A satellite image of Earth from space, showing a large tropical cyclone with a distinct eye and spiral cloud bands over the ocean. The sun is visible as a bright glow on the horizon, creating a lens flare effect.

US-CLIVAR Working Group on Tropical Cyclones and Climate

Gabriel A. Vecchi
NOAA/GFDL, Princeton, NJ

Image: NASA.

Working Group Goals

(a) An improved understanding of interannual variability, and trends, in tropical cyclone activity from the beginning of the 20th century to the present..

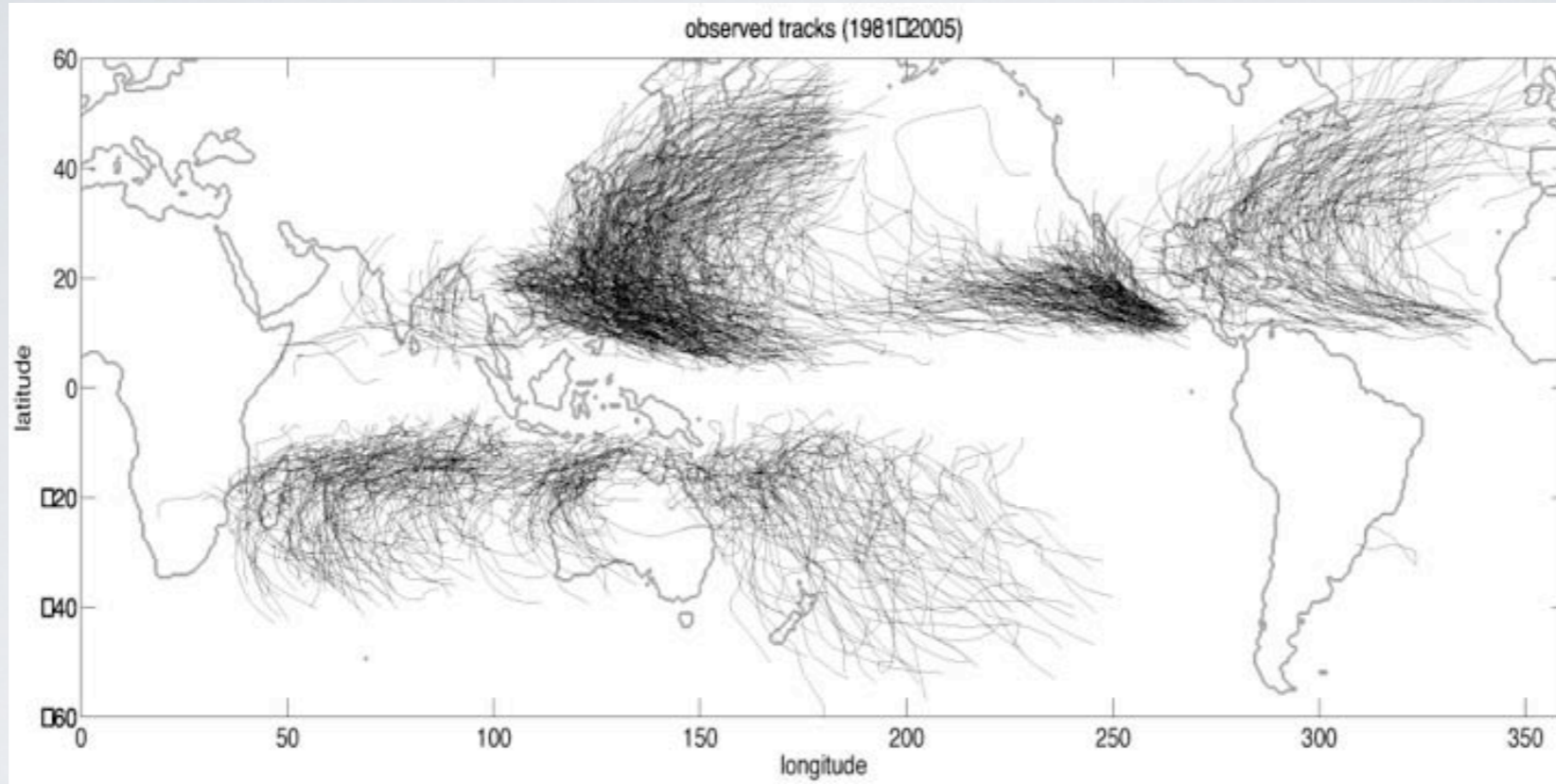
The scientific questions addressed under this objective will include: What is the tropical cyclone response of climate models to an imposed, common increase in sea surface temperature? How sensitive is the simulation of tropical cyclone variability to differences in SST analysis? To what extent are the statistics of seasonal cyclone activity constrained by SST, relative to the purely stochastic component of the tropical cyclone response in the models (i.e., what is the potential predictability?)?

(b) Quantifying changes in the characteristics of tropical cyclones under a warming climate.

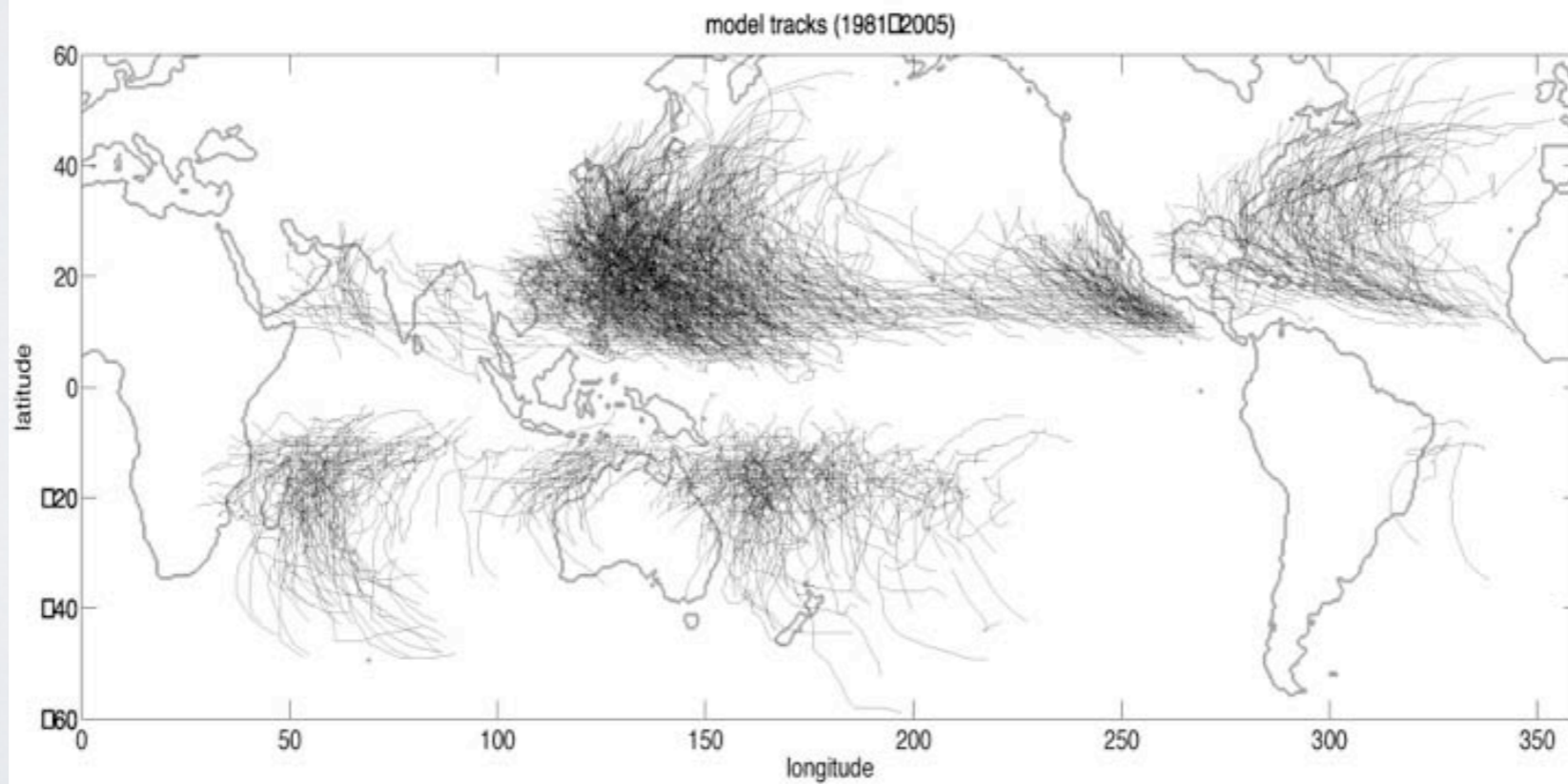
The scientific questions addressed under this objective will focus on: what is the relationship between local versus remote forcing and hurricane formation in the North Atlantic? How does tropical cyclone frequency respond to an increase in tropical mean SST versus an increase in the Atlantic alone? What about the response of tropical cyclones to local and remote forcing in other regions of tropical cyclone formation, is it similar to or different from that in the Atlantic?

High-resolution AGCMs can recover many aspects of observed hurricane tracks

Observed



C180 Model

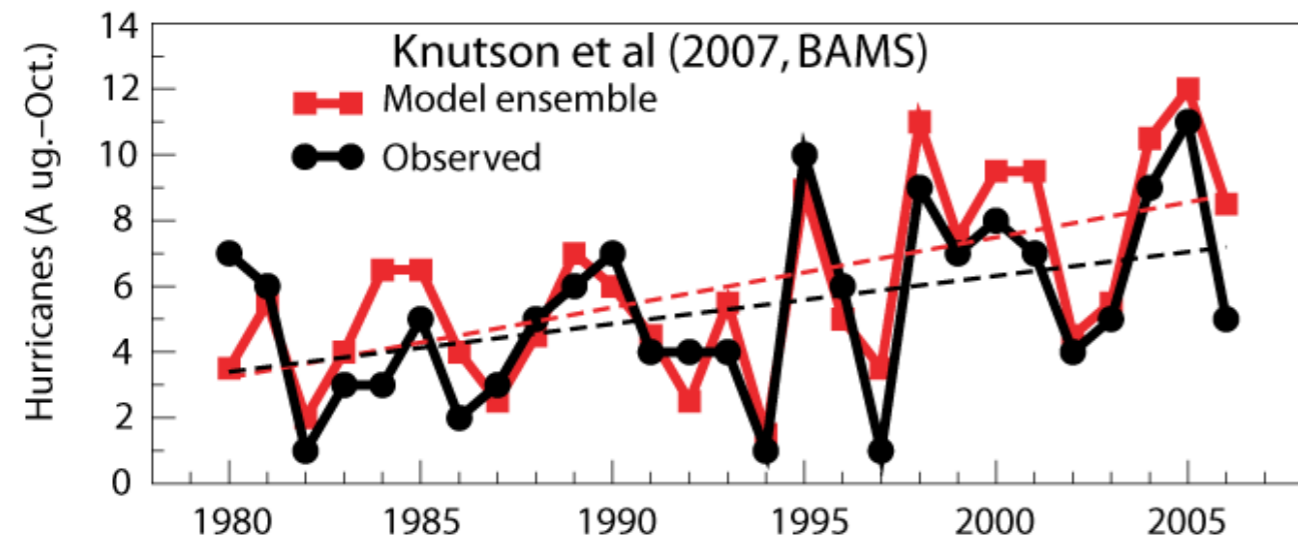
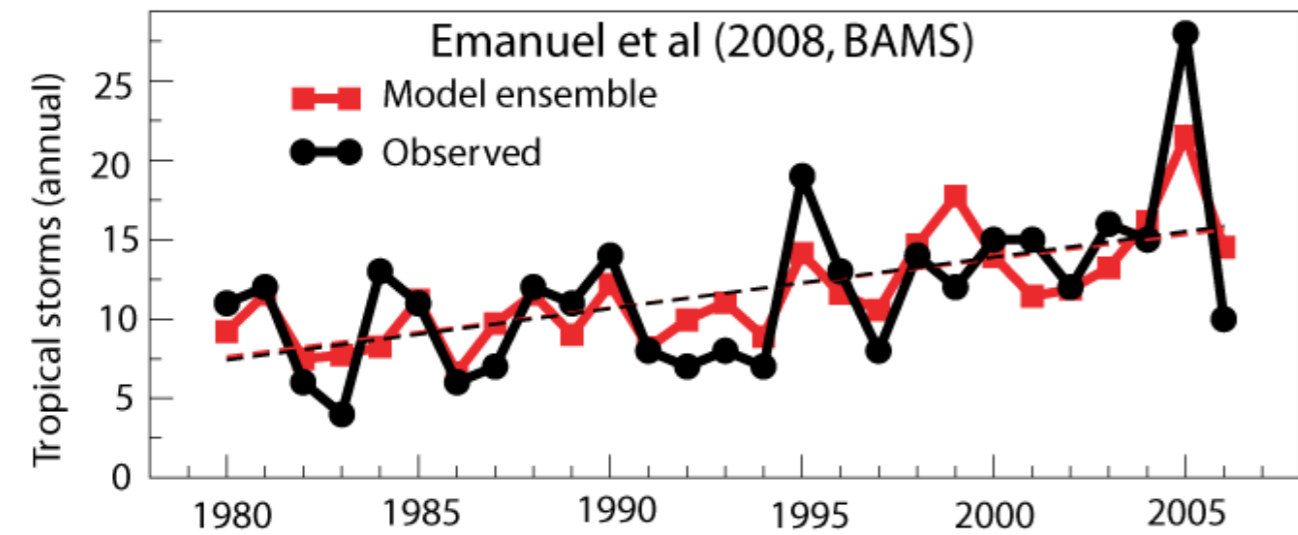


*Zhao et al
(2009, J. Climate)*

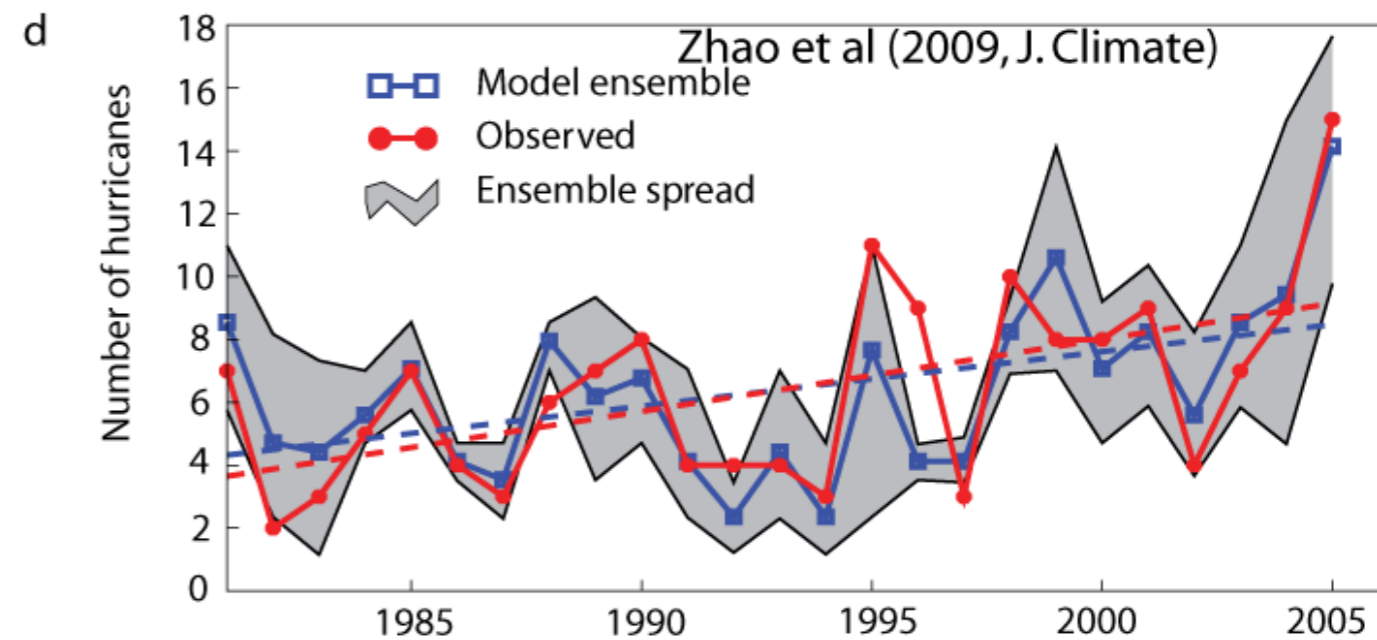
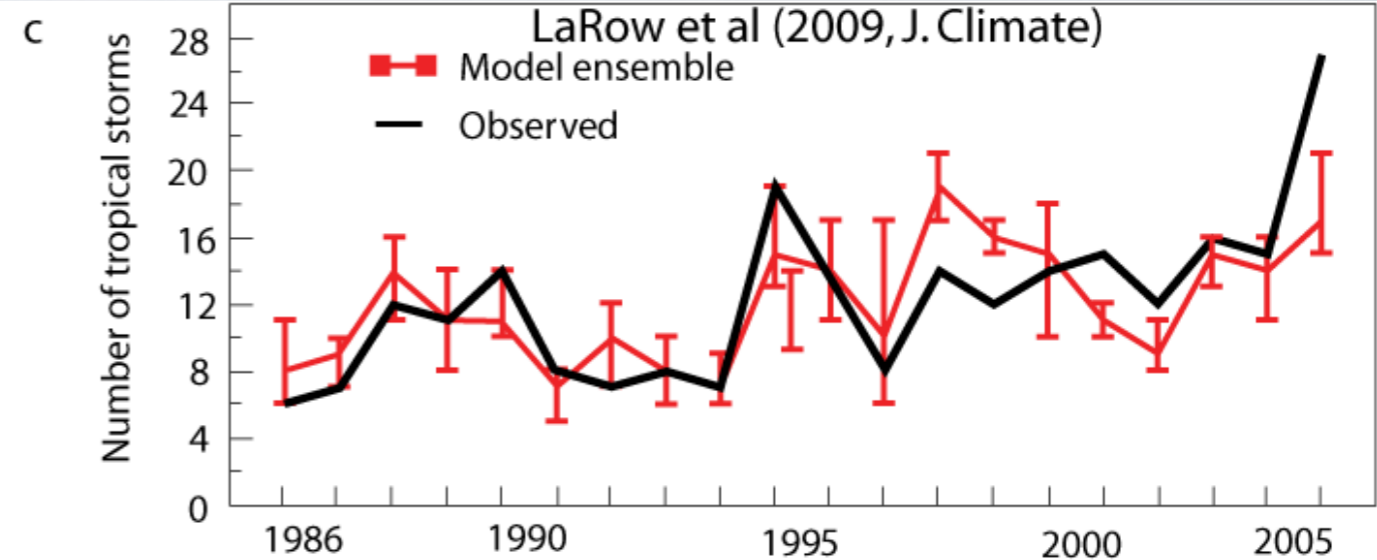
Dynamical Models Exhibit Skill in Seasonal Basin-wide Hurricane Frequency

Statistical-dynamical hybrid model

100km SST-forced AGCM



18-km regional model



50km SST-forced AGCM

COORDINATED HIGH-RESOLUTION SST-FORCED GLOBAL CLIMATE MODEL EXPERIMENTS

- 1) Interannual: Interannual experiment covering 1982-2009 and using Hadley (HadISST.v1) and Reynolds (NOAA-OI) SST products.
- 2) Climatology: Repeating SST climatology (1982-2005 from Hadley SST) for 10 to 20 years.
- 3) Global 2K: Repeating SST climatology (as in *Climatology* experiment) plus a 2K globally-uniform SST anomaly, 10 to 20 years.
- 4) Atlantic 1K: Repeating SST (as in the *Climatology* experiment) plus a 1K SST anomaly confined to the tropical North Atlantic. [ALTERNATIVE EXPERIMENT: “Atlantic Multi-decadal Oscillation” pattern with a 2 sigma forcing]
- 5) Global Warming: Repeating SST (as in the *Climatology* experiment) with (one or more) consistent, specified SST anomaly projection from the CMIP3 (and/or CMIP5) archive.

Timeline

- January 2011 – finalize membership and prospectus, first tele-conference to begin planning experiments, discuss roles and activities
- Bi-monthly tele-conferences: progress on coordination of experiments, coordinated analysis
- Fall 2011 – 1st WG Meeting at AMS Meeting in New Orleans, LA USA
- Fall 2012 – 2nd WG Meeting and workshop somewhere (Maybe at CLIVAR Summit?)
- Fall 2012 – write workshop report-

Membership

- Suzana Camargo (LDEO, Columbia U.)
– co-chair
- Gabriel Vecchi (NOAA/GFDL) – co-chair
- Kevin Walsh (University of Melbourne, Australia) – co-chair
- James Elsner (Florida State U.)
- Kerry Emanuel (MIT)
- Jim Kossin (U. Wisconsin-Madison & NOAA/NCDC)
- Hui Wang (NOAA/NCEP/CPC)
- Chris Landsea (NOAA/NWS/NHC)
- Siegfried Schubert (NASA/GSFC)

- Adam Sobel (Columbia U.)
- Gabriele Villarini (Princeton U.)
- Ming Zhao (NOAA/GFDL)

International Membership: Ex-Officio

- Lennart Bengtsson (University of Reading, U.K.)
- In-Sik Kang (Seoul National University, Korea)
- K. Oouchi (JAMSTEC - NICAM)
- H. Murakami (JAMSTEC at MRI)
- Enrico Scoccimarro (CMCC, Italy)