



Evaluating Extreme Events in a High-Resolution Regional Climate Ensemble

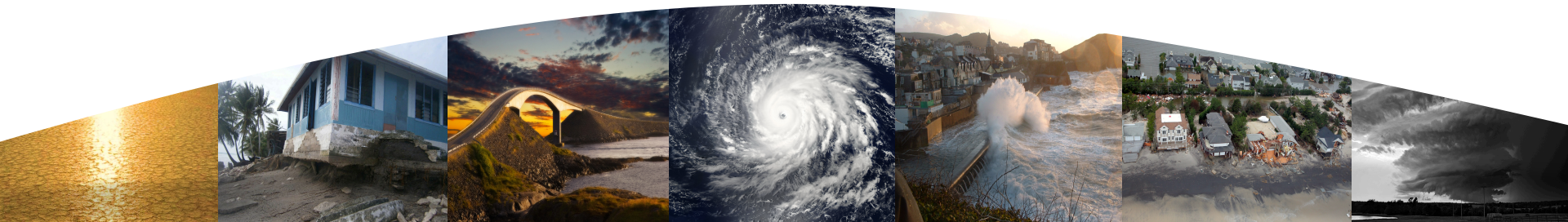
A Tropical Cyclone Perspective

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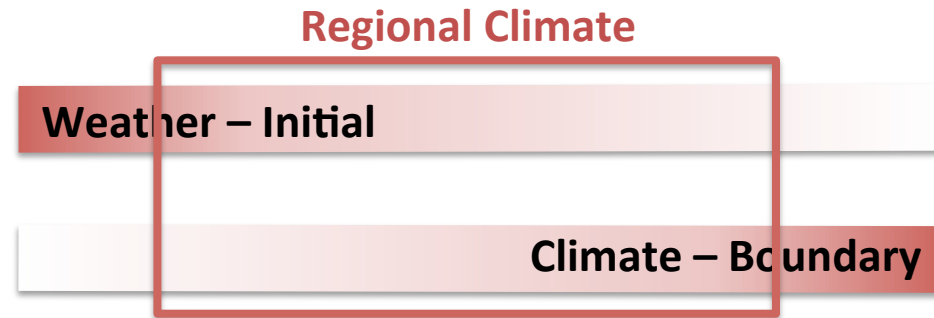
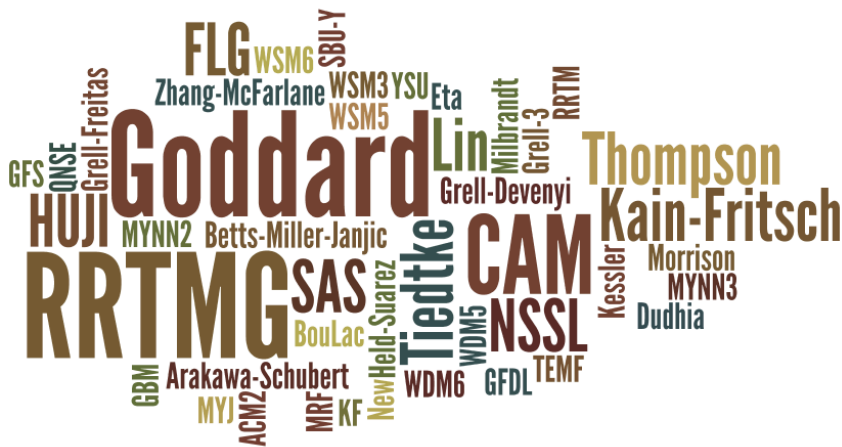
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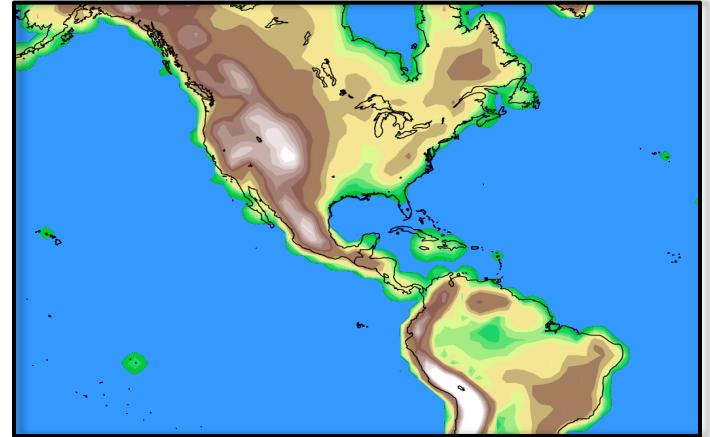
Motivation

- Model results are highly dependent on:
 - Physics parameterization
 - Non-linear interactions between schemes
 - Model resolution
 - Phenomena / Season / Area



Experiment Configuration

- Model Configuration
 - Version 3.5
 - Large domain; 36km resolution
 - ERA-Interim Driving data
 - 24 Physics Ensemble
 - 1990 - 2000
- Metric
 - Use statistical metrics rather than looking at individual events.
 - Temperature
 - Precipitation
 - Tropical Cyclones
 - Large Scale Flow Patterns (SOMS)
Poster: P11 – Evaluation of a Regional Climate Ensemble using Self-Organizing Map, Abby Jaye)



Ensemble Members

Radiation: CAM, RRTMG PBL: MYJ, YSU

Cumulus: KF, NSAS, Tiedtke

Microphysics: WSM6, Thompson

		CAM		RRTMG	
		MYJ	YSU	MYJ	YSU
KF	WSM6	CK6M	CK6Y	RK6M	RK6Y
	Thomp	CKTM	CKTY	RKTM	RKTY
Tiedtke	WSM6	CT6M	CT6Y	RT6M	RT6Y
	Thomp	CTTM	CTTY	RTTM	RTTY
NSAS	WSM6	CN6M	CN6Y	RN6M	RN6Y
	Thomp	CNTM	CNTY	RNTM	RNTY

Precipitation Anomaly - JJA

CAM

RRTMG

MYJ

YSU

MYJ

YSU



WSM6

Thomp

Tiedtke

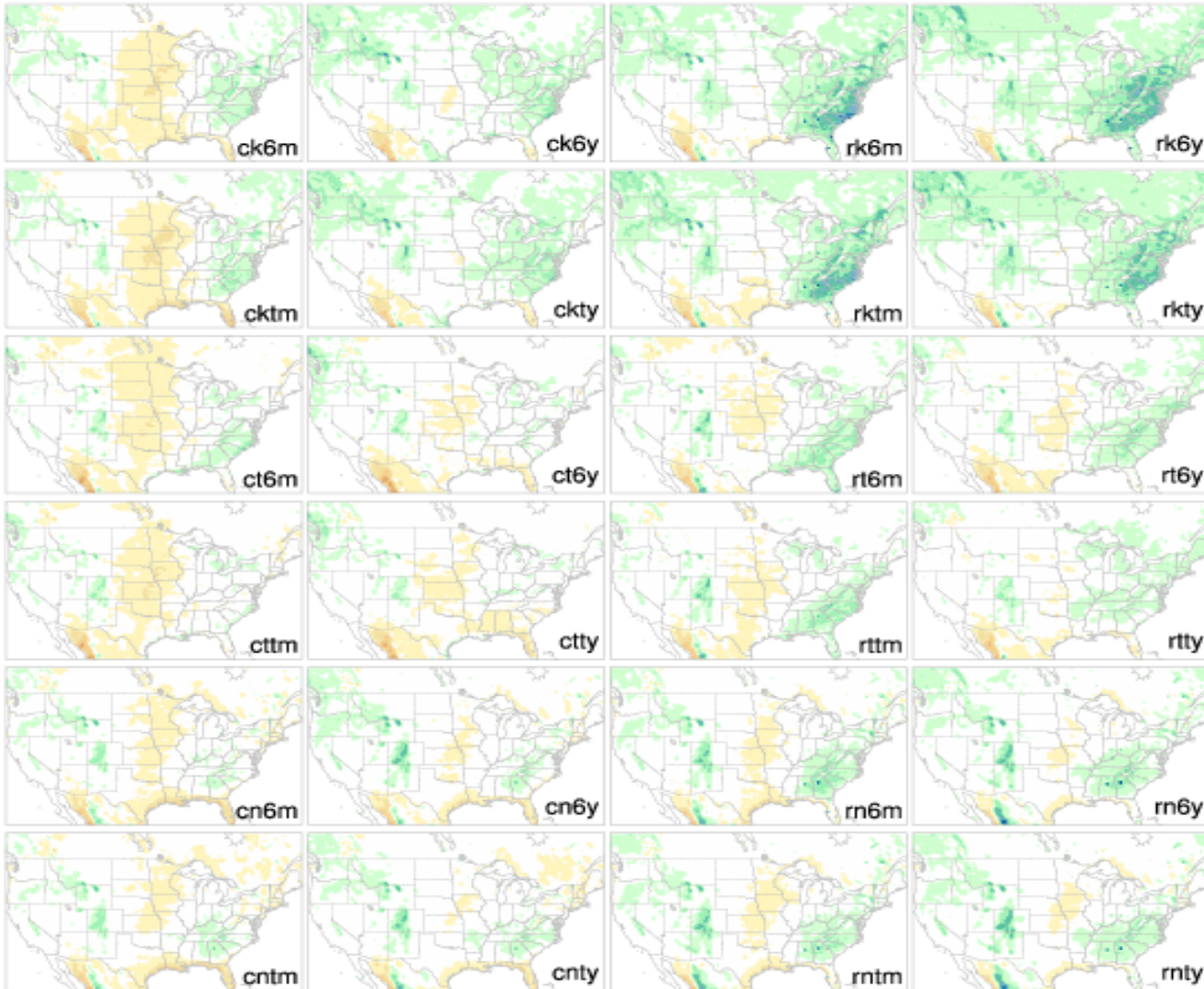
WSM6

Thomp

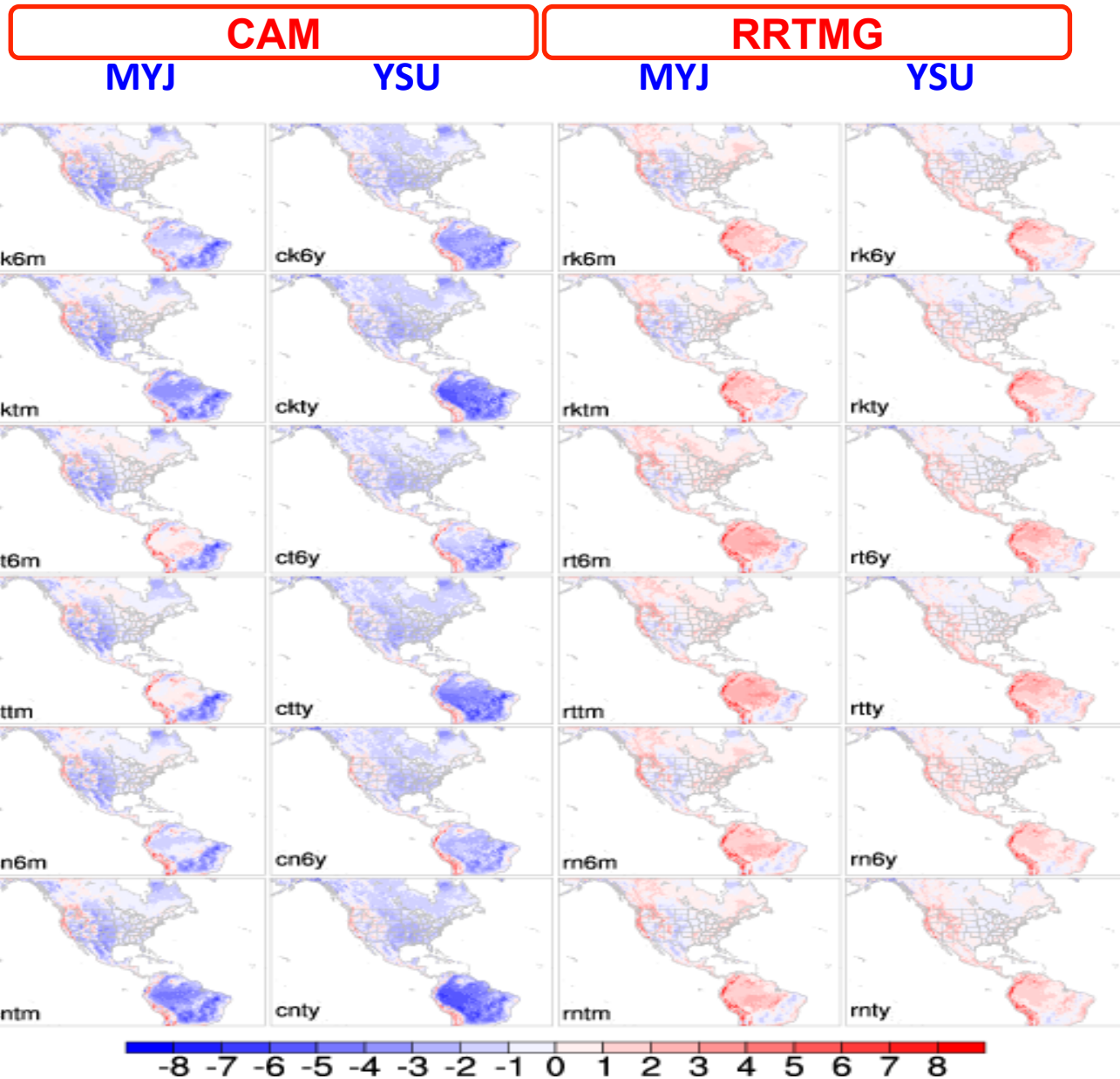
NSAS

WSM6

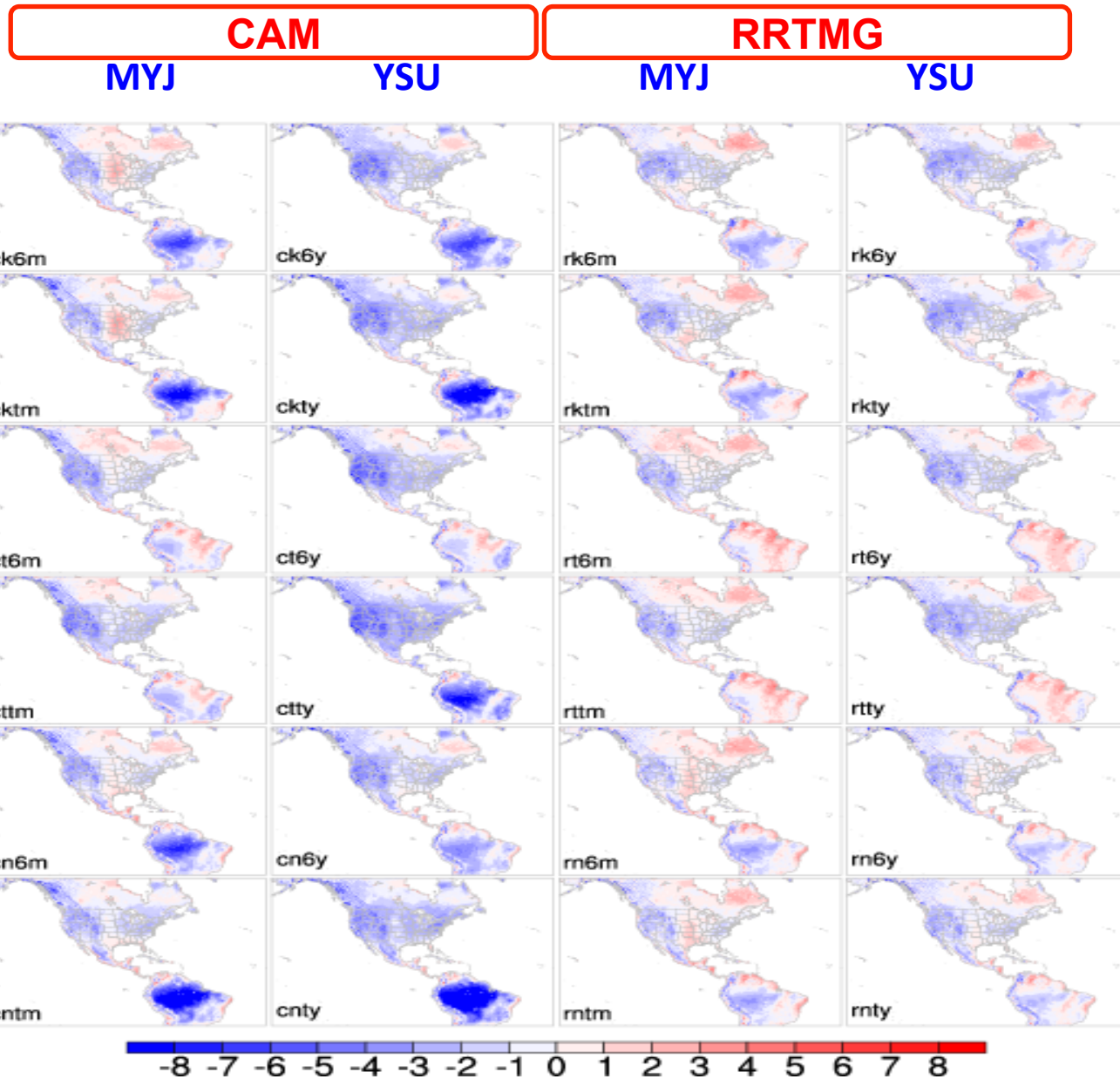
Thomp



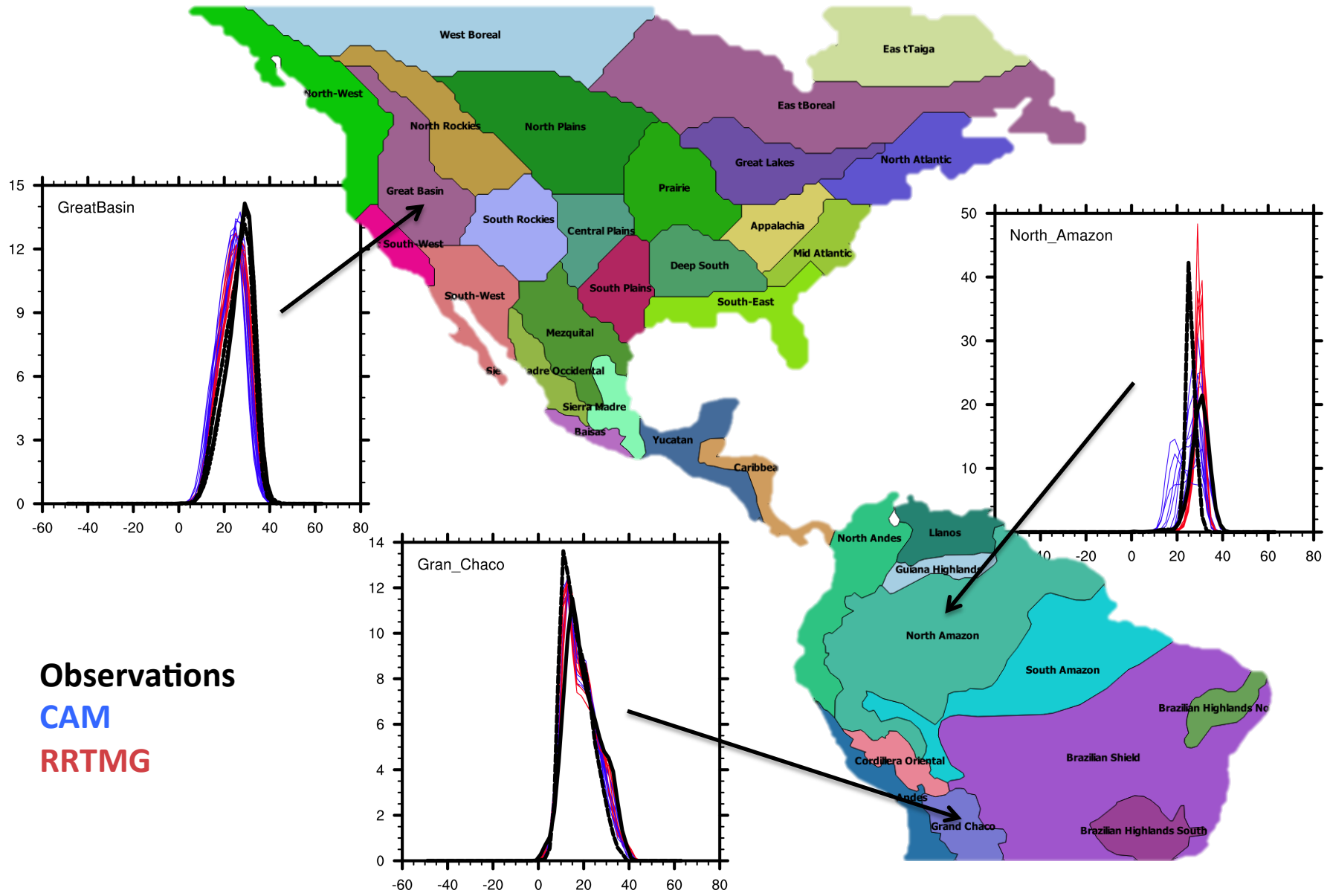
T2MIN Anomaly - JJA



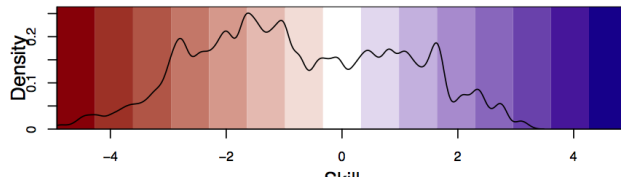
T2MAX Anomaly - JJA



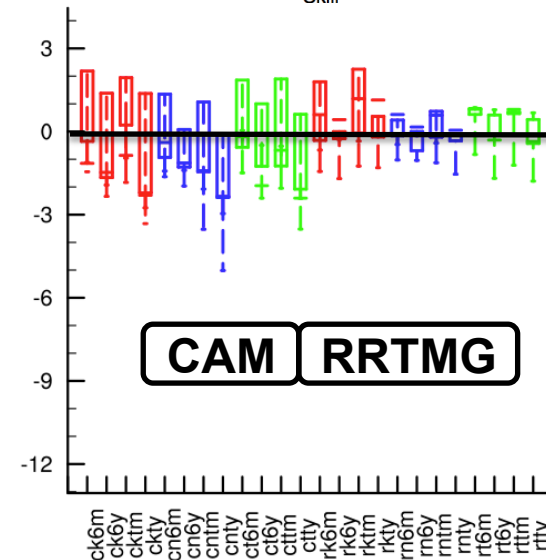
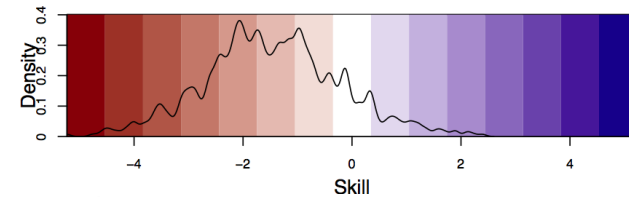
T2MAX over Climate Regions - JJA



T2 Min



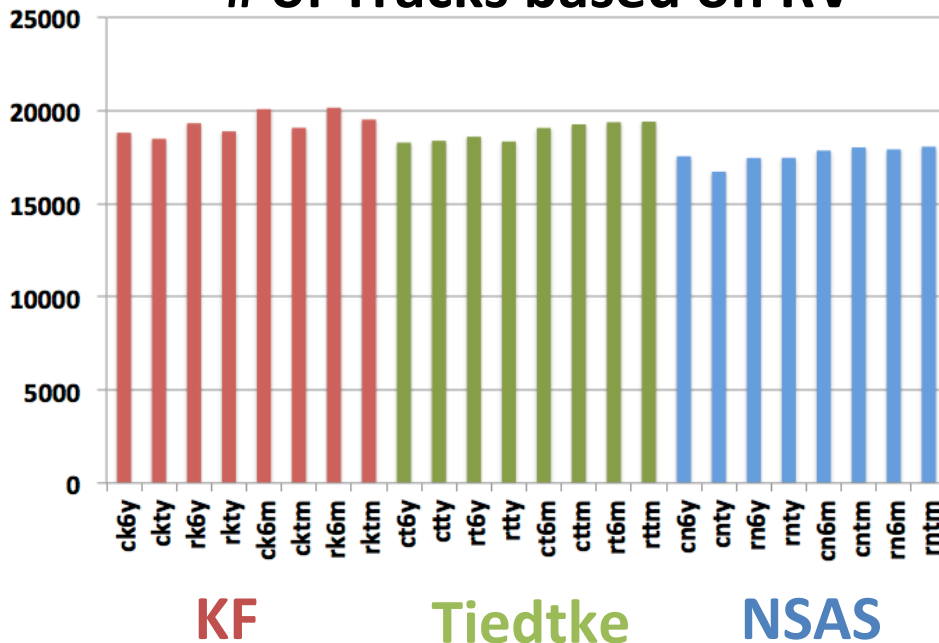
T2 Max



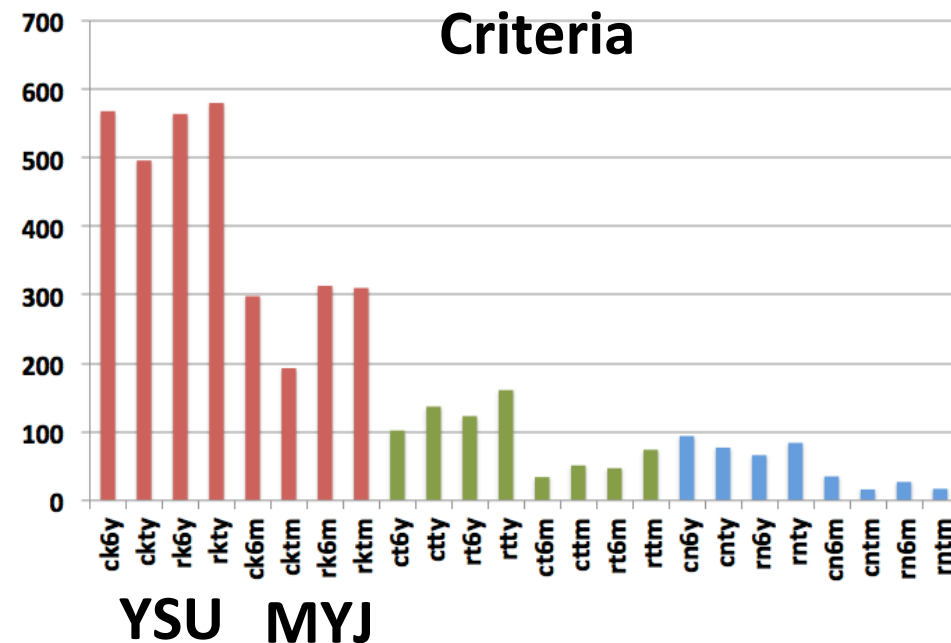
Identifying TCs - Hodges

- Relative Vorticity
- Warm Core and Vertical Structure Criteria
- Wind Speed & Duration Criteria

of Tracks based on RV



of Tracks after applying Criteria



Hurricane Tracks in each Ensemble

CAM

RRTMG

MYJ

YSU

MYJ

YSU

15

ck6m
EP : 12.45 / NA : 14.64

32

ck6y
EP : 22.68 / NA : 31.51

18

rk6m
EP : 15.06 / NA : 18.32

33

rk6y
EP : 21.01 / NA : 33.39

13

ck1m
EP : 9.36 / NA : 13.13

29

ck1y
EP : 17.94 / NA : 29.10

19

rk1m
EP : 13.45 / NA : 19.01

36

rk1y
EP : 19.86 / NA : 35.82

4

ct6m
EP : 3.99 / NA : 4.17

3

ct6y
EP : 6.64 / NA : 3.38

1

rt6m
EP : 3.88 / NA : 1.31

5

rt6y
EP : 6.26 / NA : 5.39

2

ct1m
EP : 4.11 / NA : 1.58

5

ct1y
EP : 8.37 / NA : 4.69

3

rt1m
EP : 4.85 / NA : 3.06

6

rt1y
EP : 9.62 / NA : 5.73

2

cn6m
EP : 2.42 / NA : 2.16

5

cn6y
EP : 4.04 / NA : 4.92

2

rn6m
EP : 1.64 / NA : 1.63

4

rn6y
EP : 2.69 / NA : 3.60

1

cntm
EP : 0.88 / NA : 1.15

5

cnty
EP : 1.90 / NA : 5.29

1

rntm
EP : 0.99 / NA : 1.21

4

rnty
EP : 3.45 / NA : 4.38

WSM6

Thomp

WSM6

Thomp

WSM6

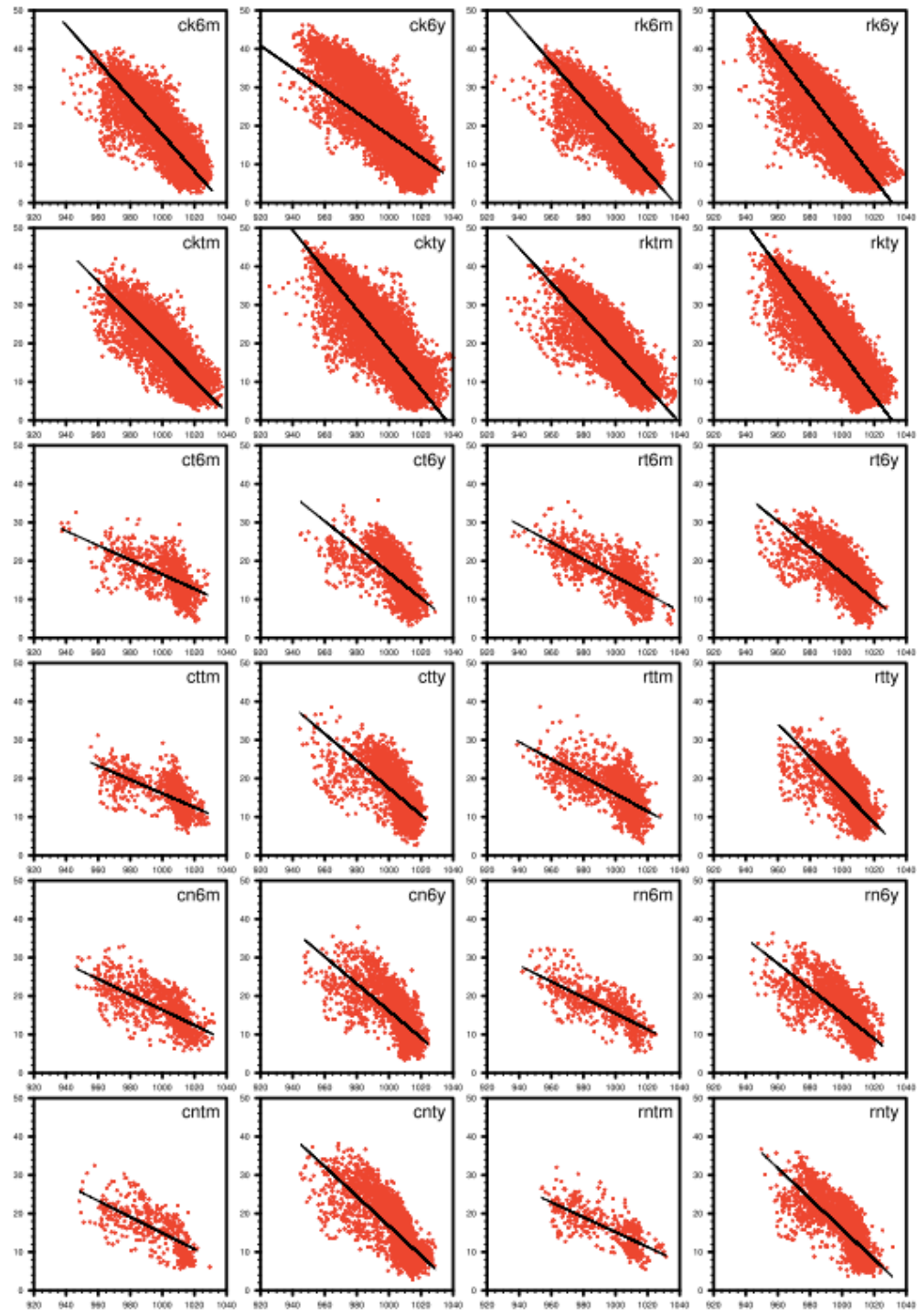
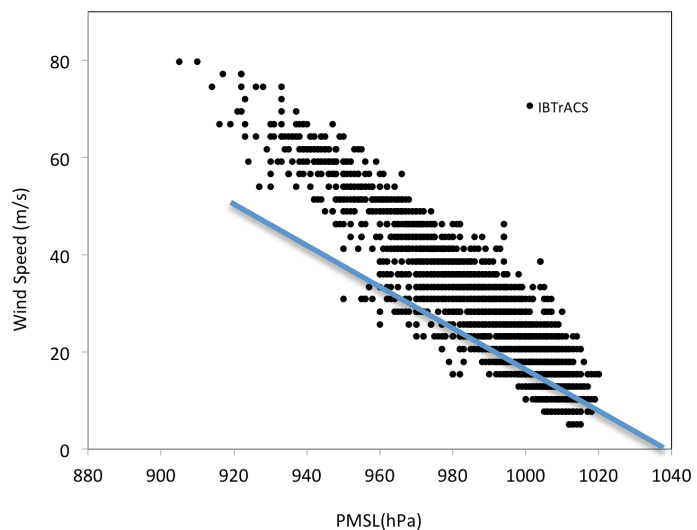
Thomp

KF

Tiedtke

NSAS

Wind-Pressure Plots



Conclusions

- From season to season, and event to event, different model configurations perform “better”
- Over a long time period, the strongest dependencies are:
 - Precipitation –Radiation, PBL and Cumulus
 - Temperature - Radiation, PBL and Cumulus
 - Tropical Storms – Cumulus and PBL
- Physics options impact the results, but the non-linear interactions is even more important.
 - Radiation – RRTMG outperforms CAM
 - At 36km KF outperforms Tiedtke and NSAS, and microphysics are not important
 - Cumulus-PBL combinations specifically are important.