2020: “Flying blind” into hurricanes?

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North Atlantic hurricane risk ca. 2020:

- Increased societal vulnerability: more population, wealth concentrated in coastal regions
  - 50% of U.S. population lives within 50 miles of coastline.
  - The $3 trillion investment in infrastructure along Gulf and Atlantic coasts may double in the next several decades

- Increased hurricane activity: peak of the Atlantic Multidecadal Oscillation plus global warming

- Potential decreased storm monitoring capability: loss of key satellite observing systems, hurricane aircraft
Average tropical cyclone activity is correlated with sea surface temperatures.
Since 1995, there has been a shift in the intensity distribution towards more major hurricanes.
Since 1995, there has been 40-50% greater activity than the previous peak period ca. 1950.
Projections for the average number of NATL tropical cyclones for 2025

# of Tropical Cyclones:

- Avg for last 50 yrs: 10
- Avg last decade: 14
- Avg ca. 2025: 14-20
  category 4+5 3-4

The combination of greenhouse warming and natural variability can produce unprecedented tropical cyclone activity in the coming decades.

For a projected 1°F SST increase and assumed peak of the AMO cycle ca. 2020, combines climate model projections and analysis of historical data.
Hurricane Katrina dramatically intensified when it crossed the warm, deep Loop Current.

In 2013, there was a complete loss of capability to observe upper ocean heat content (satellite altimeter).
Scatterometer winds (from satellite) enable early identification of circulations that become tropical storms.

2009: seriously degraded capability from European satellite (no U.S. scatterometer)
New Technology: UAVs

UAV advantages:
- Longer range and duration
- Eliminates safety concerns
- Smaller aircraft are somewhat disposable
- Monitor conditions at surface and lower atmosphere

Hurricane Hunter aircraft have contributed to improved forecasts of landfalling hurricanes
Flying Blind? Assessing the Value of Observing Systems

Observing system assessment and valuation is needed to make rational decisions about investing in the observing system:

- valuation of improved track, intensity forecast
- assessment of observing system cost
- assessment of observing system effectiveness
  - historical assessment of forecasts
  - model assimilation sensitivity studies
  - assessment of potential new and improved applications of the observations
Managing the Hurricane Risk

**Strategy 1**: status quo
cross our fingers and hope for the best

**Strategy 2**: “pre-emptive strike”
- Improved adaptation strategies
- Improved hurricane forecasts
- Improved understanding of hurricanes
- Improved hurricane observing system