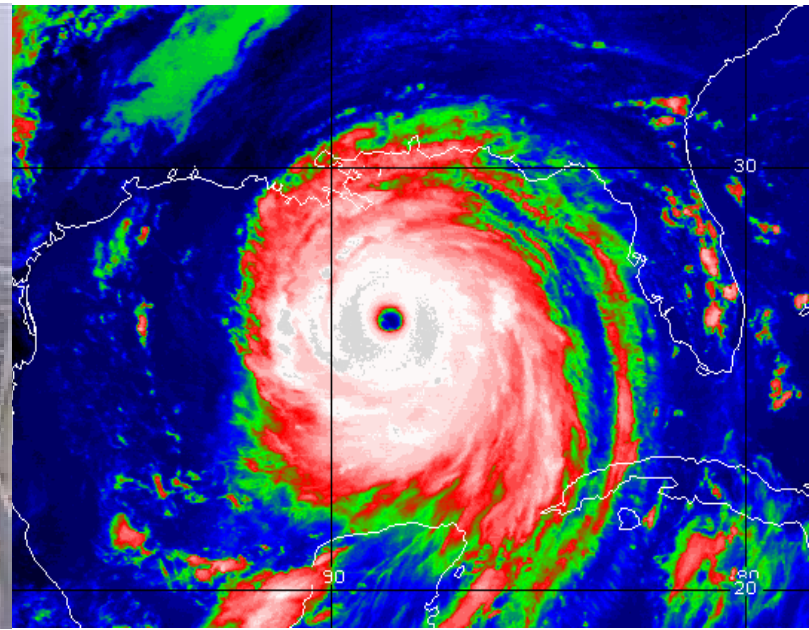


2020: “Flying blind” into hurricanes?



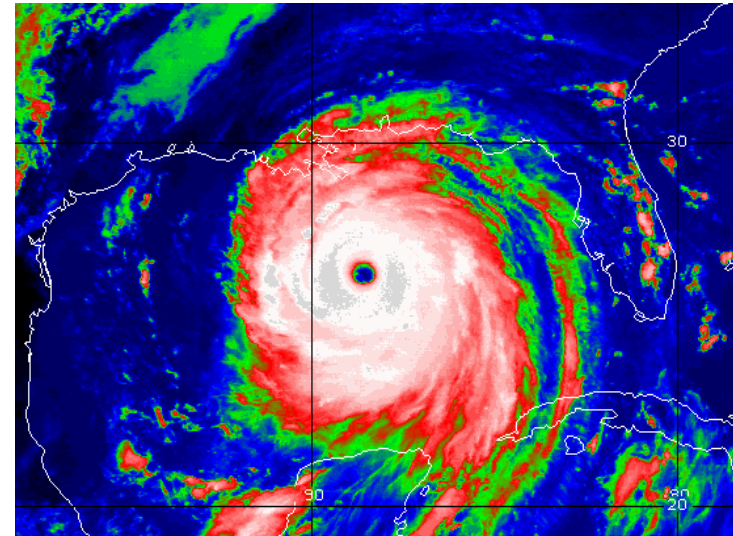
Judith A. Curry



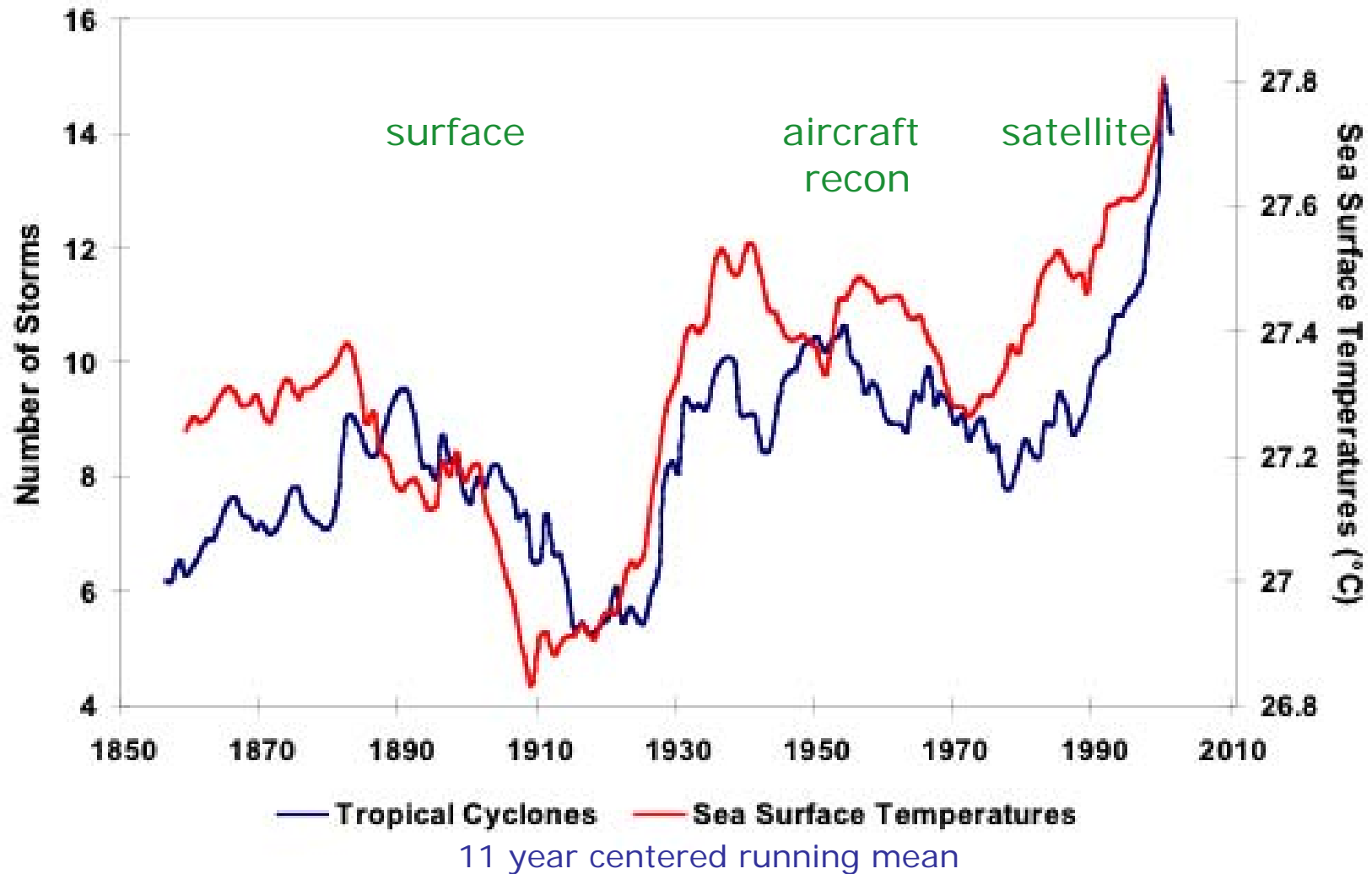
Risk: what can happen, and the odds of it happening

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

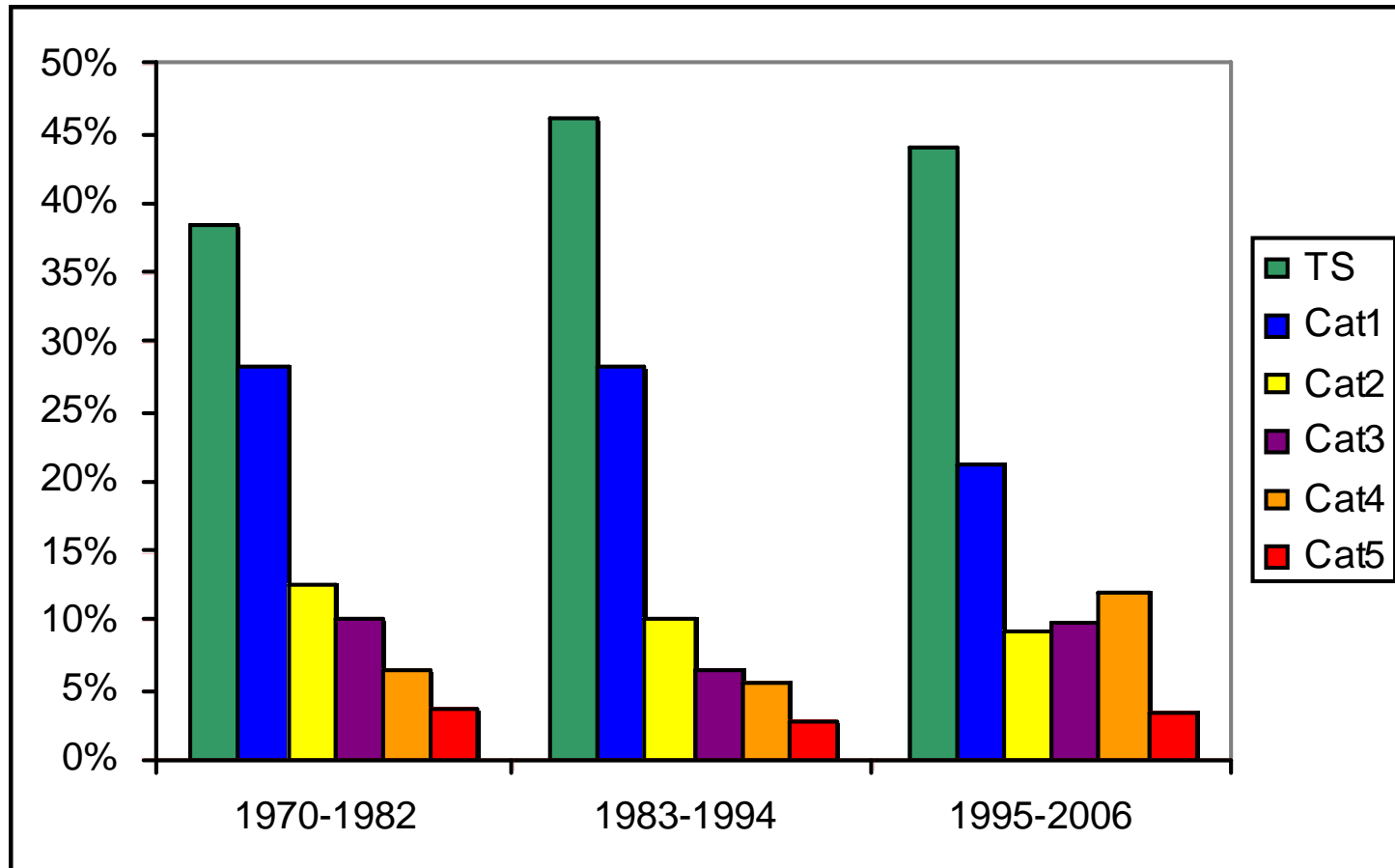


North Atlantic Tropical Cyclones



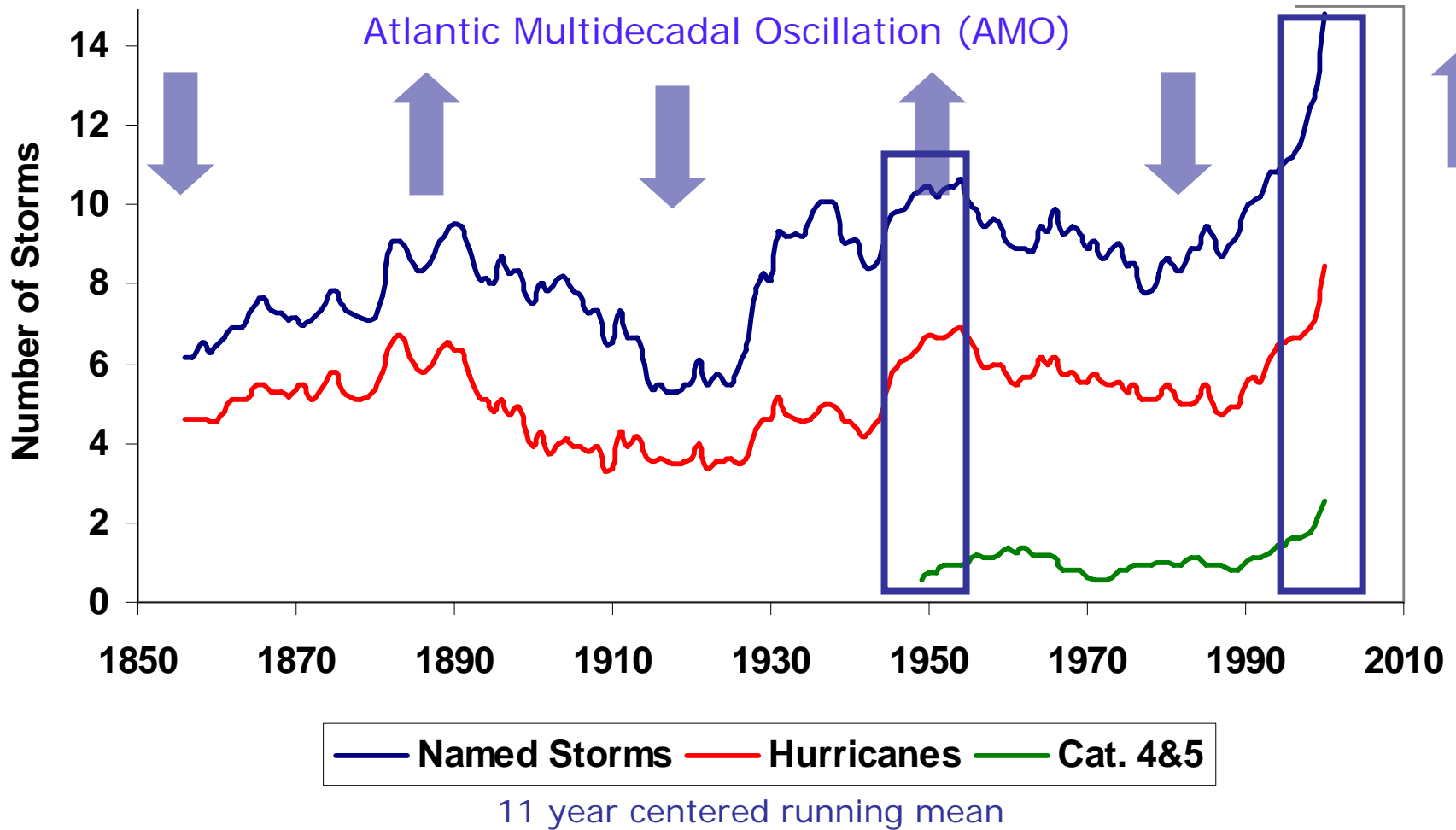
Average tropical cyclone activity is correlated with sea surface temperatures

Intensity Distribution of North Atlantic Tropical Cyclones



Since 1995, there has been a shift in the intensity distribution towards more major hurricanes

North Atlantic Tropical Cyclones



Since 1995, there has been 40-50% greater activity than the previous peak period ca. 1950

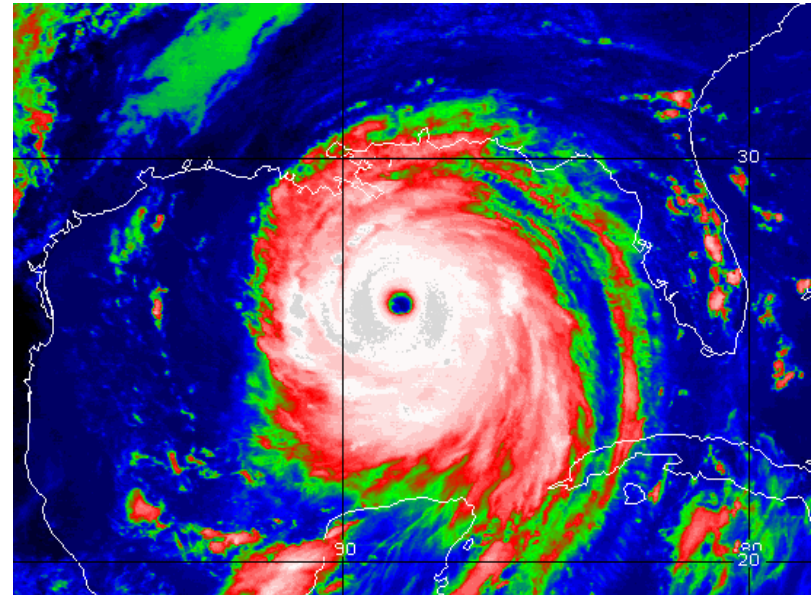
Projections for the average number of NATL tropical cyclones for 2025

of Tropical Cyclones:

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

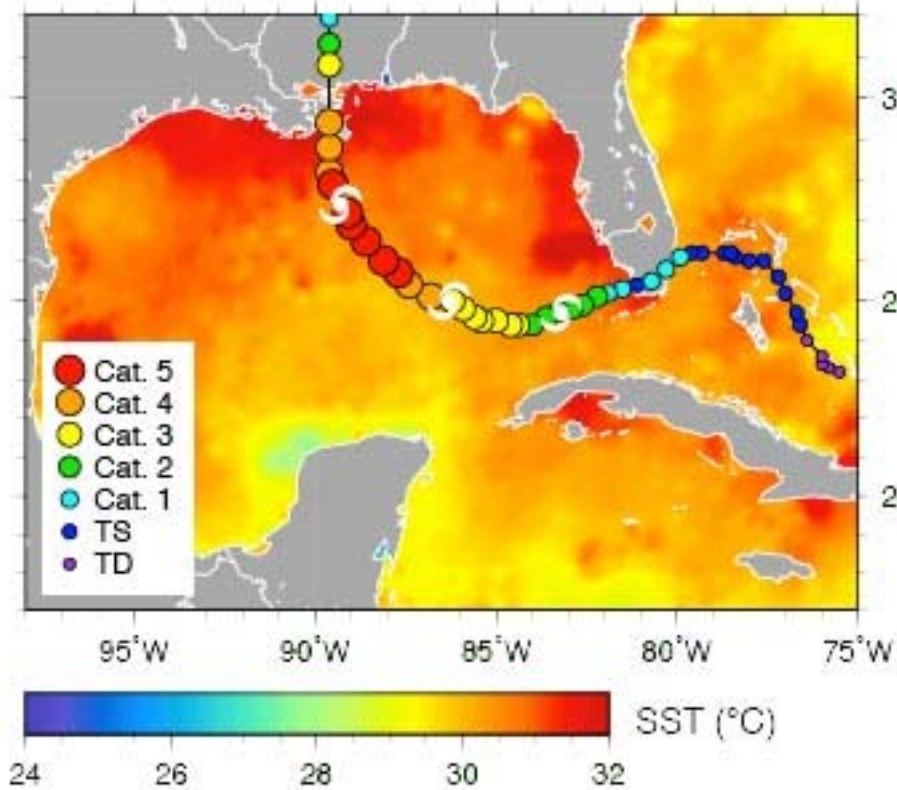
The combination of greenhouse warming and natural variability can produce unprecedented tropical cyclone activity in the coming decades

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

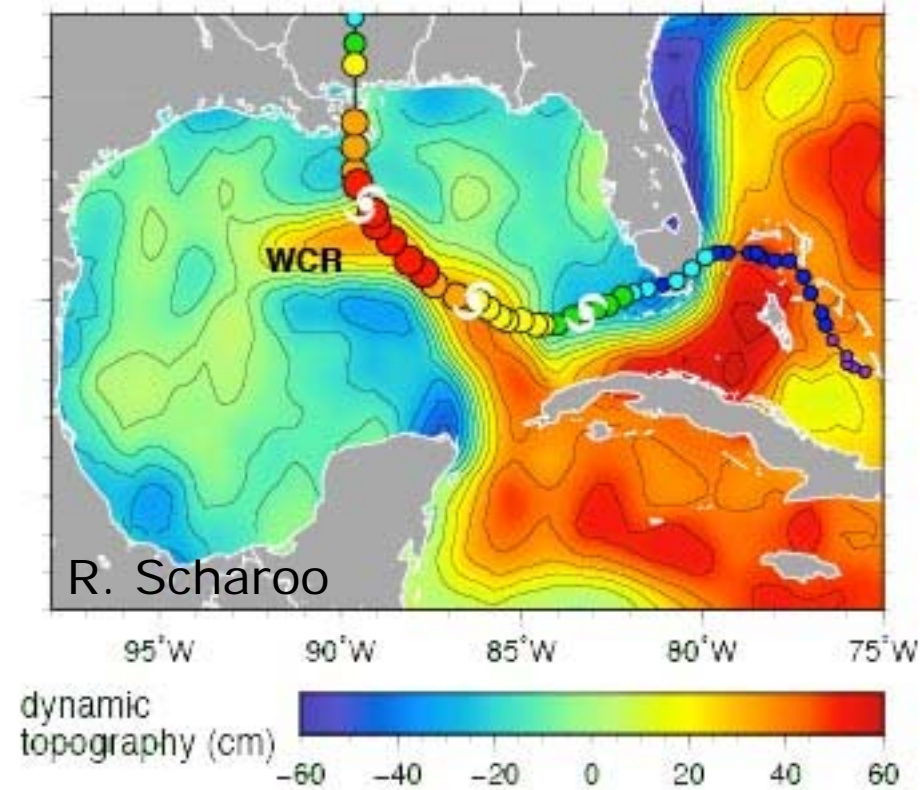


Hurricane Katrina dramatically intensified when it crossed the warm, deep Loop Current

Sea surface temperature



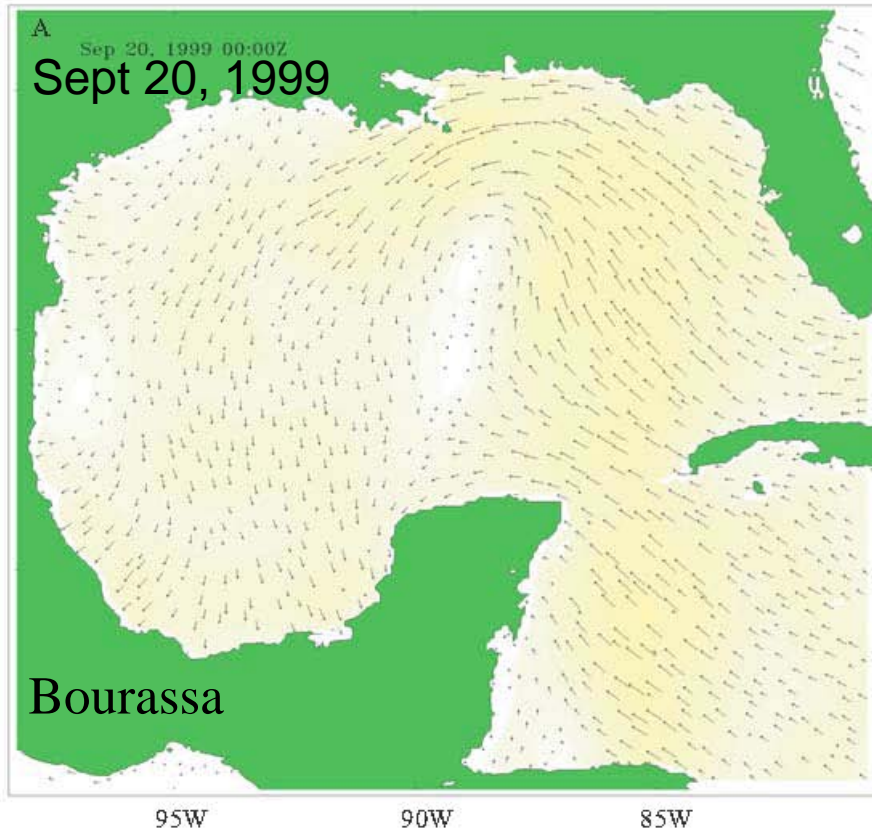
Depth of warm layer



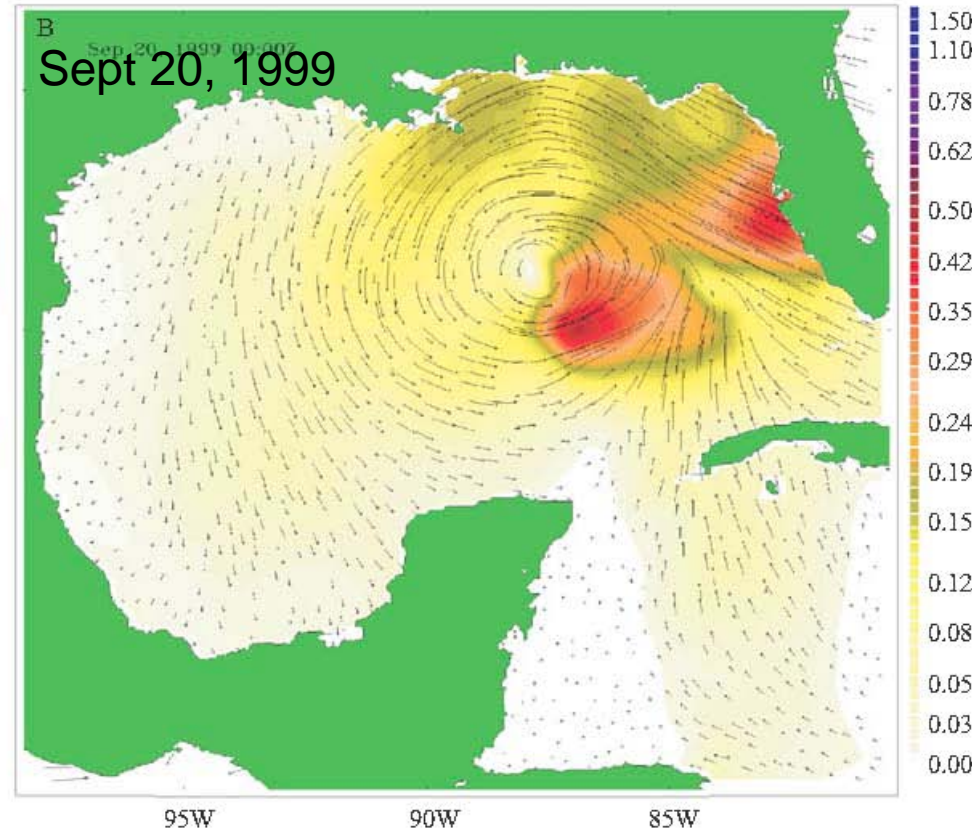
2013: complete loss of capability to observe upper ocean heat content (satellite altimeter)

Scatterometer winds (from satellite) enable early identification of circulations that become tropical storms

NCEP/NOAA winds



Scatterometer winds



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

Global Hawk



Predator



Aerosonde

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

