HURRICANES WORKING GROUP

Co-leaders:
Suzana J. Camargo, LDEO, Columbia University
Gabriel Vecchi, GFDL/NOAA
Kevin Walsh, University of Melbourne

Hurricanes WG objectives

- An improved understanding of interannual variability, and trends, in tropical cyclone activity from the beginning of the 20th century to the present.
- Quantifying changes in the characteristics of tropical cyclones under a warming climate.

Hurricane WG tasks

- Define common experiments for model simulations by participating modeling group
- Supply common data sets and tropical cyclone metrics for those experiments
- Coordinate the evaluation and reporting of common experiments and the storage of model output
- Organize workshops to present and discuss the results

Hurricanes WG

- January 2011 – present
- 1st Workshop: January 2012, New Orleans (after AMS annual meeting).
- 2nd Workshop: June 2013, GFDL
- Journal Climate special issue with papers from the WG (a few papers submitted, many more planned)
- Workshop summary BAMS article planned
- BAMS paper planned
- Dataset to be available to the community (where?)

Hurricanes WG membership

Name	Affiliation
James Elsner	Florida State University
Kerry Emanuel	MIT
James Kossin	NOAA
Timothy LaRow	Florida State University
Siegfried Schubert	NASA GSFC
Adam Sobel	Columbia University
Gabrielle Villarini	University of Iowa
Hui Wang	NOAA NCEP
Ming Zhao	GFDL
Lennart Bengtsson	University of Reading, UK
In-Sik Kang	Seoul National University, S. Korea
K. Oouchi	JAMSTEC, Japan
Enrico Scoccimarro	INGV-CCMC, Italy

Additional Contributing Members

Name	Institution
Julio Bacmeister	NCAR
Fabrice Chauvin	CNRM, France
Ping Chang, R. Saravanan, and Christina Patricola	Texas A&M Univeresity
Monika Esch	MPI, Germany
Hiroyuki Murakami	University of Hawaii
Christiane Jablonowsky	University of Michigan
Malcolm Roberts	Met Office, UK
Pier Luigi Vidale	University of Reading, UK
Michael Wehner	Lawrence Berkeley National Laboratory

Simulations:

- Climatology
- Climatology plus 2K
- Climatology + $2CO_2$
- Climatology plus 2K + $2CO_2$
- Interannual

Model Data:

Model	Resolution	Runs	Number of years
CAM5.1	1 deg 0.25 deg	Climo, p2K, 2CO2, p2K2 CO2	15 years
Echam5 - INGV	0.75 deg	Climo, p2K, 2CO2, p2K2 CO2	10 years
CNRM	0.5 deg	Interannual	40 years
FSU	1 deg	Climo, 2CO2, p2K, Interannual	5 yrs, 10 yrs, 10 yrs, 25 years
HIRAM GFDL	0.6 deg	Climo, p2K, 2CO2, p2K2 CO2, Interannual	20 years 30 years, 3 ens.
GISS	1 deg	Climo, p2K, 2CO2, p2K2 CO2, Interannual	20 years 20 years, 3 ens
GSFC - NASA	0.6 deg	Climo, p2K, 2CO2, p2K2 CO2, Interannual	20 years 30 years

Model Data II

Model	Resolution	Runs	Number of years
HadGEM3	1 deg 0.5 deg 0.25 deg	Climo, p2K, p2K 2CO2	20 years
JAMSTEC	0.14 deg	Climo, GW	4 months
MRI-CGCM3	0.8 deg	Interannual, p1.83K CO2F, SSTf, CO2F	25 years
NCEP	1 deg	Climo, p2K, 2CO2, p2K 2CO2	20 years
WRF	1 deg (Atlantic)	Climo, Interannual	20 years

Issues

- Varying periods, variables and runs among the models.
- Not all modeling groups are providing the data in all time frequencies necessary for the analysis (monthly, data, 6-hourly).
- Serving the data for the community after the WG publishes papers analyzing the dataset is still an unsolved problem.

RESULTS FROM GFDL WORKSHOP

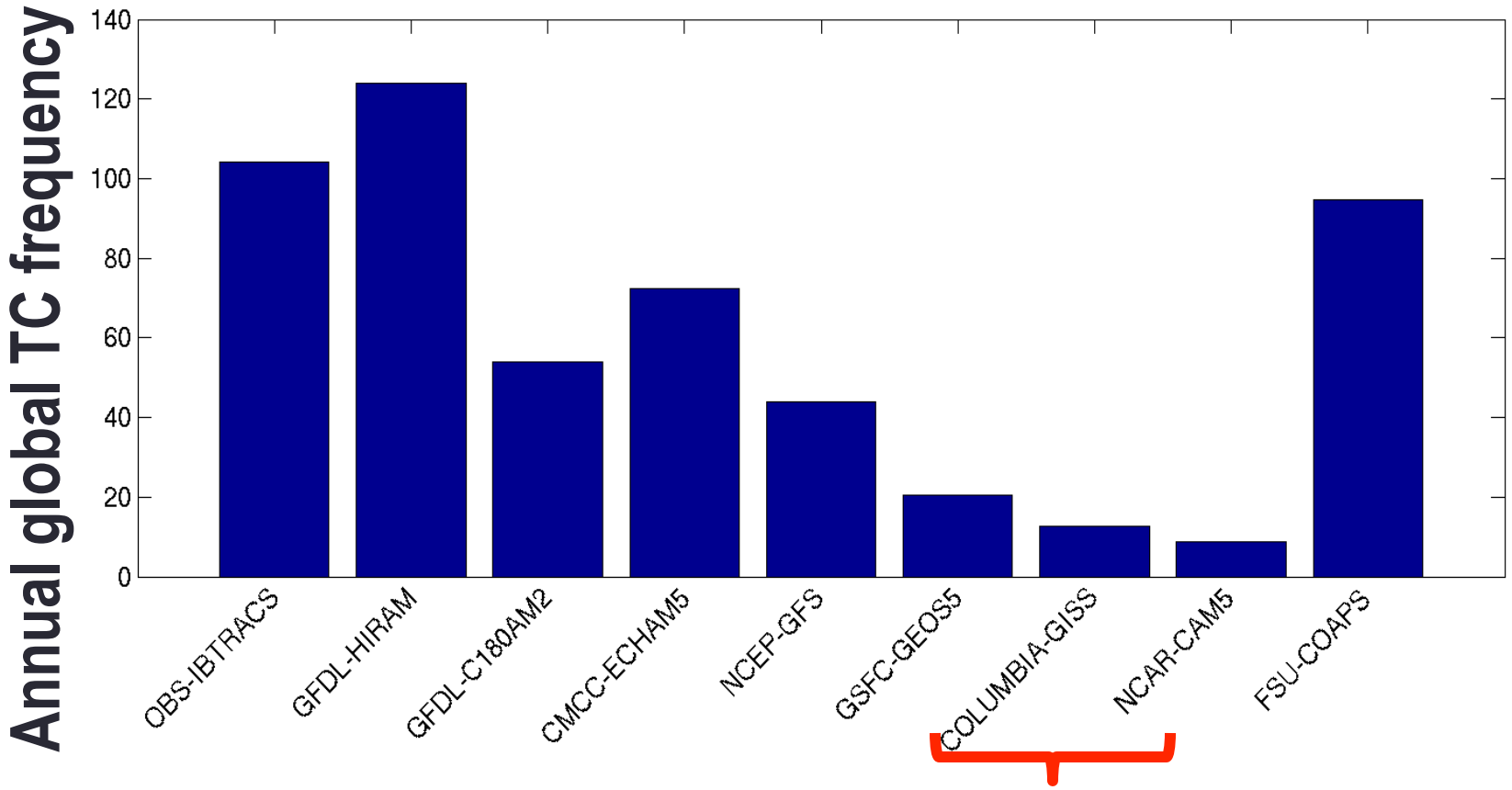


Figure: Ming Zhao, GFDL

GISS, C180AM2, ECHAM5, GEOS5: excessive WP to EP and NA TC ratio

GFS, CAM5: produce the opposite

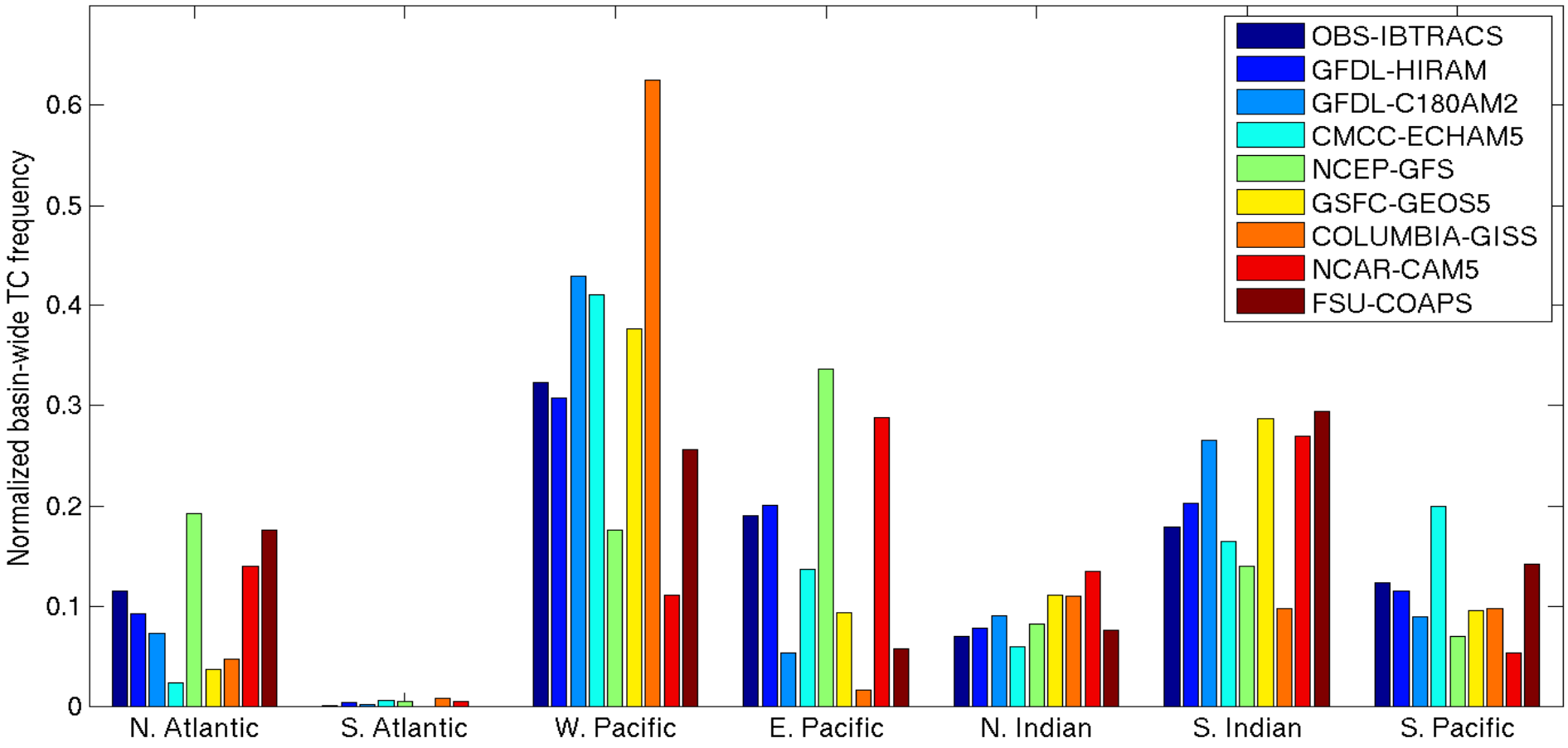


Figure: Ming Zhao, GFDL

TC GENESIS FREQUENCY DISTRIBUTION FROM THE CONTROL SIMULATIONS

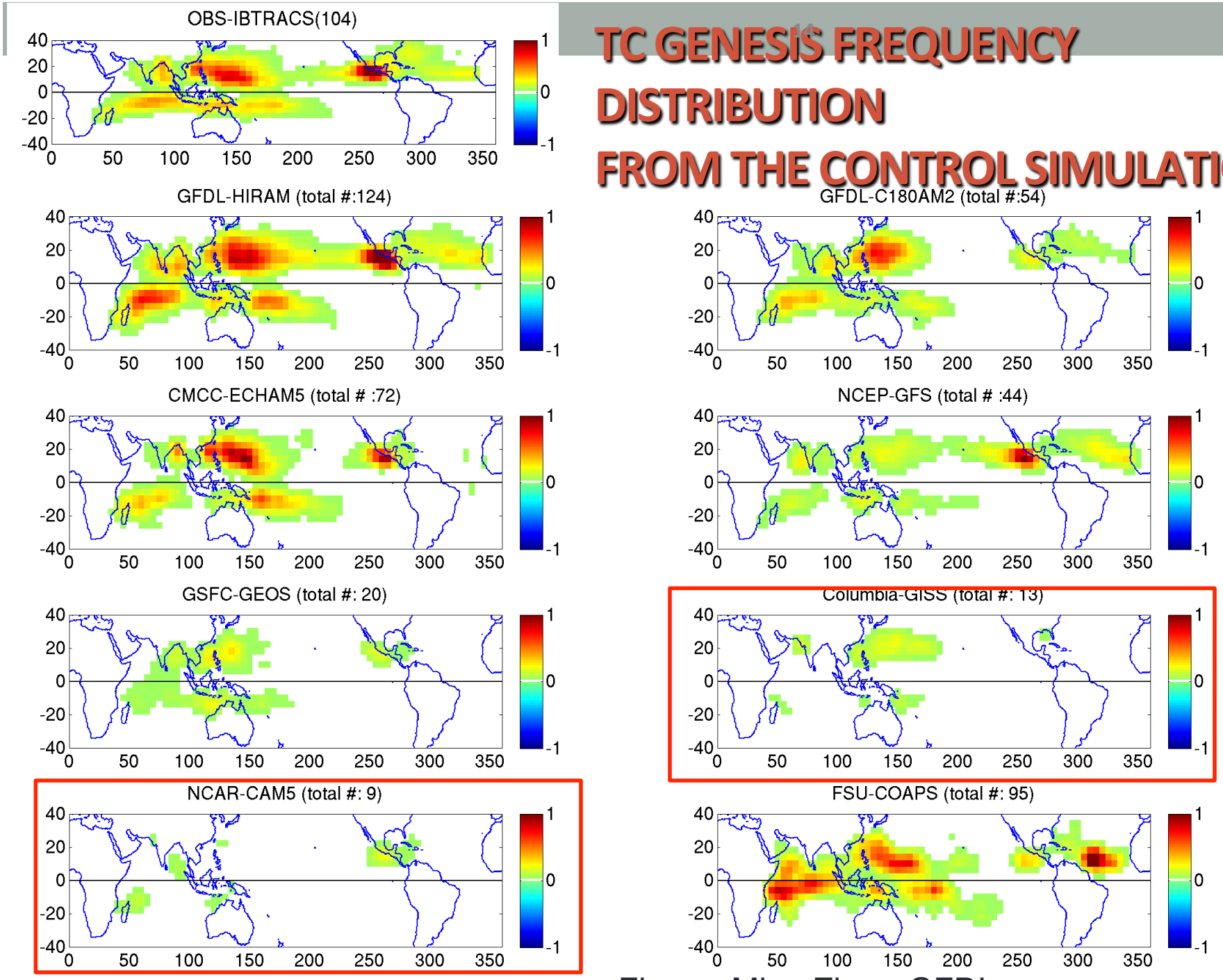


Figure: Ming Zhao, GFDL

Genesis Density: Latitude

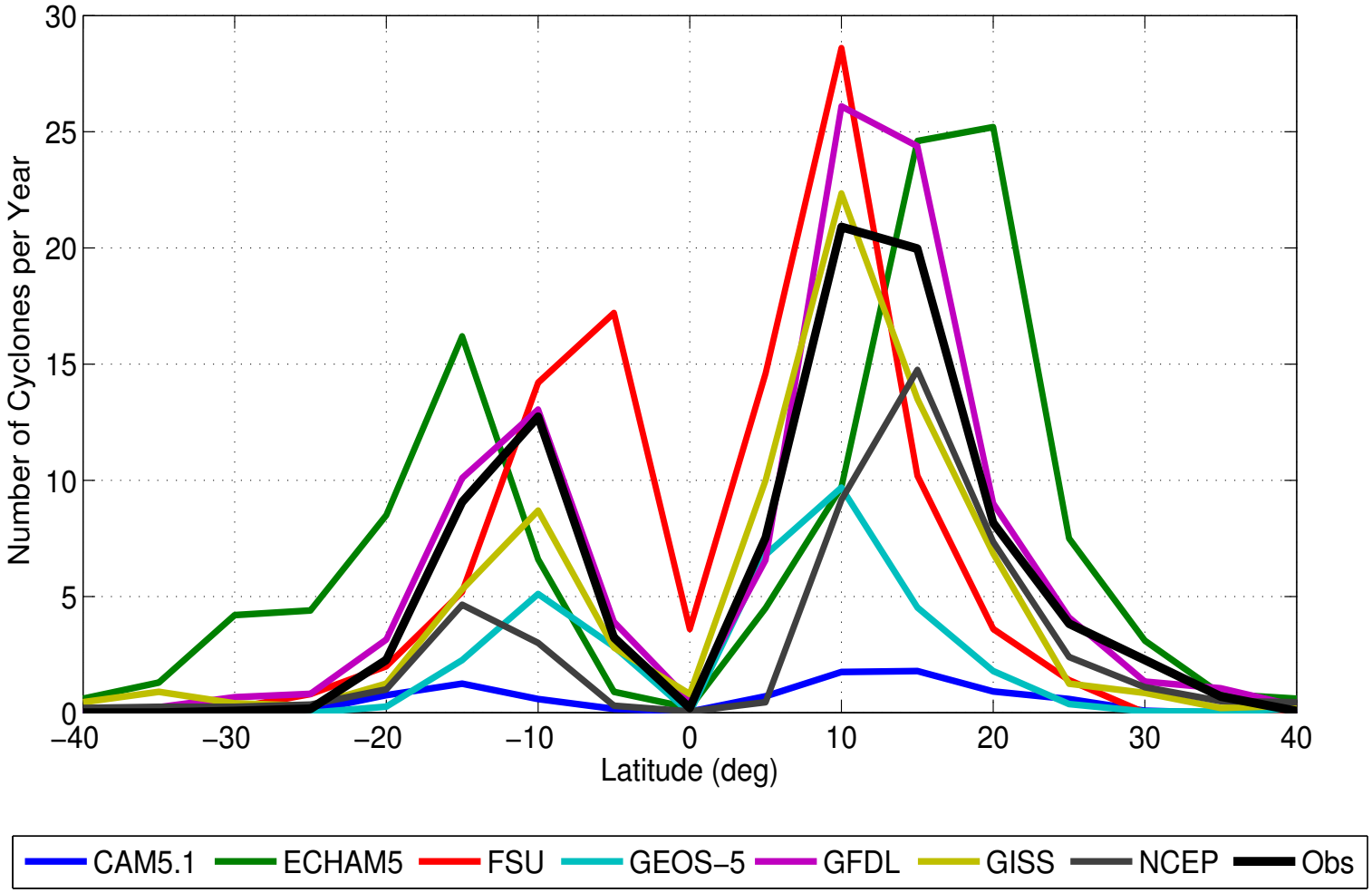


Figure: Daniel Shaevitz, LDEO

Genesis Density: Longitude

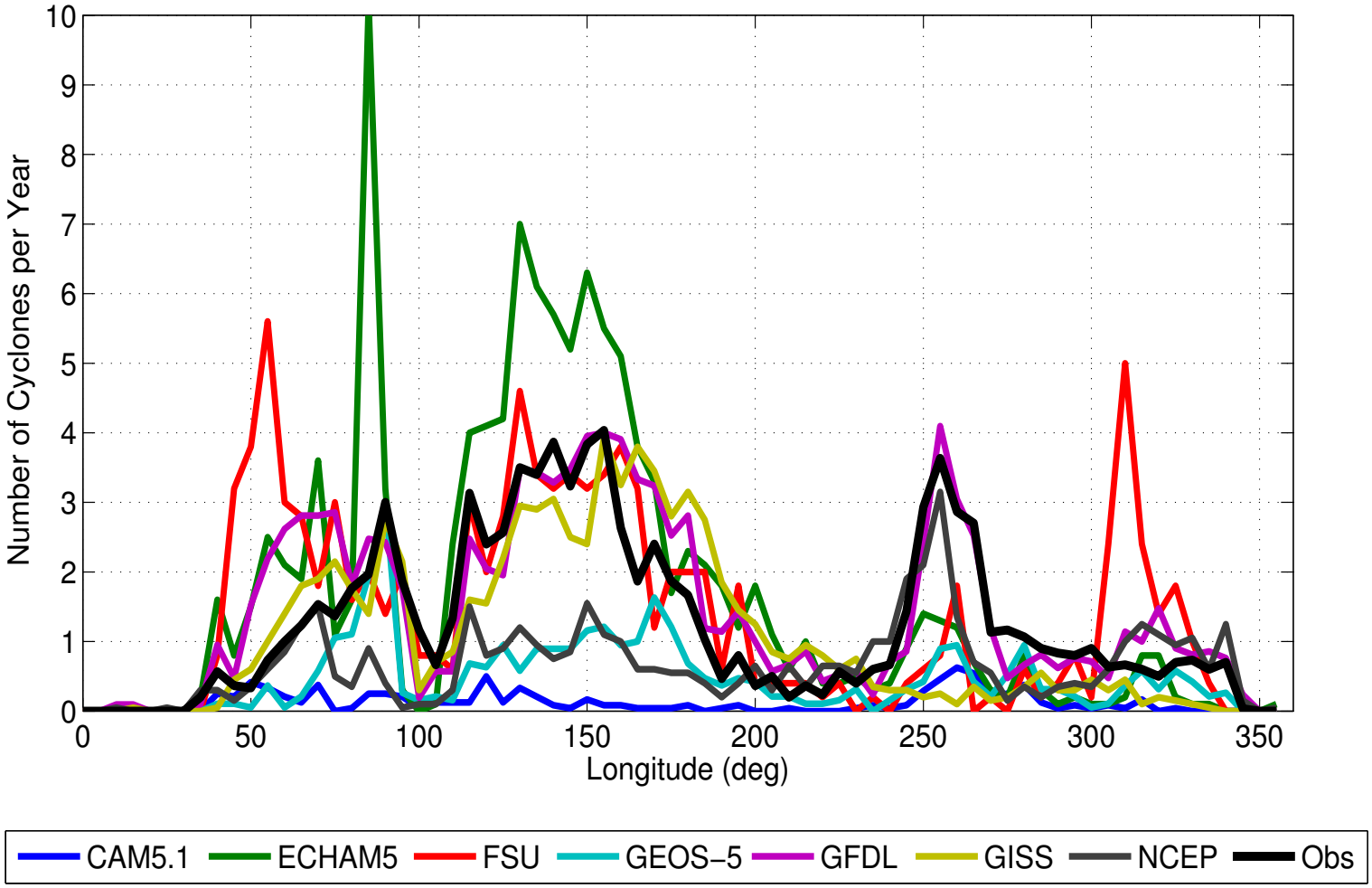


Figure: Daniel Shaevitz, LDEO

CUMULATIVE PROBABILITY DISTRIBUTION OF GLOBAL TC INTENSITY

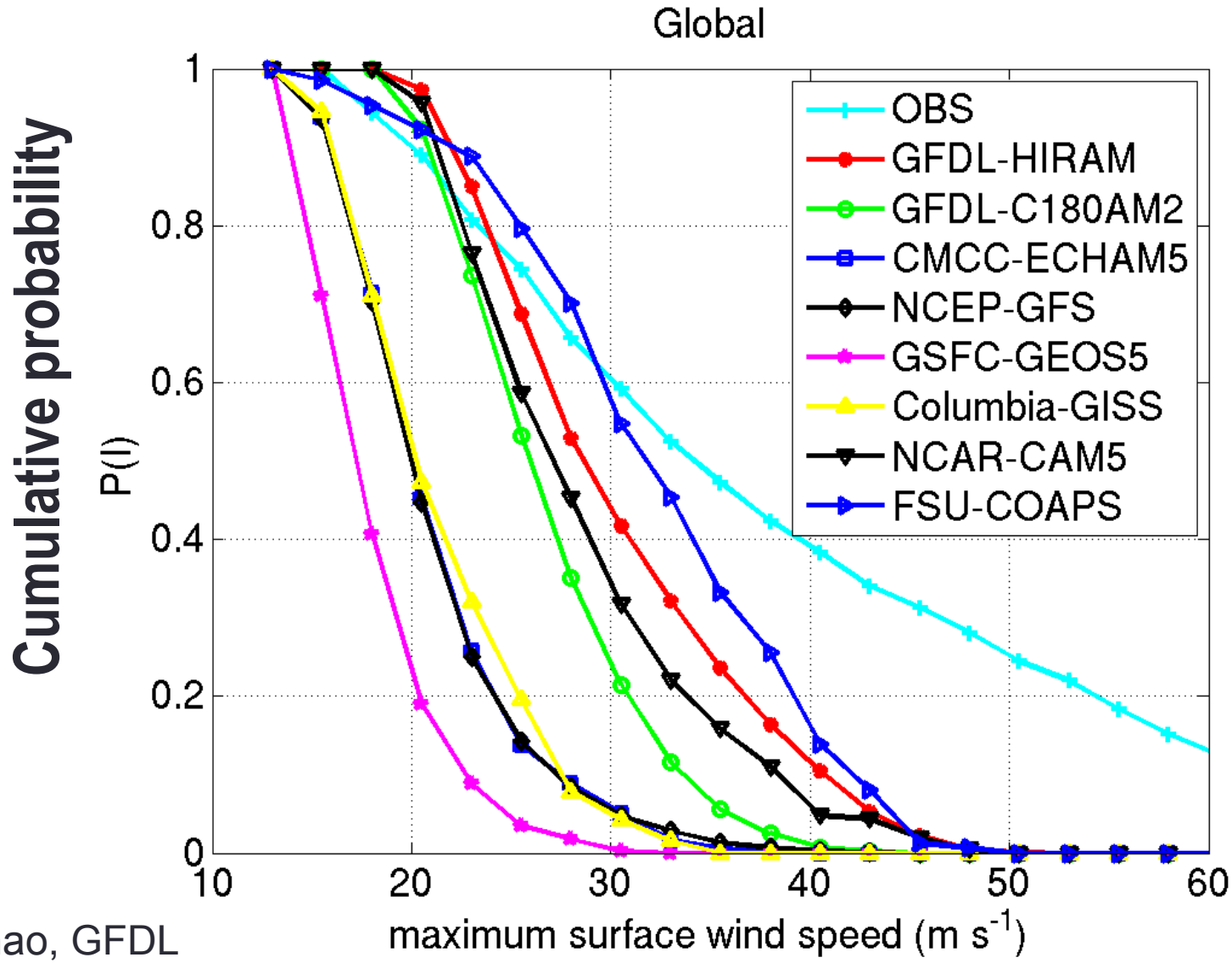


Figure: Ming Zhao, GFDL

Seasonal Cycle

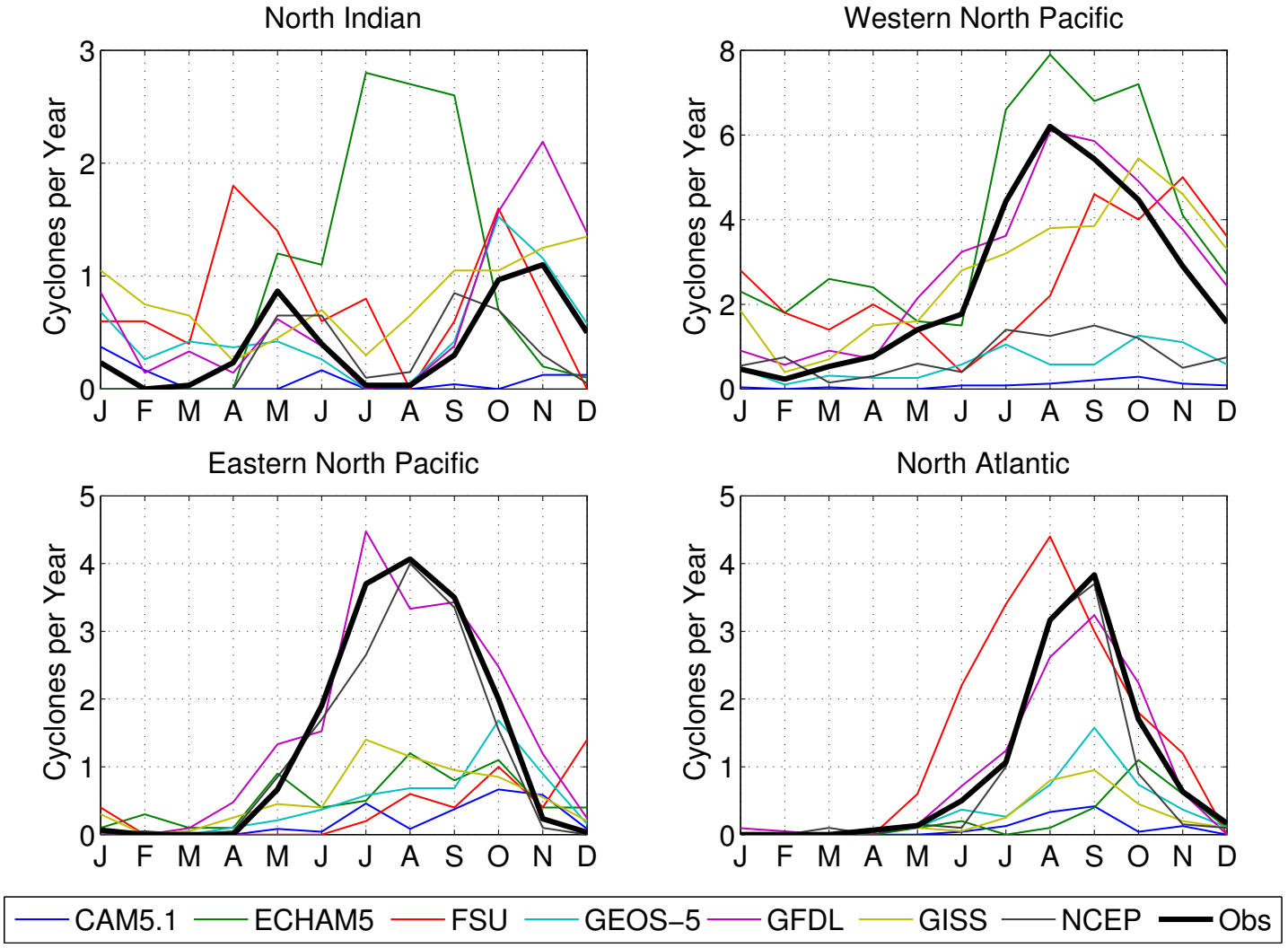


Figure: Daniel Shaevitz, LDEO

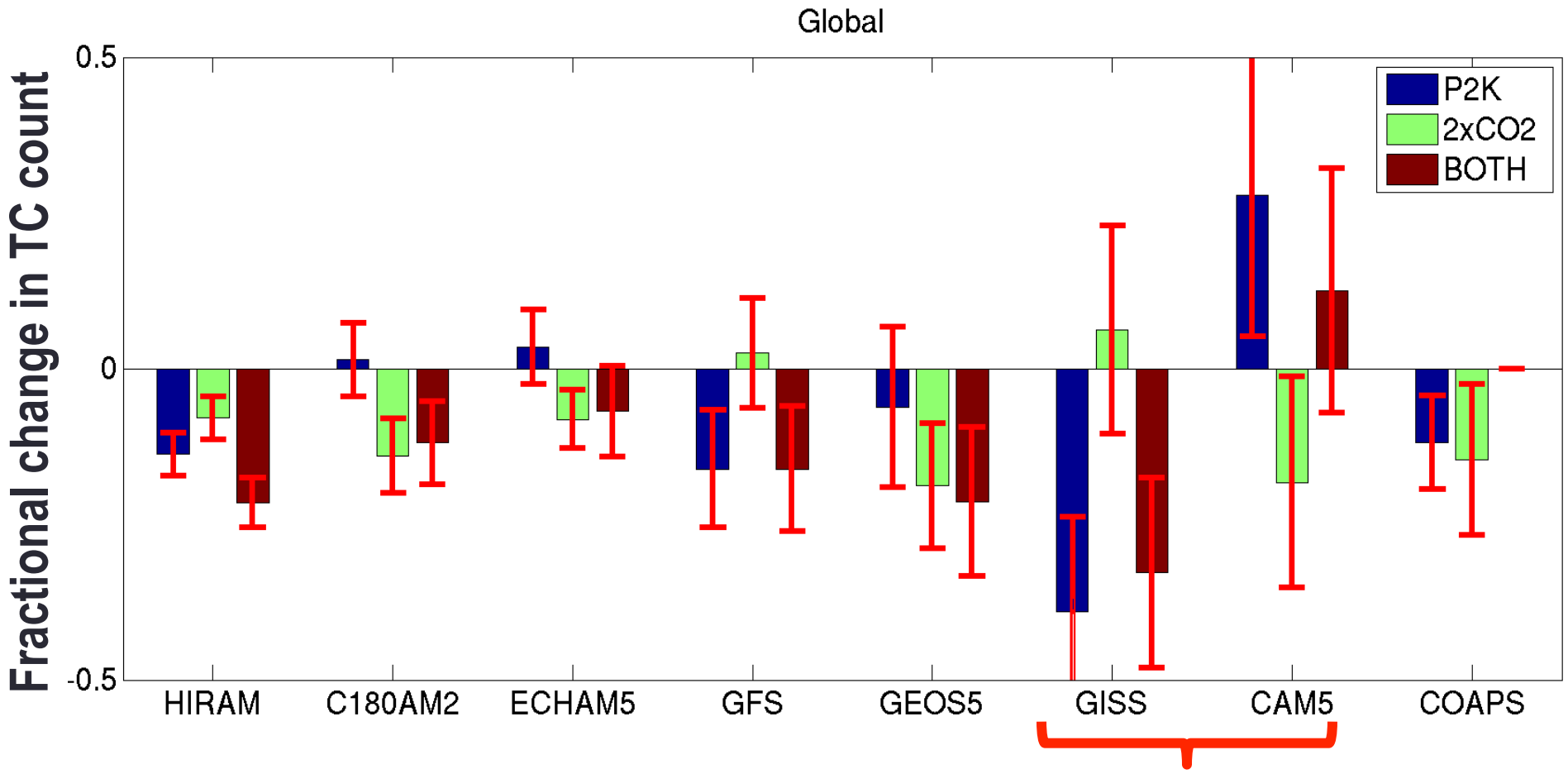


Figure: Ming Zhao, GFDL

Statistical-dynamical downscaling: Synthetic Tracks

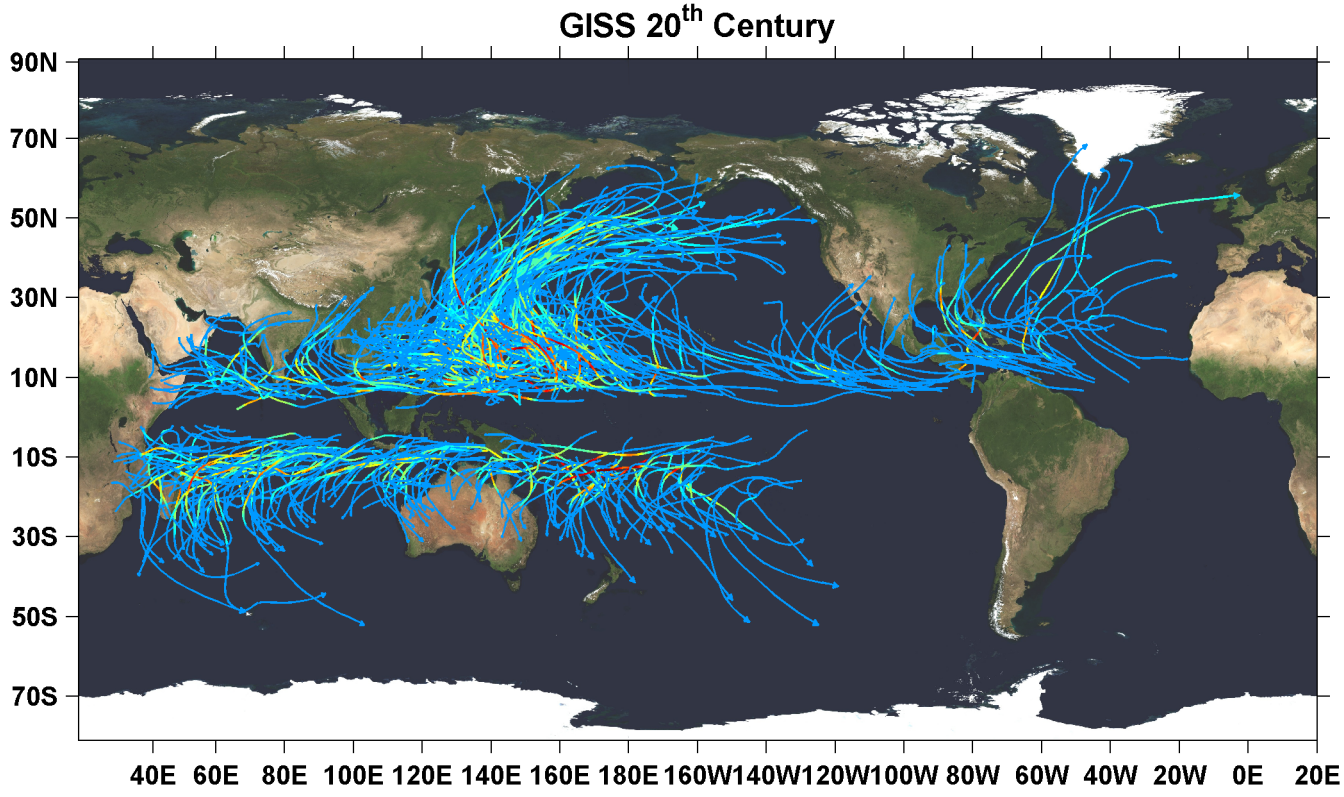
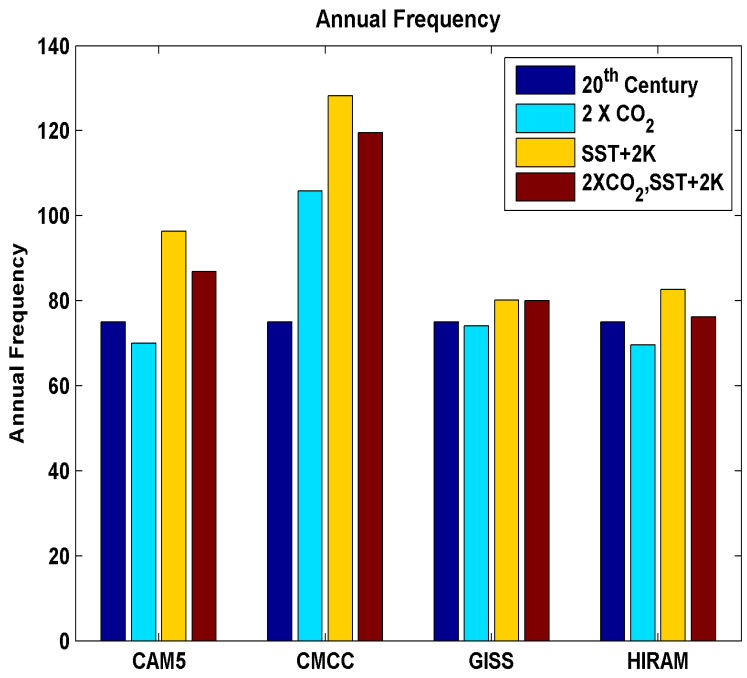
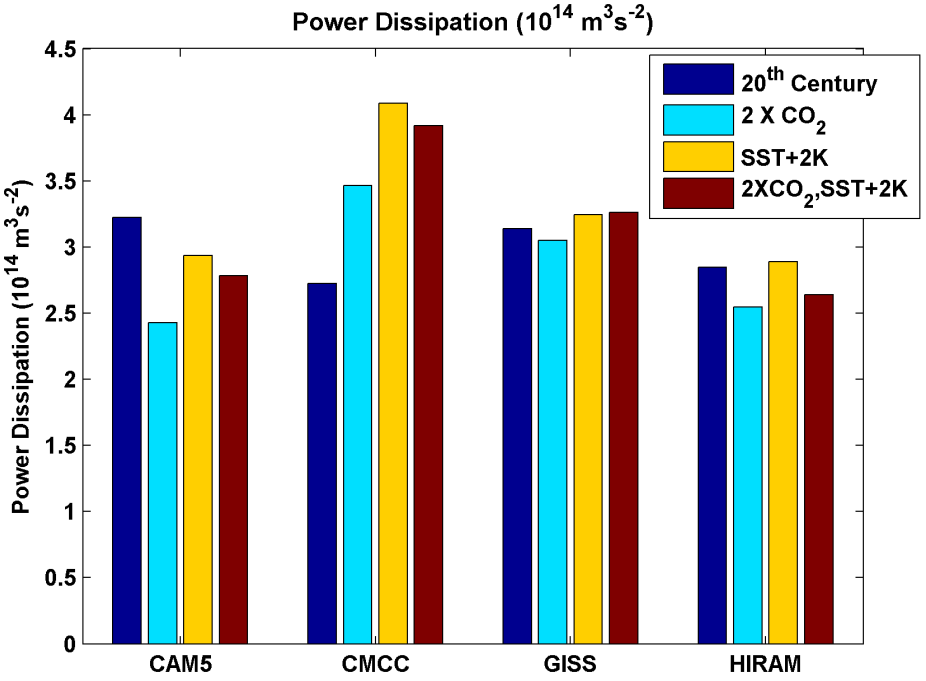


Figure by Kerry Emanuel, MIT

Frequency and Power Dissipation



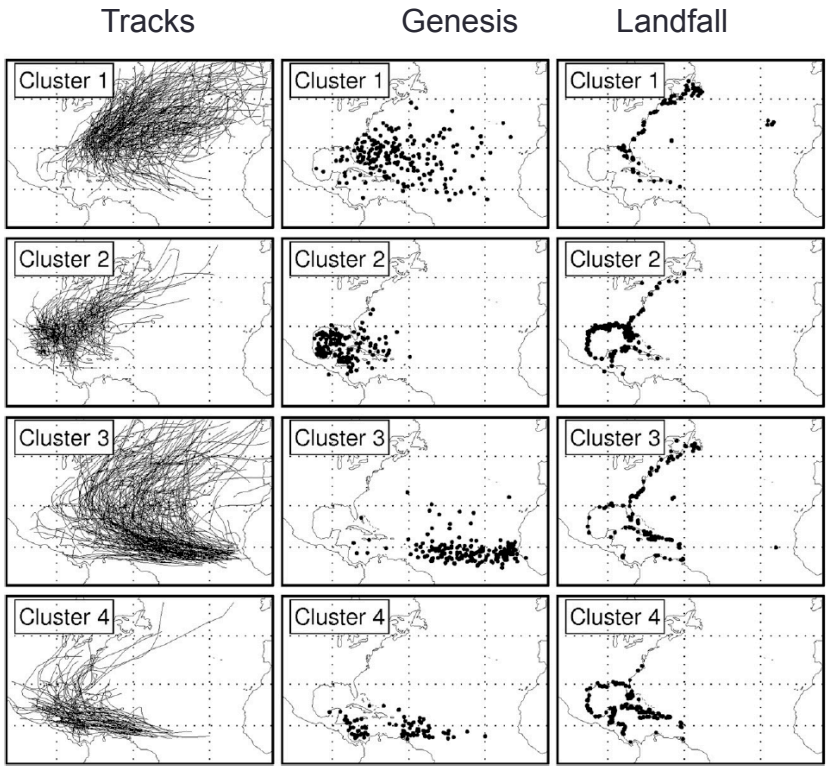


Figures: Kerry Emanuel, MIT

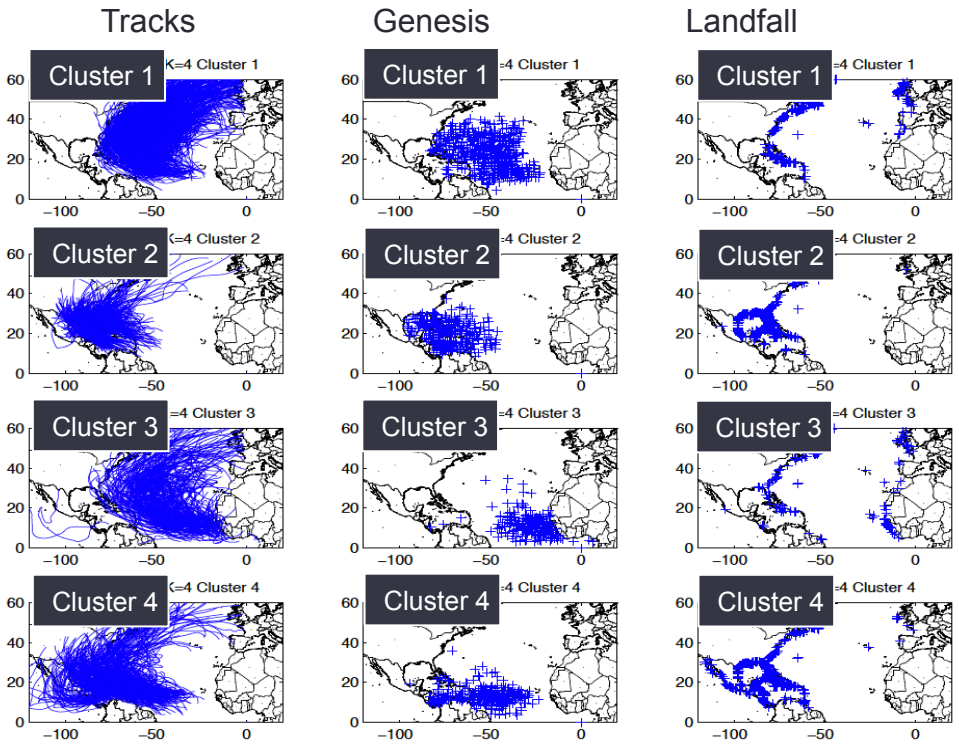
Clusters in downscaled simulations

Observations (HURDAT)

Kossin et al. 2010



GFDL_D (downscaled)

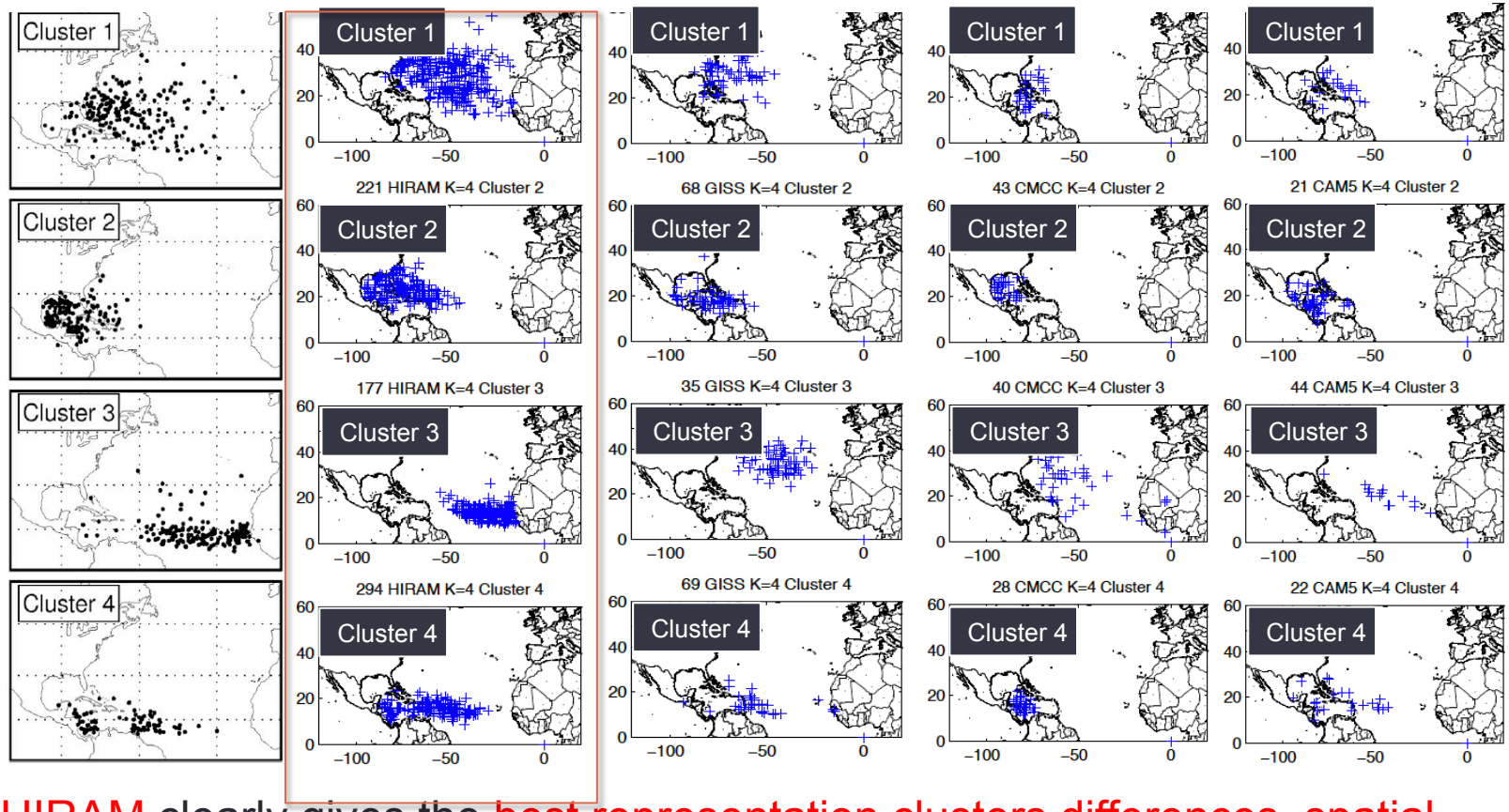


Very good representation of the clusters for all the downscaled simulations in terms of tracks, genesis and landfalls.

Figure: Anne-Sophie Daloz, University of Wisconsin-Madison

Clusters in explicit simulations

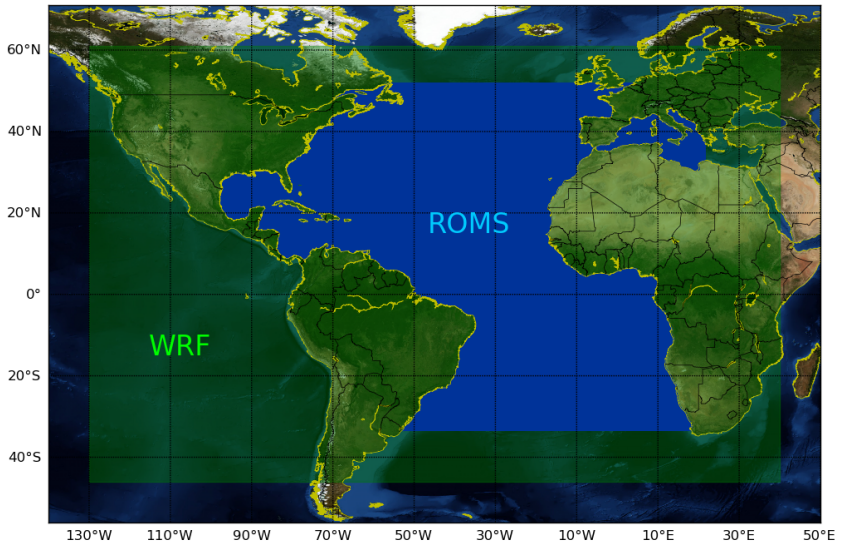
GENESIS

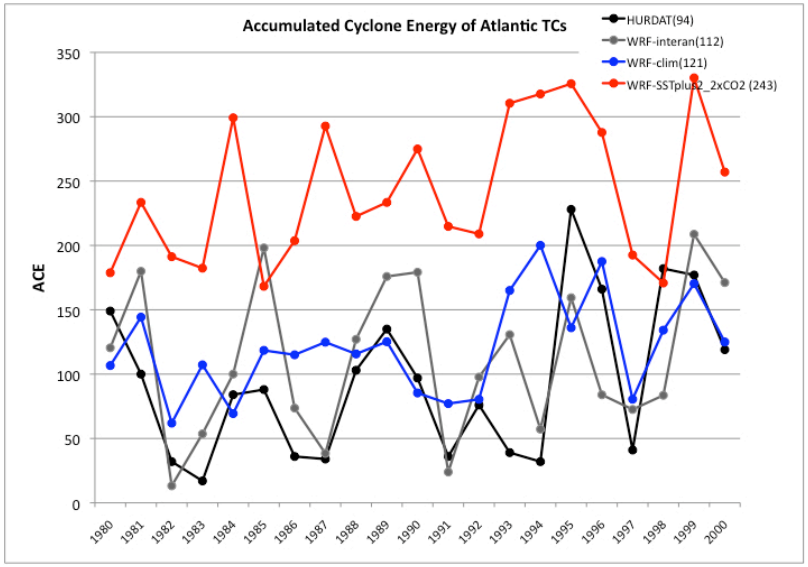


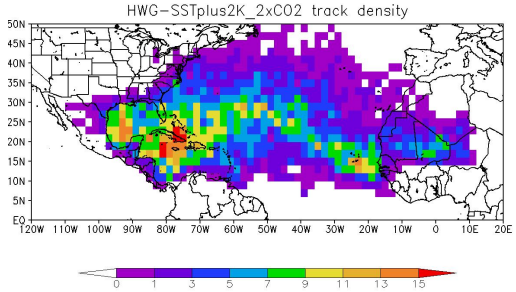
HIRAM clearly gives the best representation clusters differences spatial resolution, AEWs.

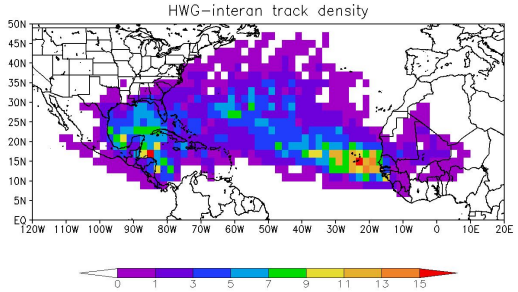
Figure: Anne-Sophie Daloz, University of Wisconsin-Madison

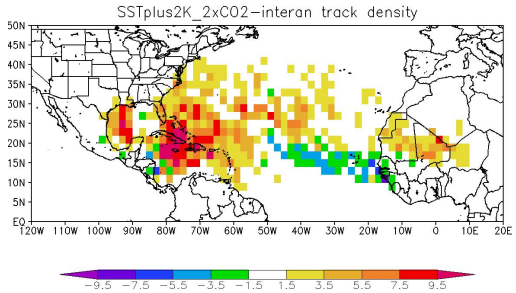
Texas A&M Coupled Regional Climate Model (TAMU-CRCM)





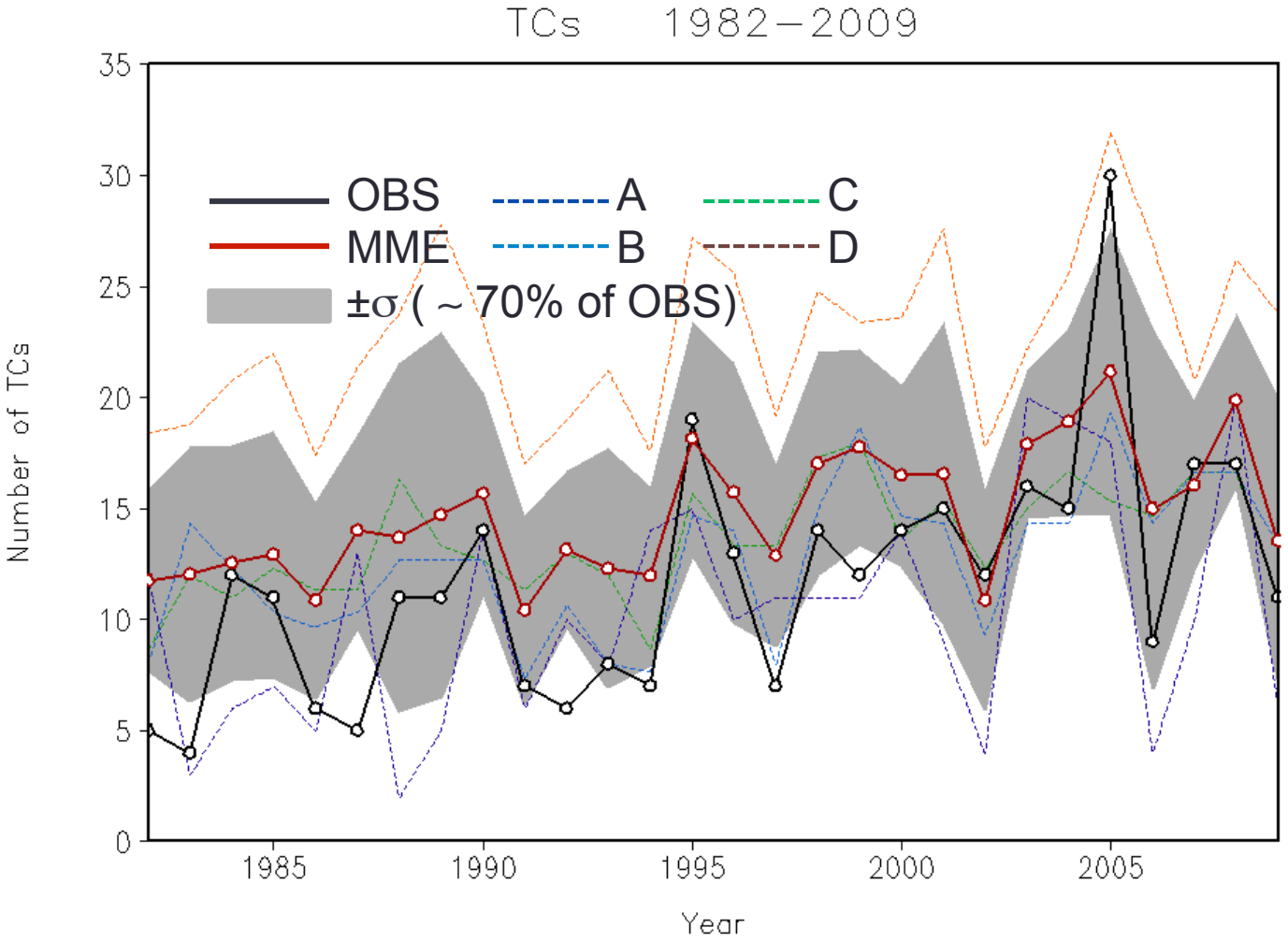






Figures by P. Saravanan and Christina Patricola, Texas A&M

TC Time Series



A, B, C, D – ensemble mean of individual models
MME – average of the ensemble means of individual models

Figure: Hui Wang, NCEP

TC Statistics

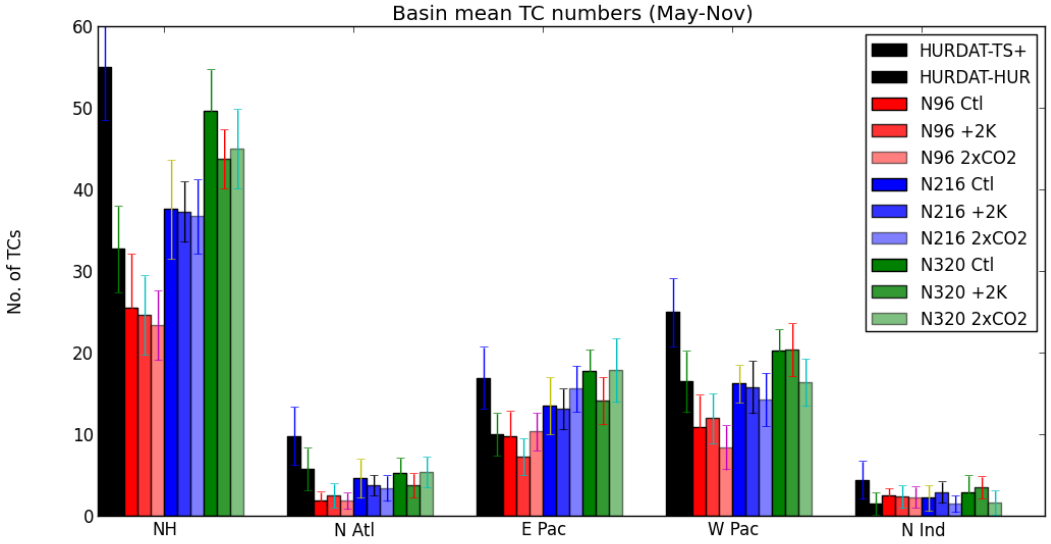
	Mean	Trend	AC	RMSE	Rank
OBS	11.7	3.9			
MME	14.8 4	2.1	4 0.82	1 4.6	2 3
Model A	10.3 2	2.5	1 0.53	5 5.3	3 4
Model B	12.7 1	2.2	2 0.73	3 3.8	1 1
Model C	13.5 3	1.7	5 0.60	4 4.7	4 2
Model D	22.7 5	2.2	3 0.75	2 11.5	5 5

Rank

AC – anomaly correlation
Trend – increase of TCs per decade
MME – average of ensemble means of all individual models

Table: Hui Wang, NCEP

HWG experiments



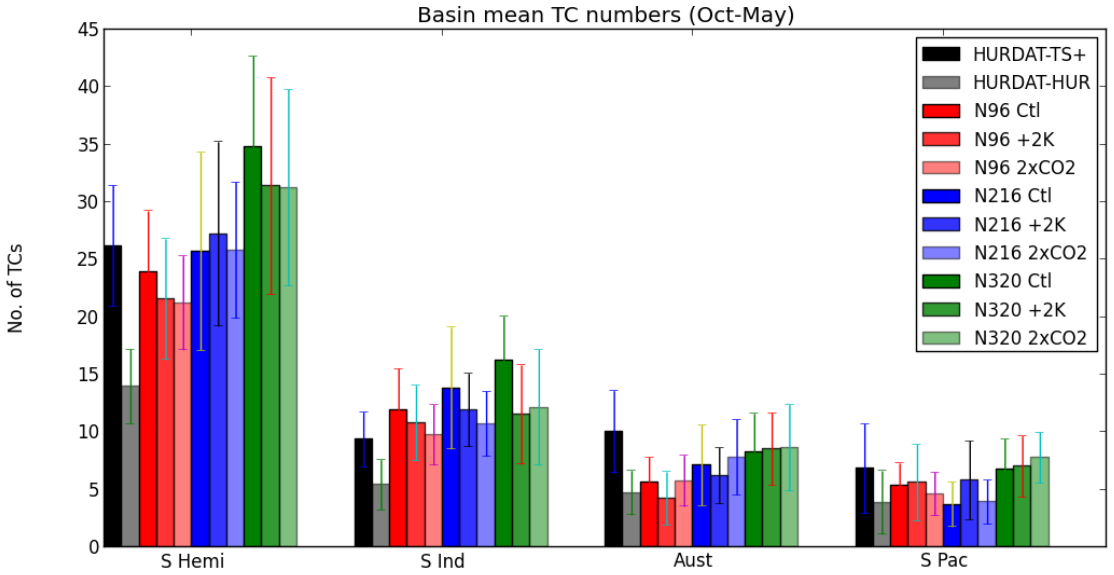
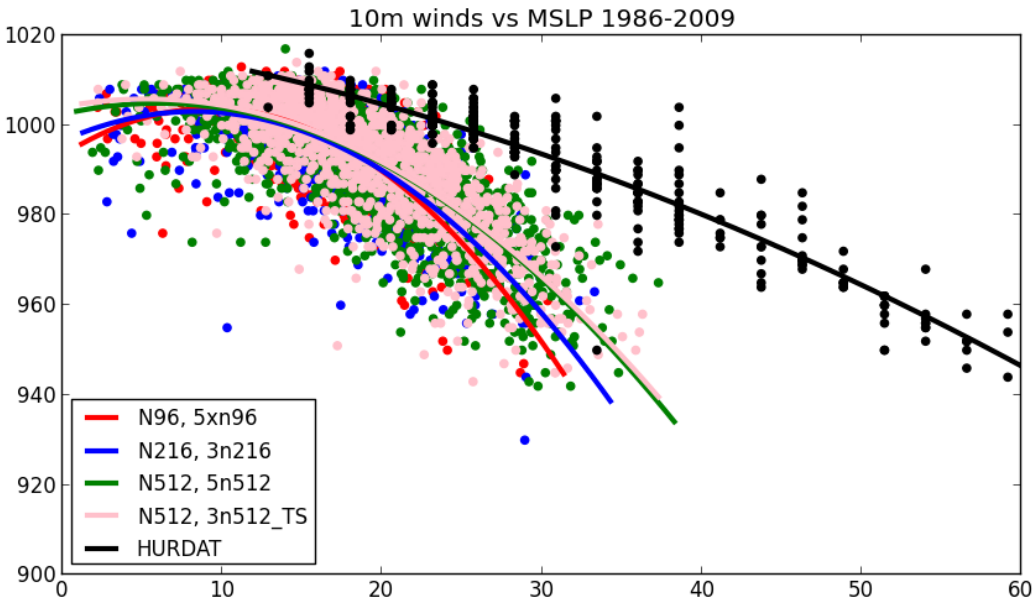


Figure: Malcolm Roberts, UK MetOffice

NH tropical cyclone intensity (wind speed vs MSLP) for
(top) 10m wind

(bottom) 925hPa winds

(HURDAT is 10m in both)



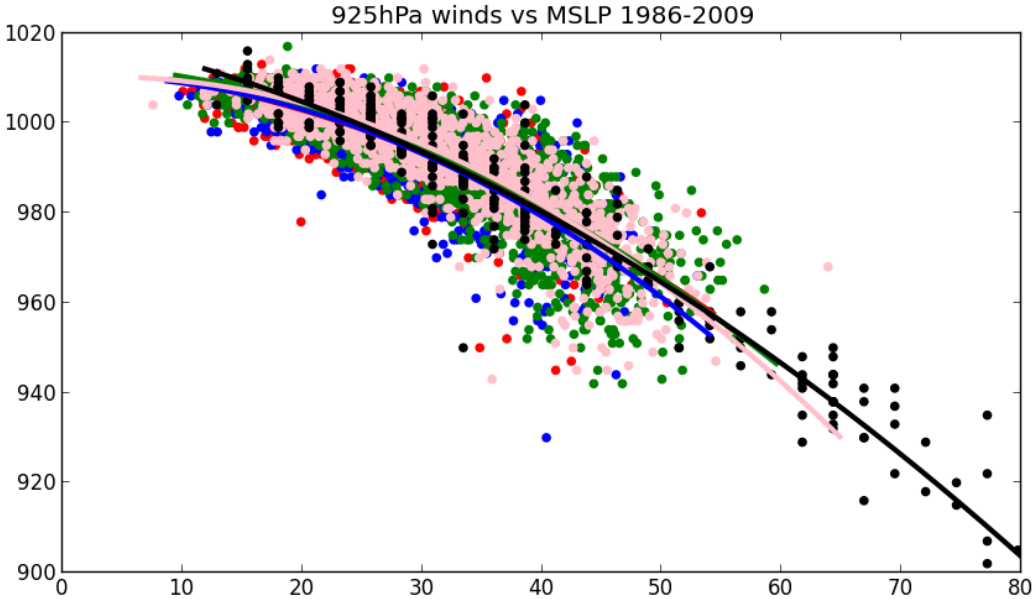
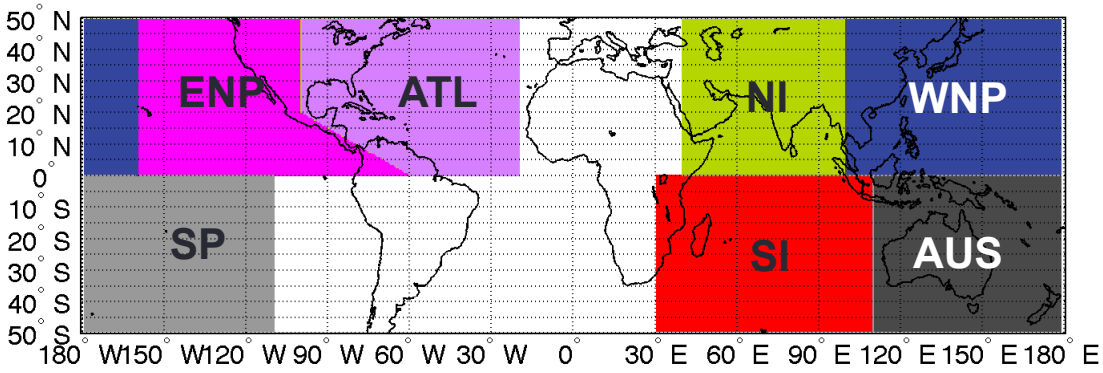
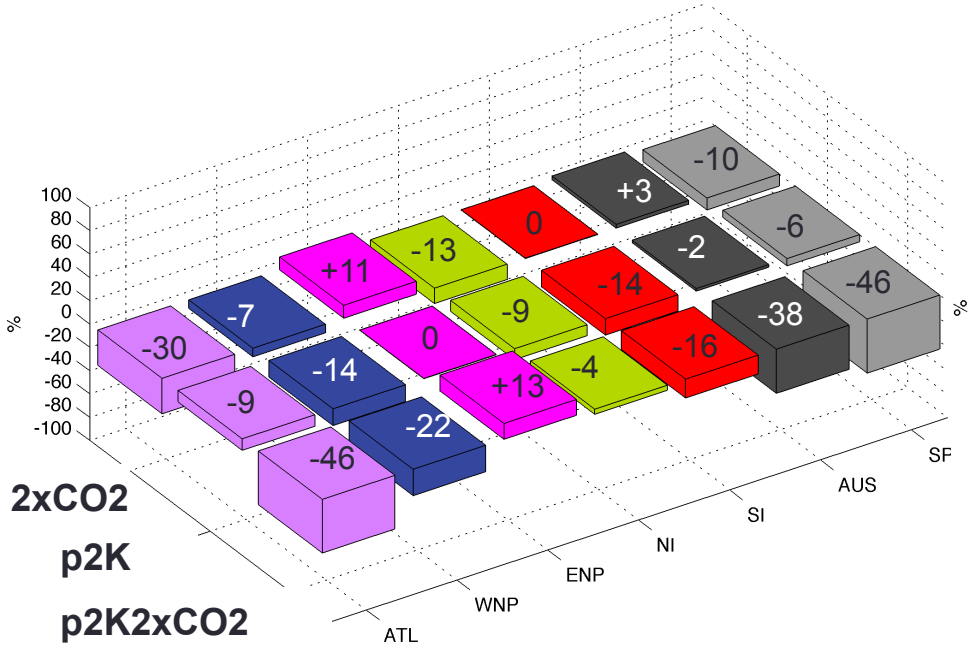


Figure: Malcolm Roberts, UK MetOffice

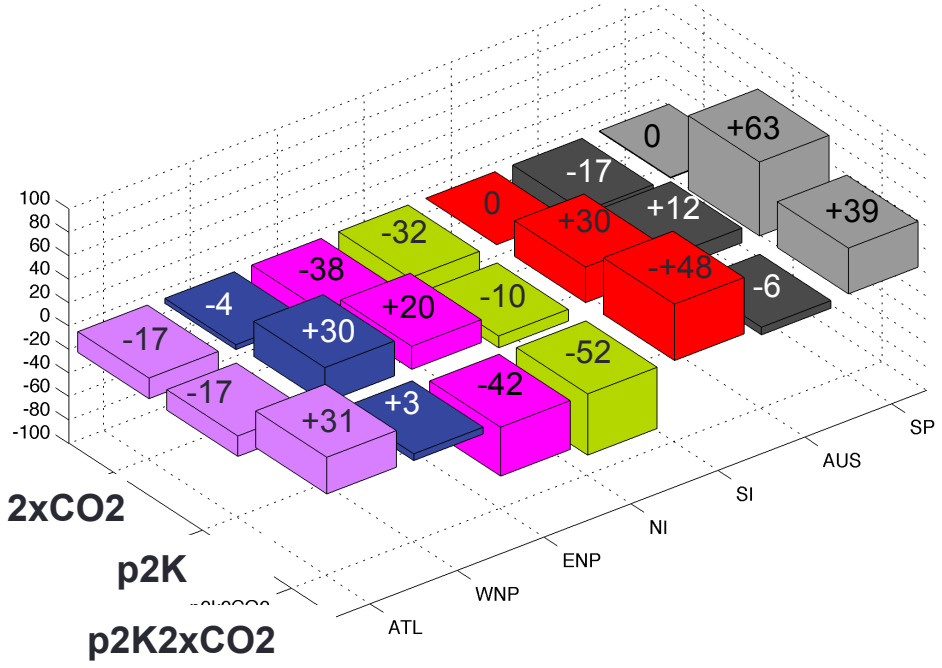
Changes in the total amount of water in TCs regions



GFDL TC precipitation increase [% wrt CONTROL]

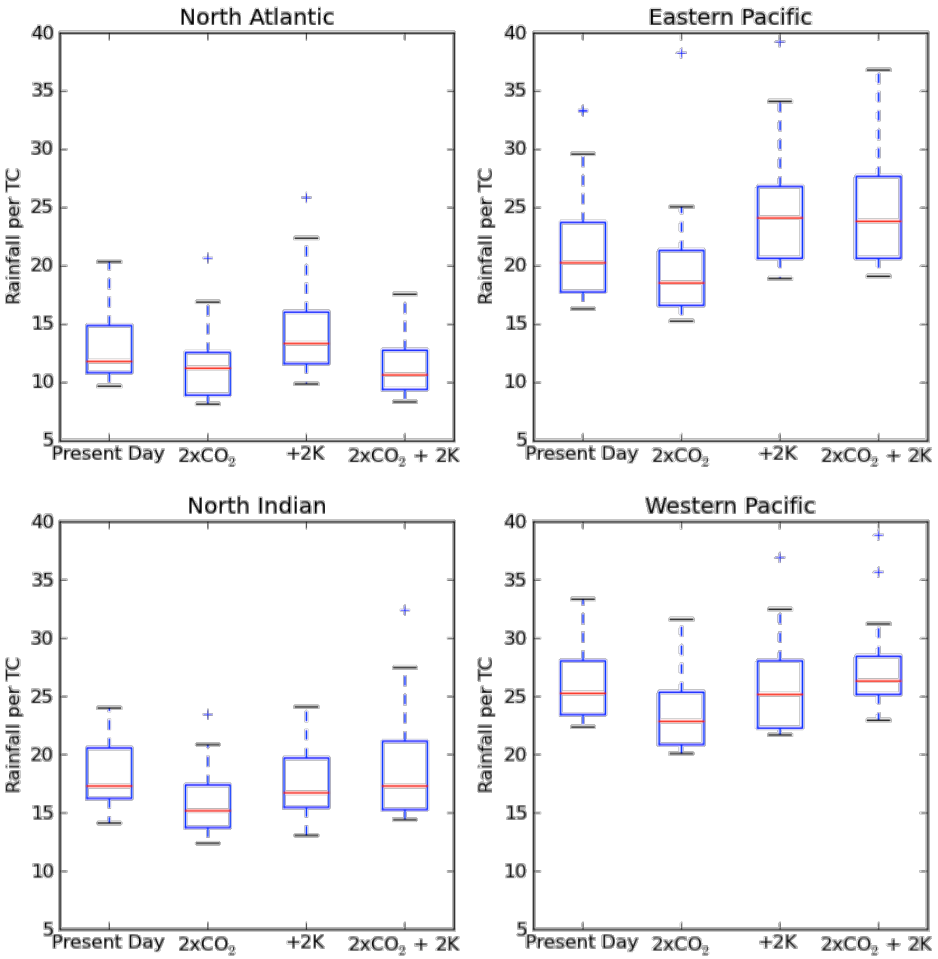


CMCC TC precipitation increase [% wrt CONTROL]

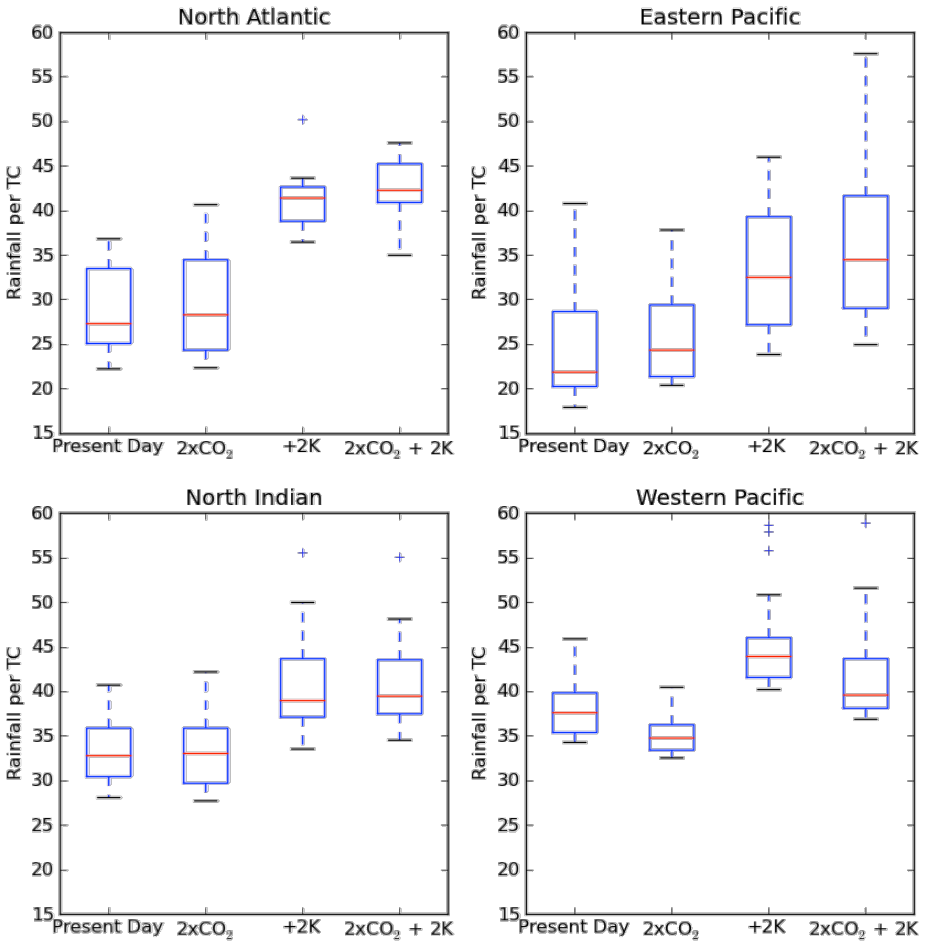


Figures: Enrico Scoccimarro, CMCC, Italy

TC Rainfall: HiRAM & ECHAM5-CMCC



HiRAM



ECHAM5-CMCC

Figures: Gabrielle Villarini, University Iowa

Summary

- 12 modeling centers have finished simulations and contributed data to the WG.
- Lamont serving data to the WG.
- 2 successful workshops
- BAMS paper in preparation
- Journal Climate special issue in place
- Multi-model analysis by various groups in progress.
- Not enough resources for tier 2 experiments.
- Looking for host to WG dataset to open to community