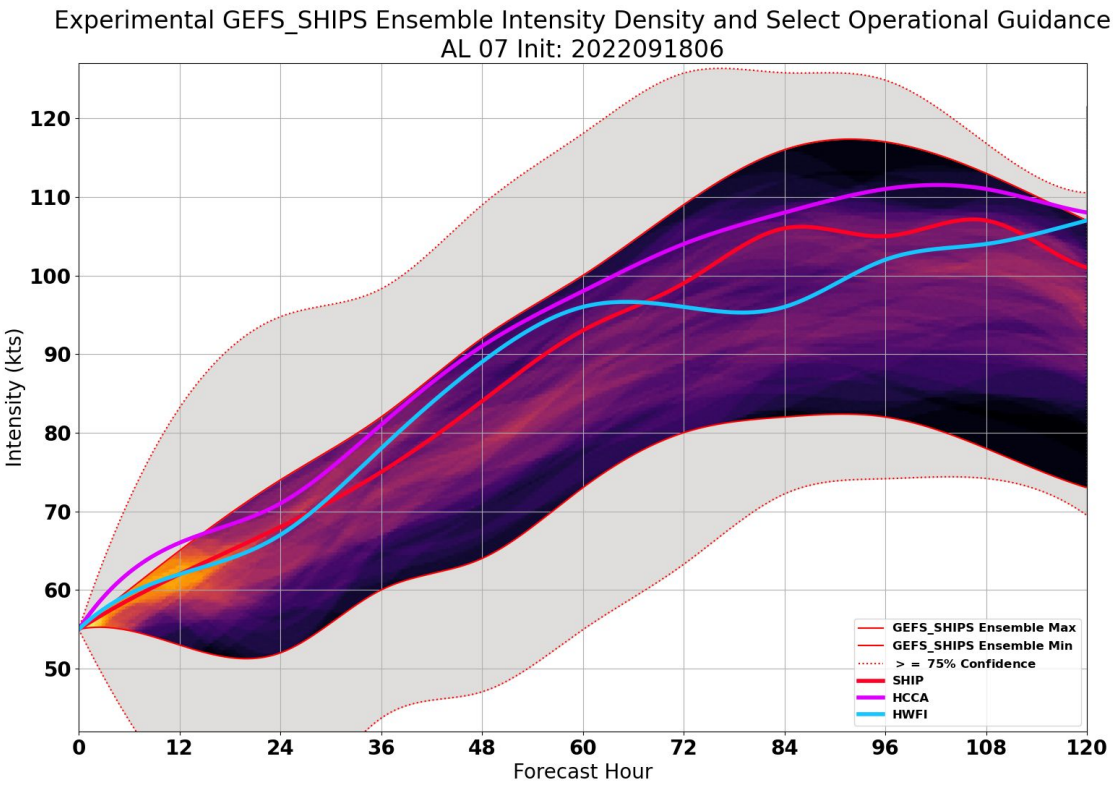
HAFS Ensemble (EMC)

Franklin



Prototype Multi-Model WSP (CIRA)

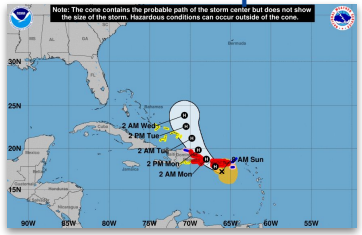
Ensemble-Based Statistical-Dynamical Guidance



NHC Hollings Scholar: Isaac Schluesche, NHC/TSB

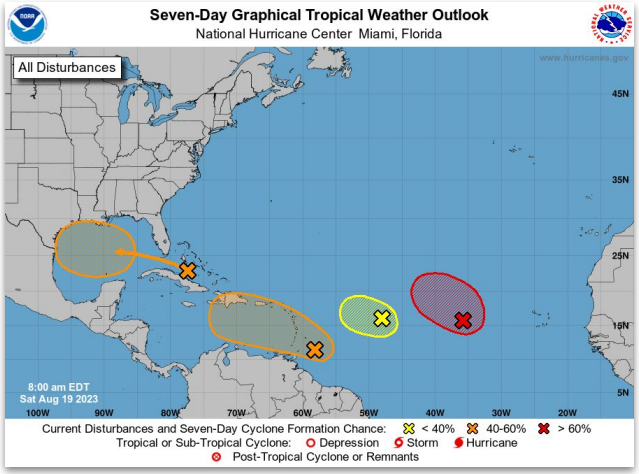
Fiona - Sept 15

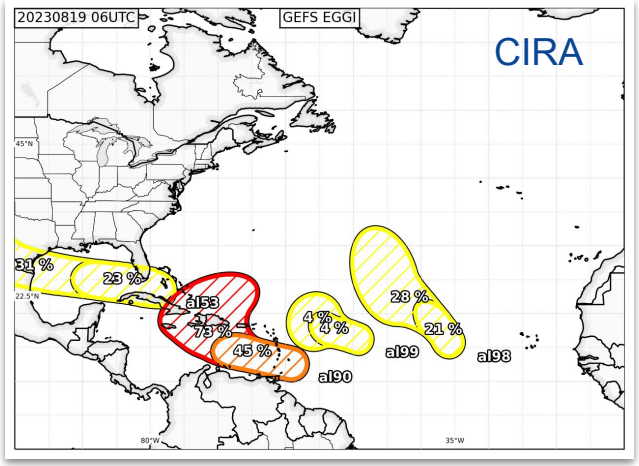
Fiona - Sept 18



Genesis Guidance

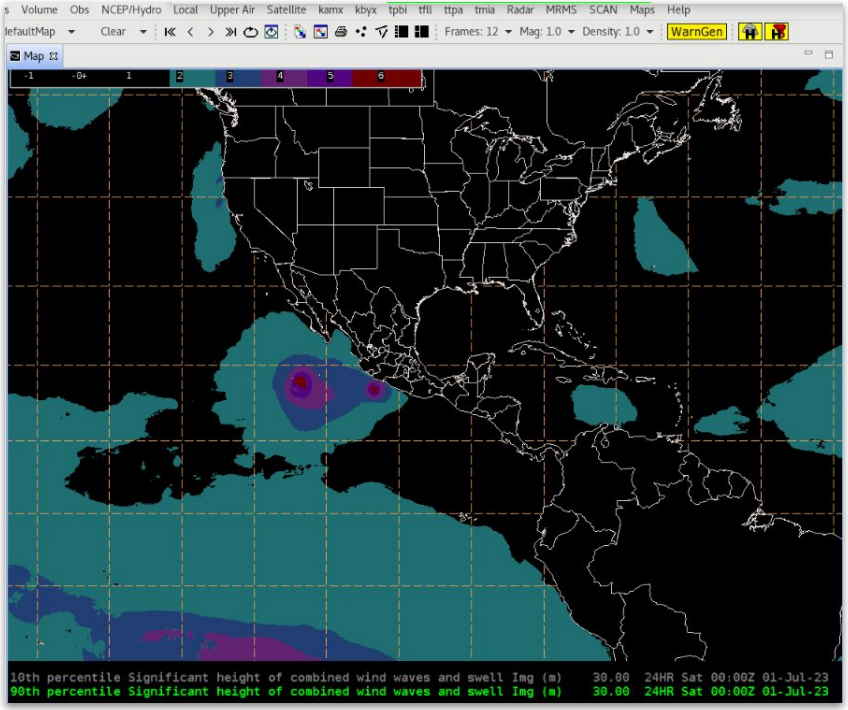
- Directly applicable to NHC Tropical Weather Outlooks
- Potential to incorporate into AWIPS as guidance
- GEFS-based guidance developed via HFIP funding (CIRA)



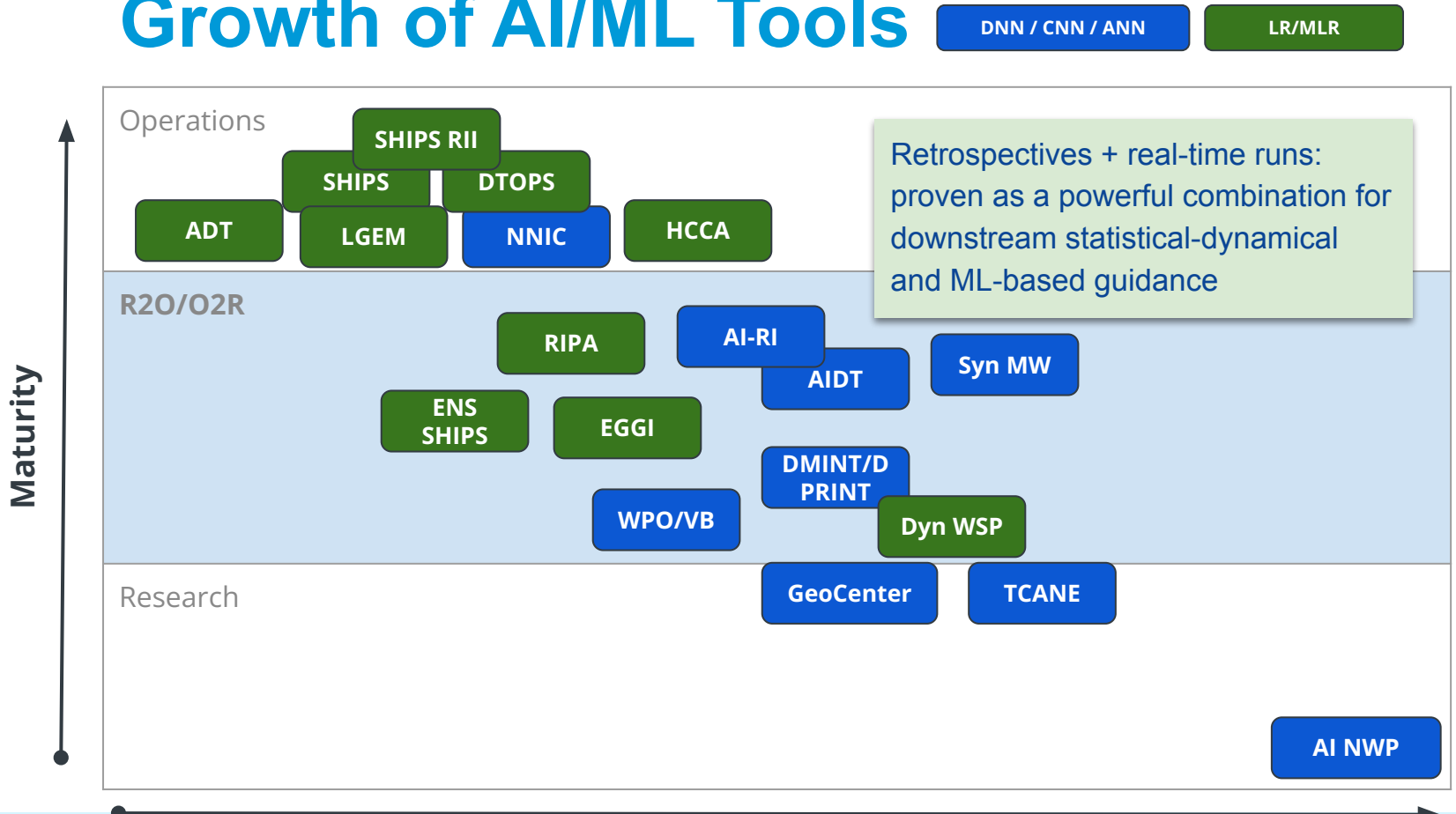


National Blend of Models

- Probabilistic wind/wave guidance for offshore areas
- May be enhanced with a regional wave prediction system (RWPS)
- Applications include new probabilistic marine products

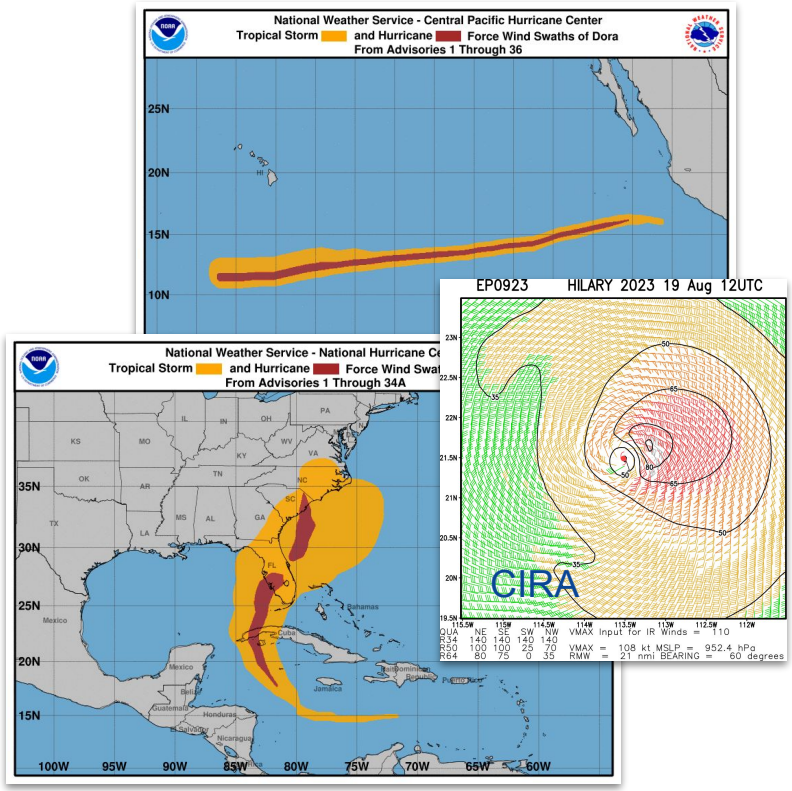


Growth of AI/ML Tools



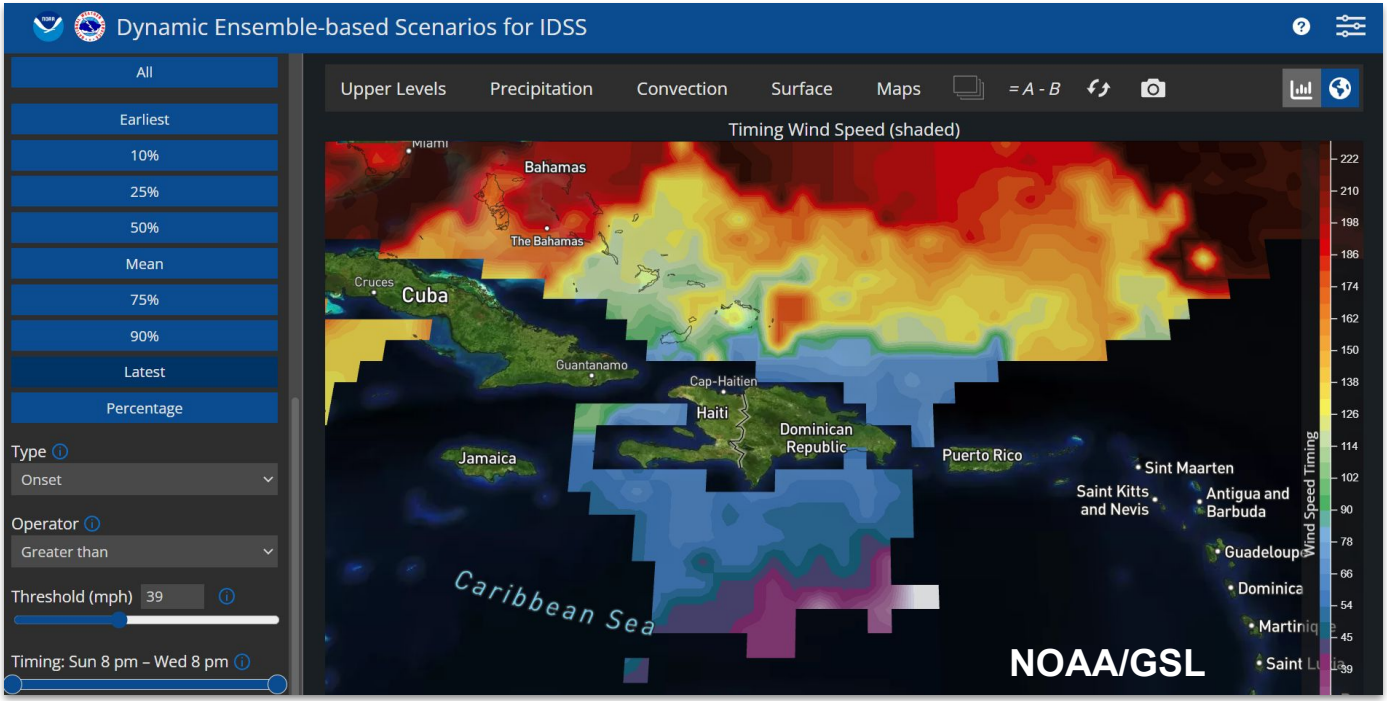
Hazard-Based Verification

- How to best evaluate ensemble-based systems?
  - Hazard magnitude, location, extent, and timing
- 2-D wind swath facilitates verification of track, intensity and structure
  - Enables direct connection between model spread/skill and hazard risk communication products



Ensemble Visualization & Interrogation

- Forecasters require a robust platform for complex, interactive interrogation



Summary: Critical Needs

- **Mesoscale NWP TC Ensemble** – a missing link for hazard magnitude, timing and uncertainty communication
- **Retrospective Forecasts** – virtually all emerging statistical-dynamical and machine learning tools benefit from retrospective runs (3+ years) to optimize skill
- **Hazard Verification** – explore new metrics to align with hazard risk communication objectives
- **Ensemble Interrogation Platform** – Forecasters require a platform to enable rapid data analysis and probabilistic IDSS
    - Including all global ensemble systems

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