

MME at NCEP

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CDPW#36 TX

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Environmental Modeling Center, NCEP/NWS/NOAA**

Other acknowledgements follow

Acknowledgement National MME

- Probably will miss some people (sorry)
- GFDL: Tony Rosati, Rich Gudgel
- IRI: Dave DeWitt
- Univ of Miami: Ben Kirtman, Duke Min, NCAR
- NASA: Siegfried Schubert, Zhao Li, Max Suarez
- CPO/CTB: Don Anderson/Jin Huang

MME

- MME history
- NMME and IMME
- National MME (why now?, skill, examples Aug/Sept 2011)
- International MME (one slide), with Eurosip
- Why hindcasts?, how many years
- Threats to MME in real time

History

- MME has subjectively always appealed to the human forecaster. 2nd opinion.
- ‘Consensus’ (Sanders, MIT)
- CPC practice for 6-10, NAEFS
- A more formal approach has been elusive because 1) hindcasts are required (how many hindcasts?), 2) methods of consolidation, 3) it has to be worth the trouble, 4) almost unsurmountable co-linearity
- MME based on perturbed NCEP models???

NMME for seasonal prediction

- The idea (or external push on NCEP) has been around for years, ever since Demeter, CTB ..
- Has been difficult among other things because the working idea was that NCEP would have to run hindcasts and/or realtime forecasts of other institution's model.
- NOW these institutions will do this themselves and simply supply us with the hindcasts and real-time forecasts, playing by our rules.
- Keep in mind: coupled models only.

Hindcast Situation

	startmonths available NOW	Period	Members
CFSv1	12	1981-2009	15
CFSv2	12	1982-2009	24(28)
GFDL-CM2.1	>6	1982-2010	10
IRI-Echam4-f	12	1982-2010	12
IRI-Echam4-a	12	1982-2010	12
CCSM3.0	>4	1982-2010	6
NASA	>2	1981-2010	6/8***

Hindcast Situation

	Arrangement of Members	Leads
CFSv1	1st 0Z +/-2days, 21st0Z+/-2d, 11th0Z+/-2d	0-9 months
CFSv2	4 members (0,6,12,18Z) every 5th day	0-9
GFDL-CM2.1	All 1st of the month 0Z	0-11
IRI-Echam4-f	All 1st of the month**	0-7
IRI-Echam4-a	All 1st of the month**	0-7
CCSM3.0	All 1st of the month**	0-11
NASA	1 member every 5th day as CFSv2	0-9

Atmosphere

Ocean

Reference

T62L64	MOM3L40 0.30 deg Eq	Saha et al(2006)	CFSv1
T126L64	MOM4 L40 0.25 deg Eq	Saha et al 2010	CFSv2
2X2.5deg L24	MOM4 L50 0.30 deg Eq	Delworth et al 2006	GFDL-CM2.1
T42L19	MOM3 L25 0.5 deg Eq	DeWitt MWR(2005)	IRI-Echam4-f
T42L19	MOM3 L25 0.5 deg Eq	"	IRI-Echam4-a
T85L26	POP L40 0.3 deg Eq	Kirtman and Min (2009)	CCSM3.0
1X1.25deg L72	MOM4 L40 0.25 deg at Eq	Rienecker et al (2008)	NASA

** The CCSM and IRI has an arbitrarily selected (from an AMIP run) state for atmosphere and soil - the initialization date only applies to the ocean which may use some data in the future (where possible).

Notes: 1) All forecast data sets are given to NCEP at **1X1 (360X181)** degree and gribbed at NCEP

Notes: 2) Only **monthly mean** data of **tmp2m, prate** and **sst** is requested at this point

Notes: 3) Obs data set 1 (monthly mean) at 1X1 based on GHCN_CAMS (monthly tmp2m, Fan+Van den Dool 2008 0.5X0.5 degree 1948-last month)

Notes: 4) Obs data set 2 (monthly mean) at 1X1 based on CPC_Unified (land-only daily raingauge, Xie 2010 0.5X0.5 degree 1979-recent)

Notes: 5) Obs data set 3 (monthly mean) at 1X1 based on CMAP (global 5 day mean precip, Xie and Arkin 1997, 2.5X2.5 degree 1979-recent)

Notes: 6) Obs data set 4 (monthly mean) at 1X1 based on SST OI (daily SST, Reynolds et al (2007), 0.25X0.25 degree, sept 1981-recent)

Final comment hindcasts

- IRI will be distribution center for the three variables on 1X1 grid, format=grib. Seven models, 30 years of hindcast. First batch of three starting months (Aug-Sep-Oct) will be shipped to IRI in late October.

Real Time:

Real time integrations are collected from the respective ftp sites at 5pm COB 8th of the month.

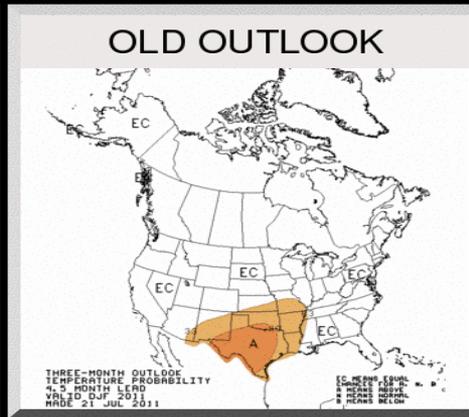
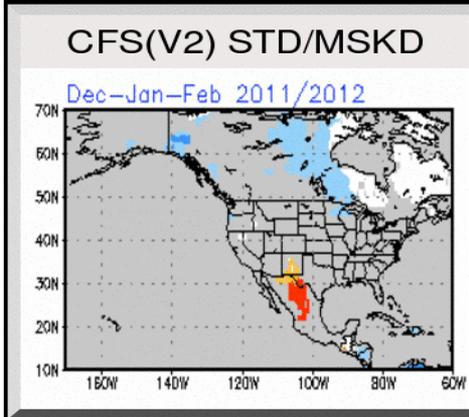
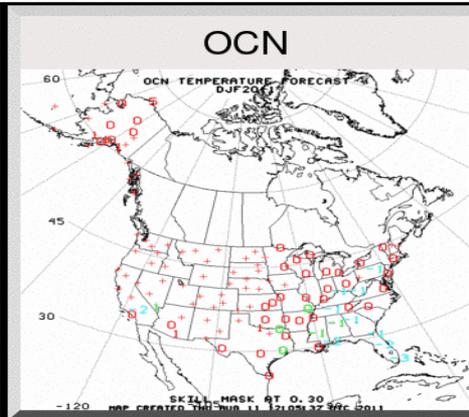
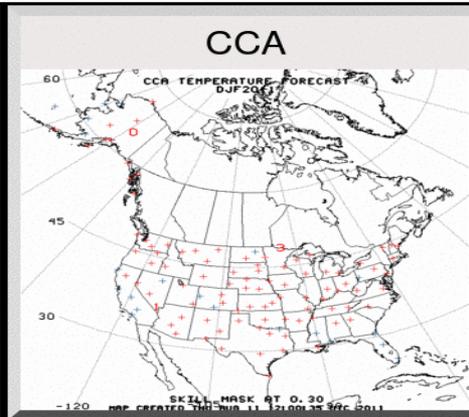
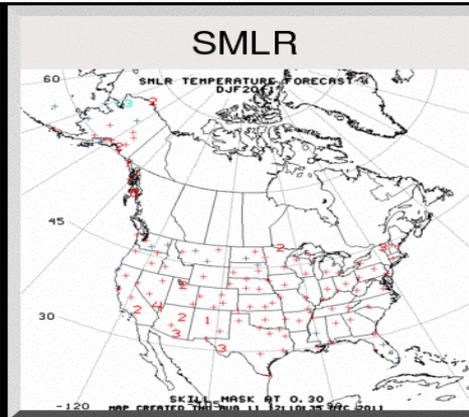
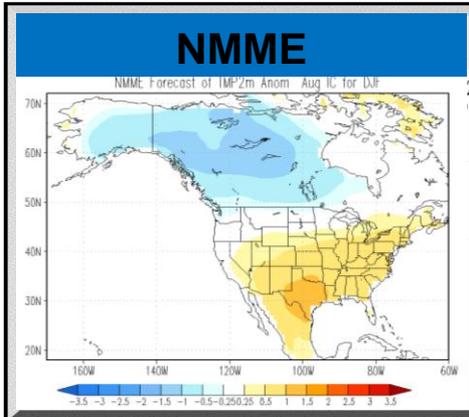
Desire: Robust scripts that can handle any number of models and members

Real Time Forecast Situation Aug 2011 forward

	Mem bers	Arrangement of Members	Leads
CFSv1	28	X most recent days (4 per day)	0-9 months
CFSv2	40	Y most recent days (4 per day)	0-9
GFDL	10	All 1st of the month 0Z	0-11
IRI-f	12	All 1st of the month**	0-7
IRI-a	12	All 1st of the month**	0-7
CCSM 3.0	6	All 1st of the month**	0-11
NASA	6***	1 membr evry 5th day as CFSv2 hindcst	0-9

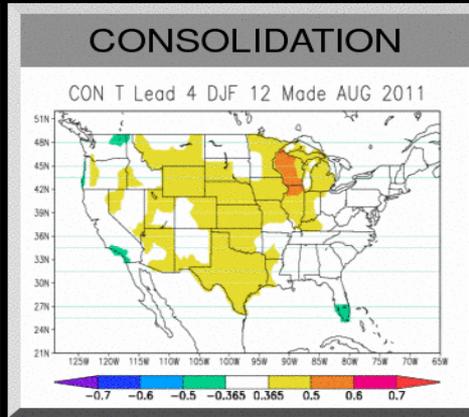
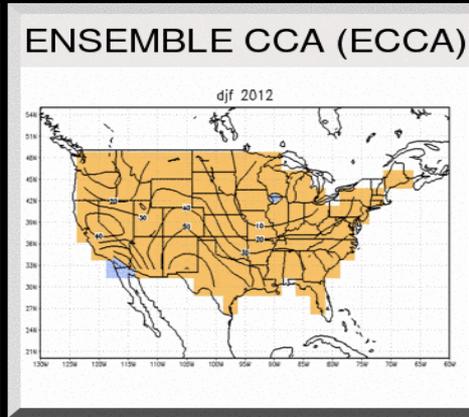
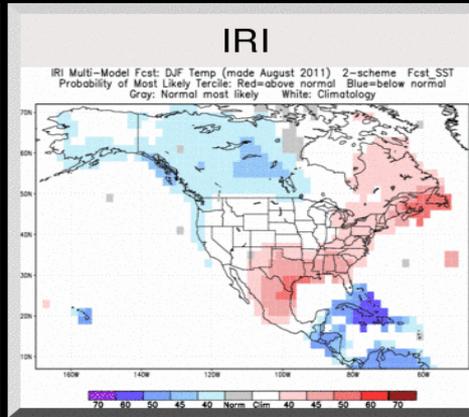
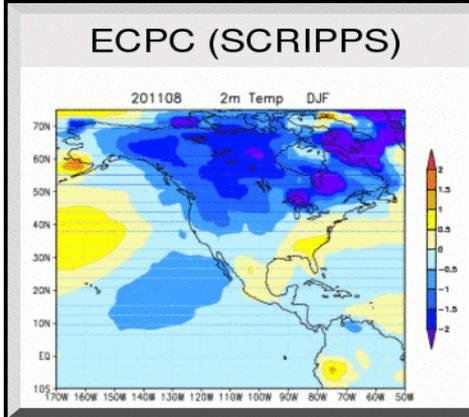
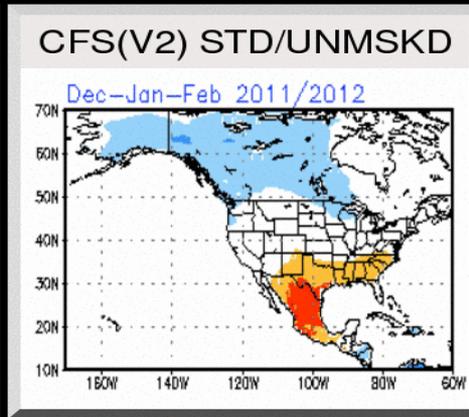
*** plan to increase to 10 with 4 additional breeding perturbations

DJF Season [Temperature]



**** NEW OUTLOOK ****

IMAGE NOT AVAILABLE



Evaluation of NMME Forecast Skills

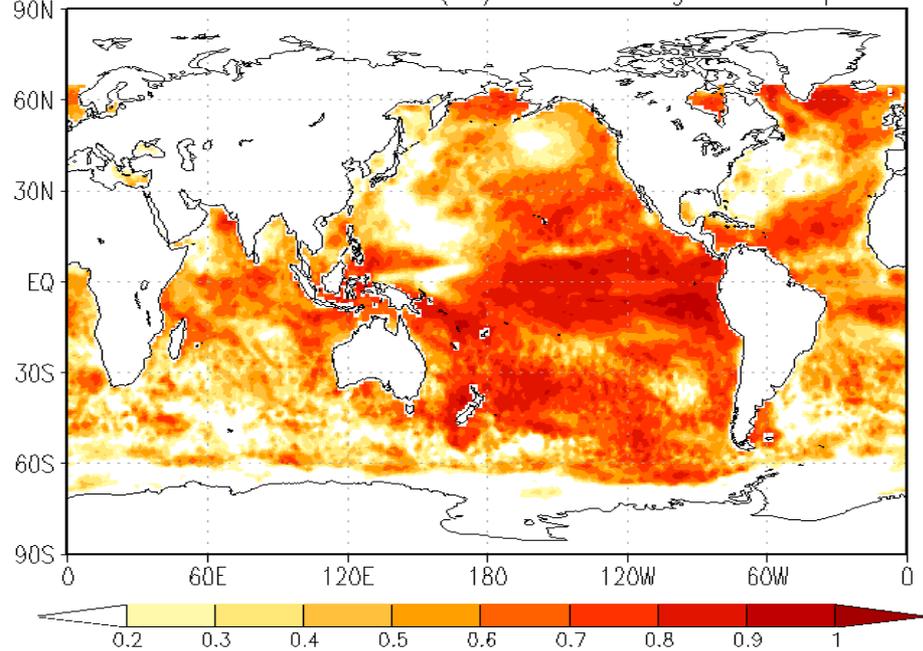
- Initial Conditions: August
- Equal weight for ens mean of six models: (Note ambiguity)
- Only AC

Sea Surface Temperature

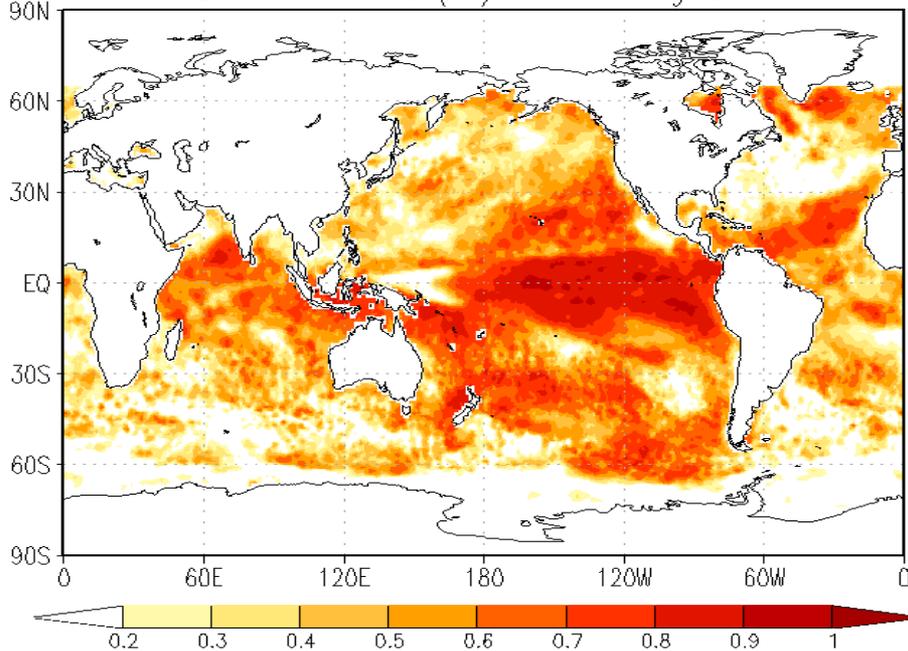
Verification observation

- SST OISST-QD
- 1982-2009

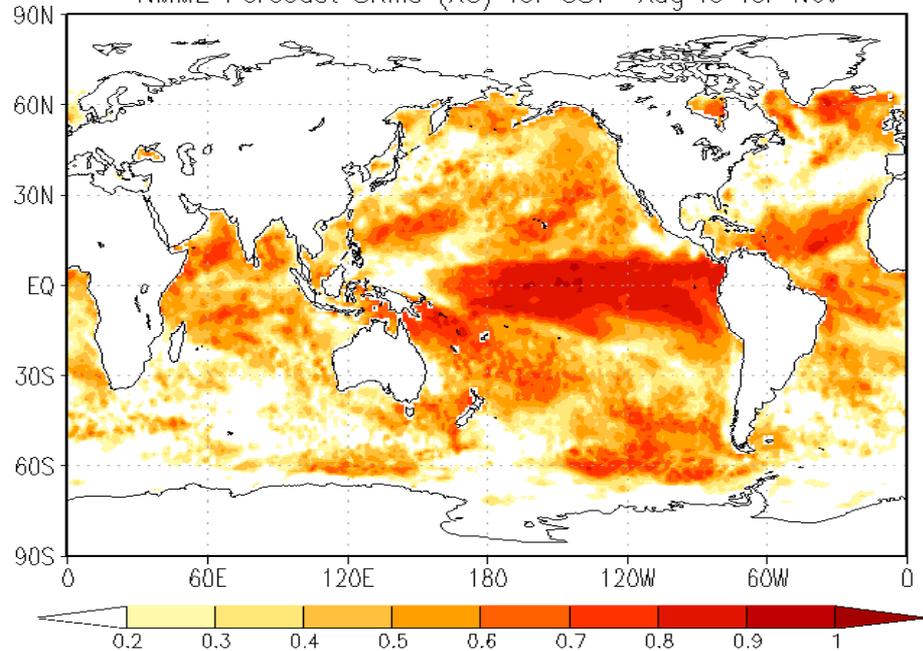
NMME Forecast Skills (AC) for SST Aug IC for Sep



NMME Forecast Skills (AC) for SST Aug IC for Oct



NMME Forecast Skills (AC) for SST Aug IC for Nov

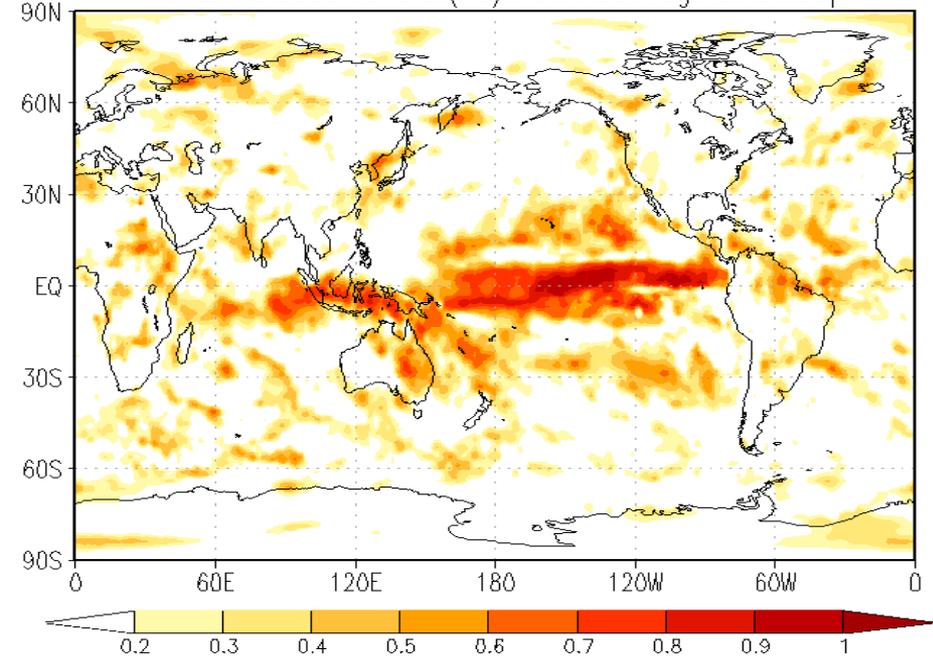


Precipitation global

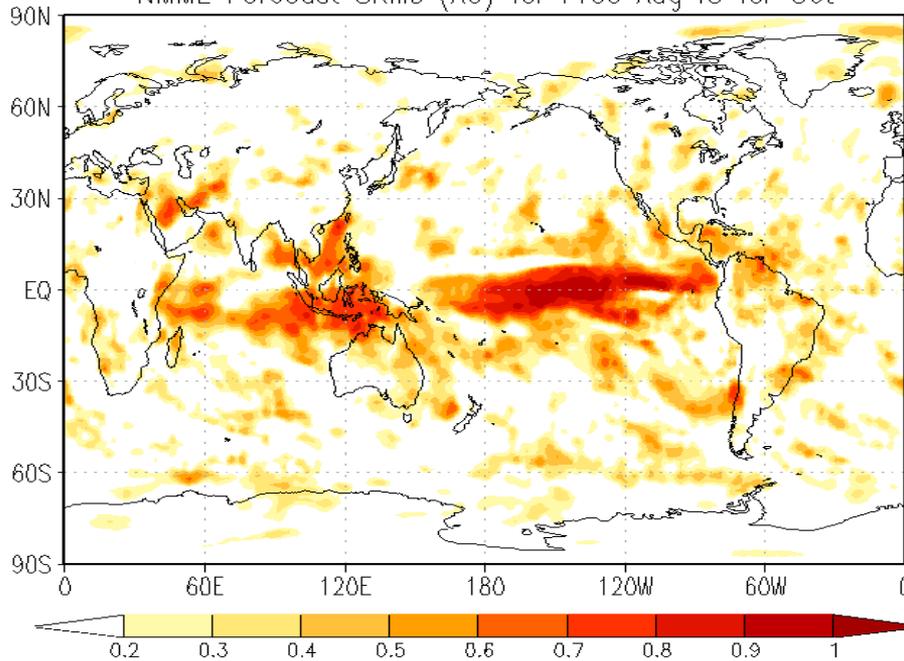
Verification observation:

- CMAP
- 1982-2009

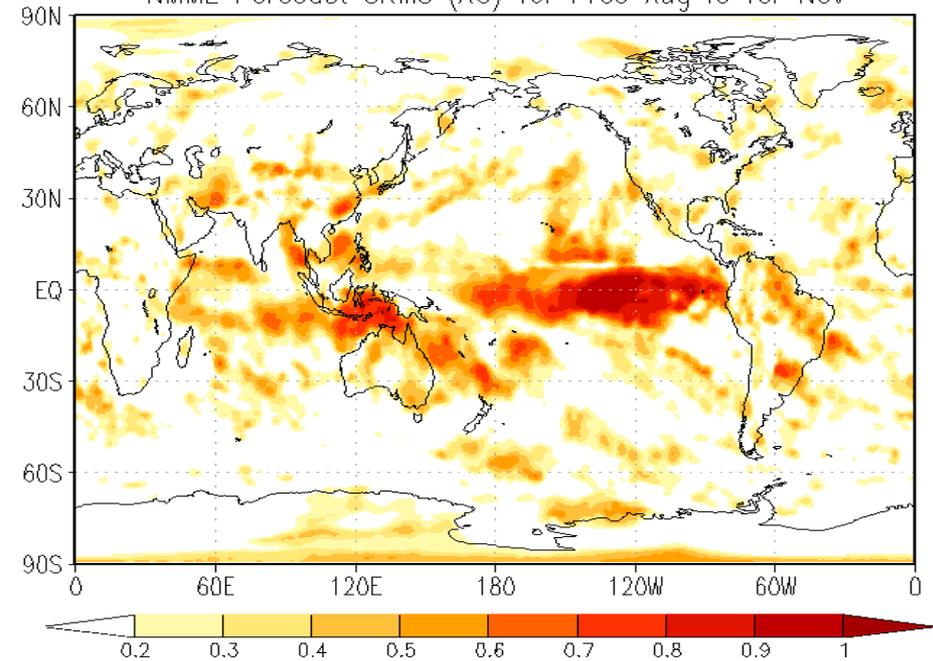
NMME Forecast Skills (AC) for Prec Aug IC for Sep



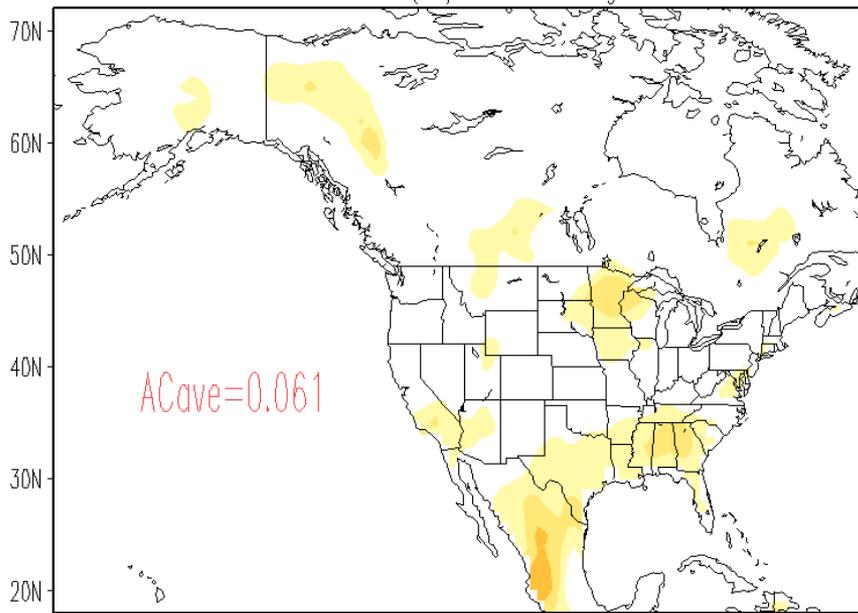
NMME Forecast Skills (AC) for Prec Aug IC for Oct



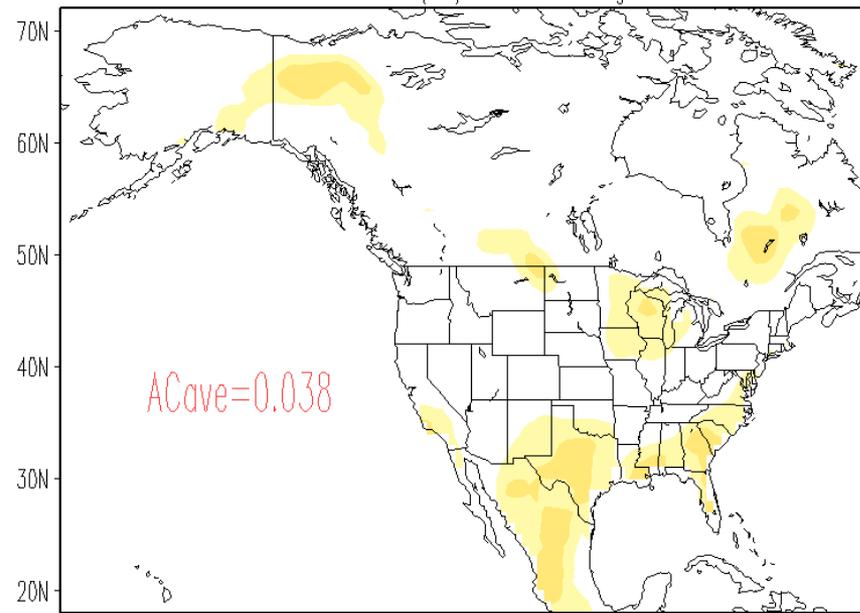
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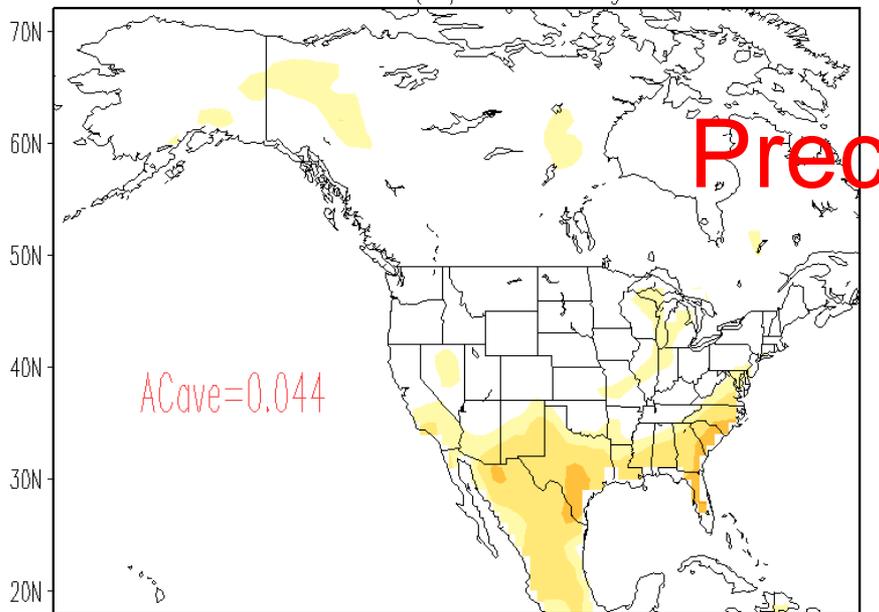
NMME Forecast Skills (AC) for Prec Aug IC for OND



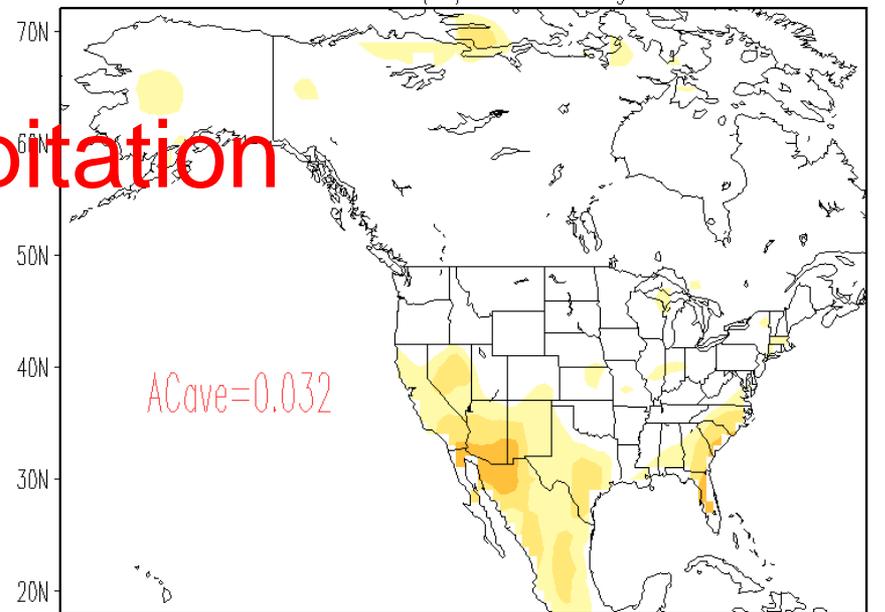
NMME Forecast Skills (AC) for Prec Aug IC for NDJ



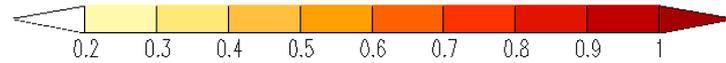
NMME Forecast Skills (AC) for Prec Aug IC for DJF



NMME Forecast Skills (AC) for Prec Aug IC for JFM



Precipitation

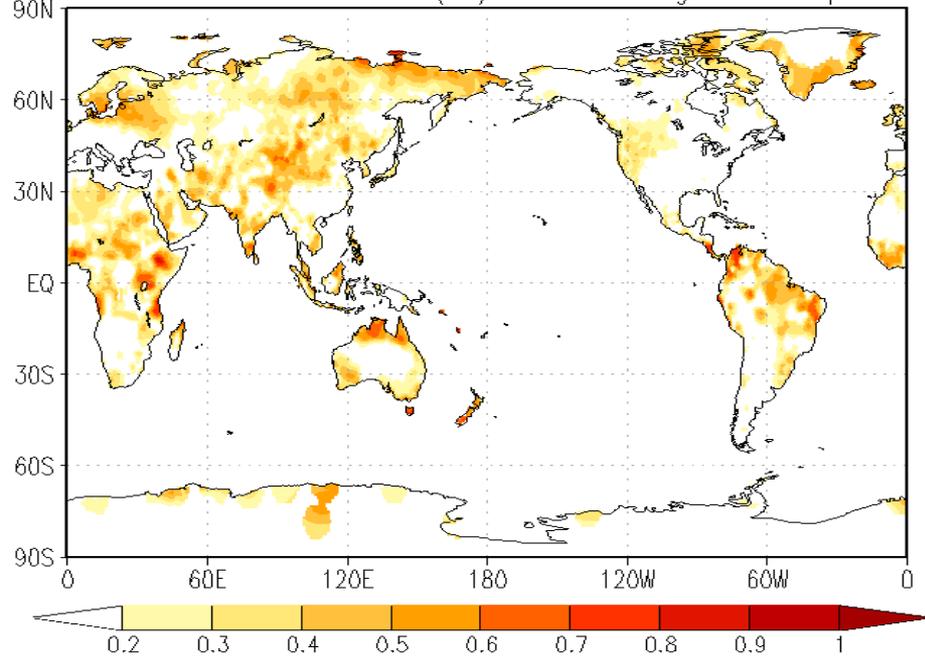


Temperature at 2 Meter Global

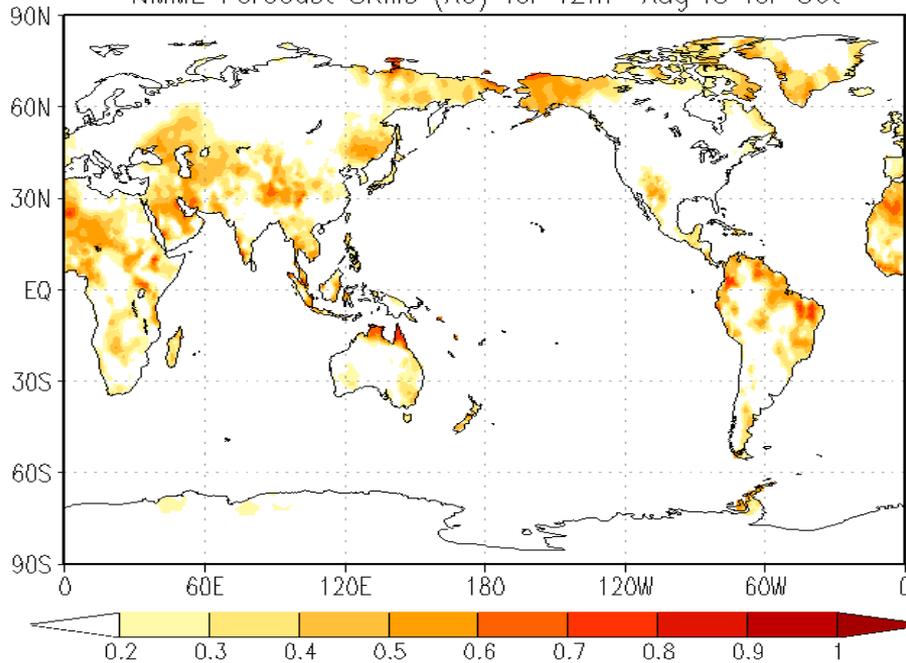
Verification observation

- GHCN_CAMS
- 1982-2009

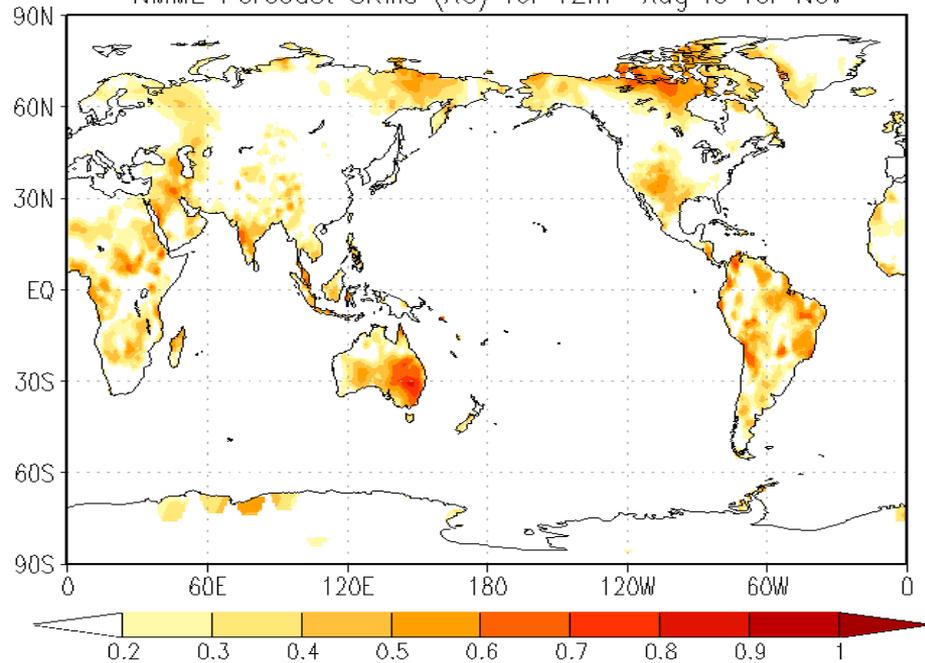
NMME Forecast Skills (AC) for T2m Aug IC for Sep



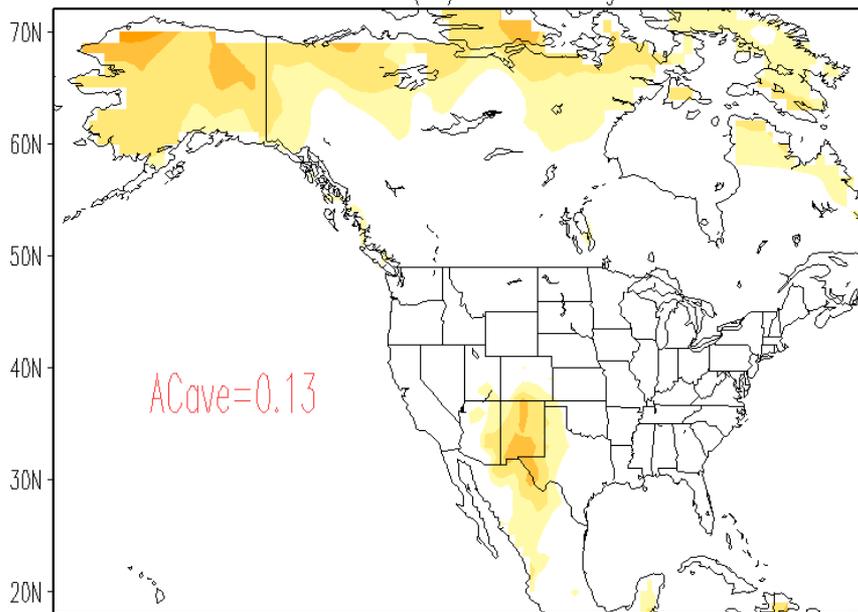
NMME Forecast Skills (AC) for T2m Aug IC for Oct



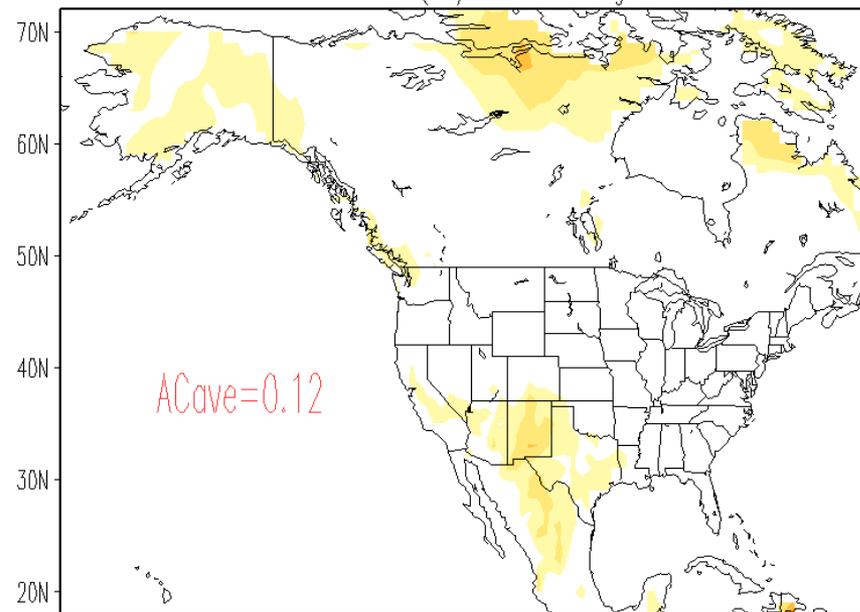
NMME Forecast Skills (AC) for T2m Aug IC for Nov



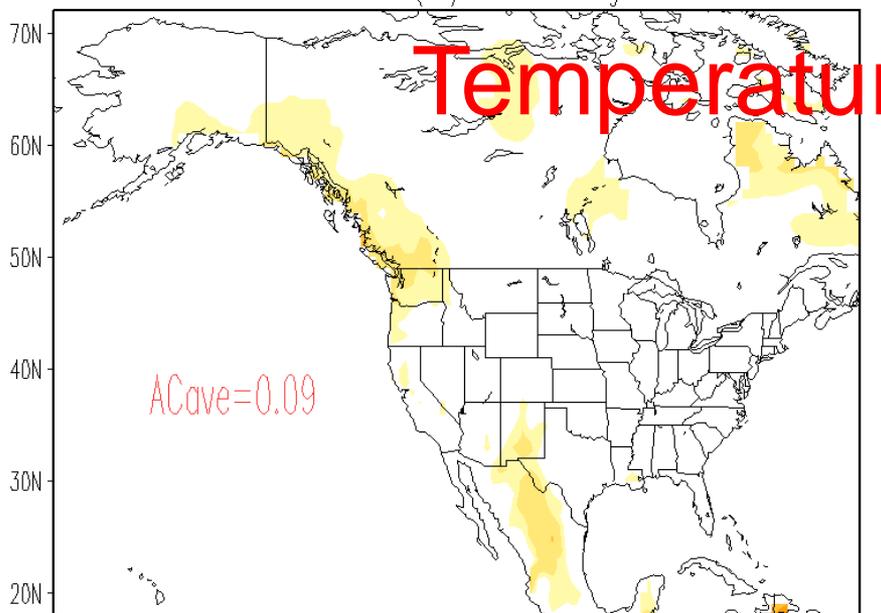
NMME Forecast Skills (AC) for T2m Aug IC for OND



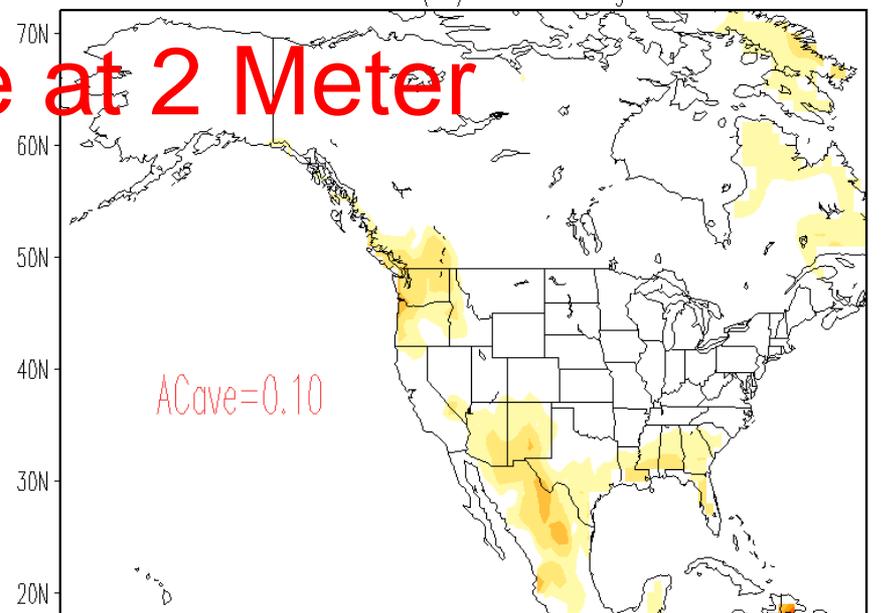
NMME Forecast Skills (AC) for T2m Aug IC for NDJ



NMME Forecast Skills (AC) for T2m Aug IC for DJF



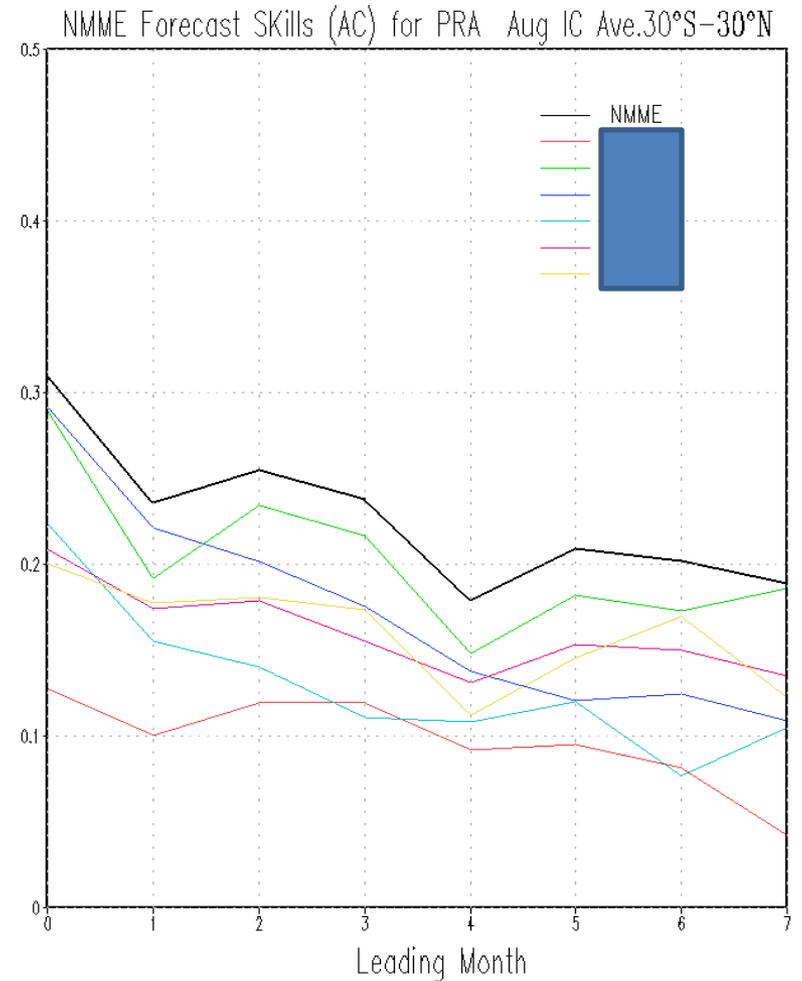
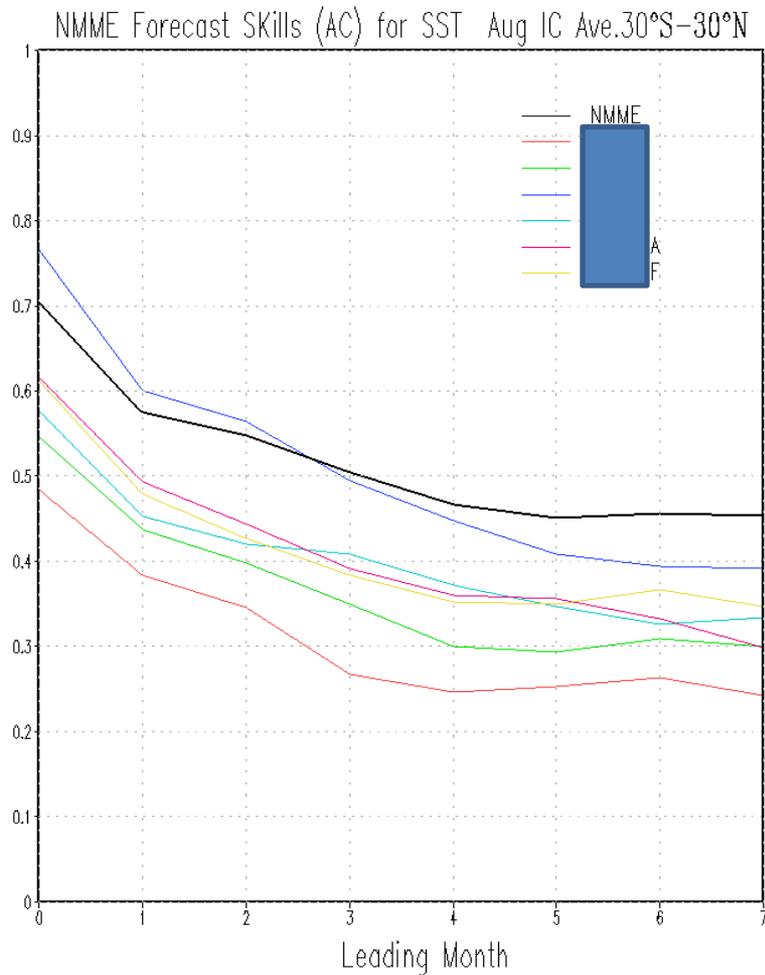
NMME Forecast Skills (AC) for T2m Aug IC for JFM



Temperature at 2 Meter

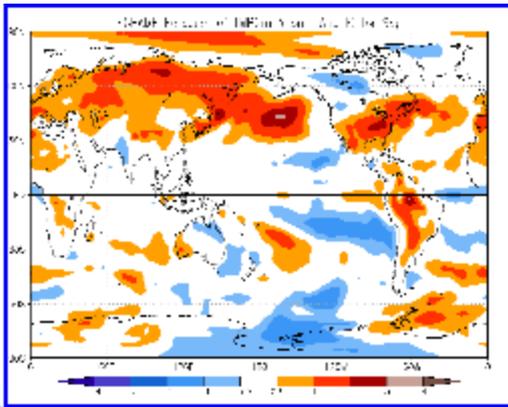


NMME Forecast Skills and RMS of SST (Ave. 30S-30N)

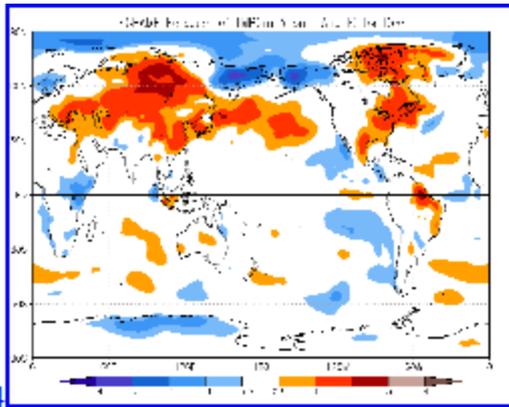


Website for display (pardon the progress)

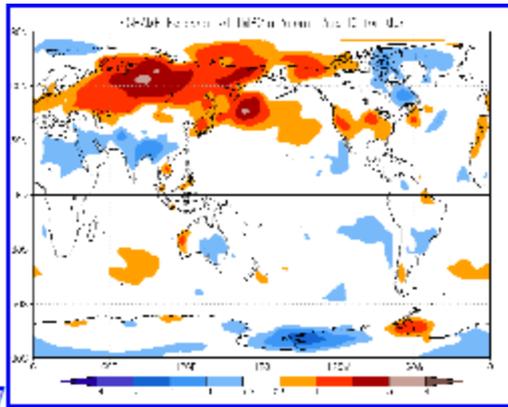
- <http://origin.cpc.ncep.noaa.gov/products/people/wd51yf/NMME/>



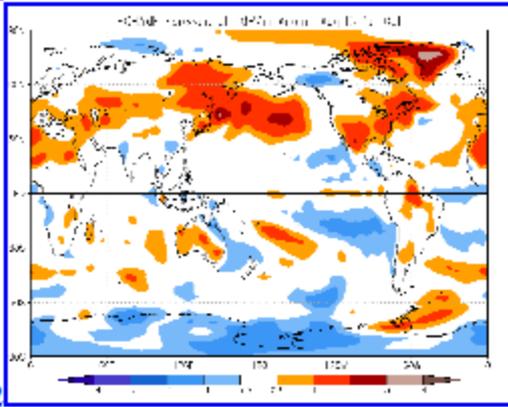
Lead 1



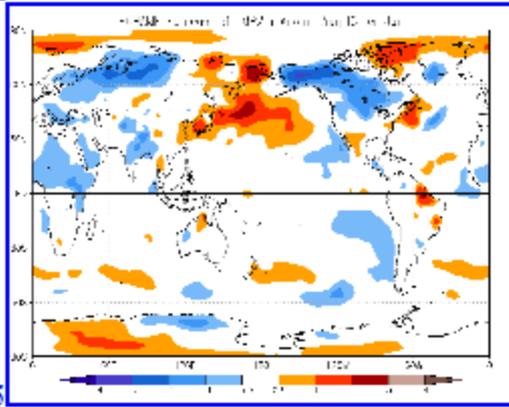
Lead 4



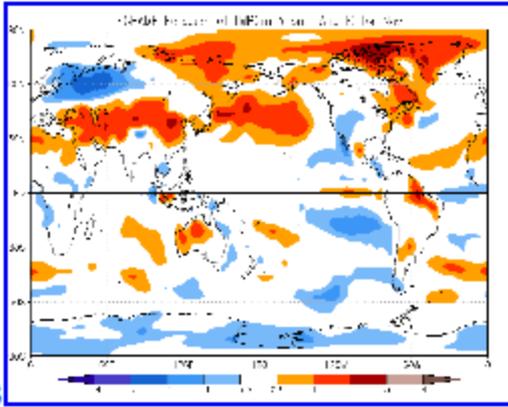
Lead 7



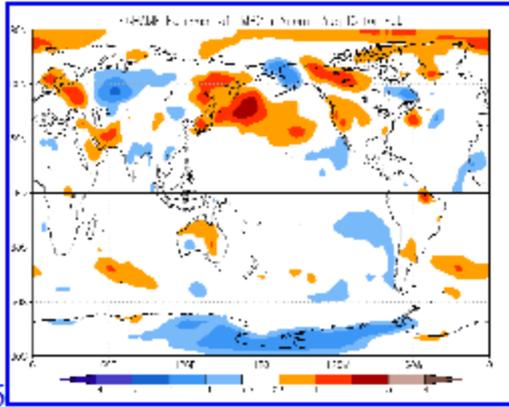
Lead 2



Lead 5



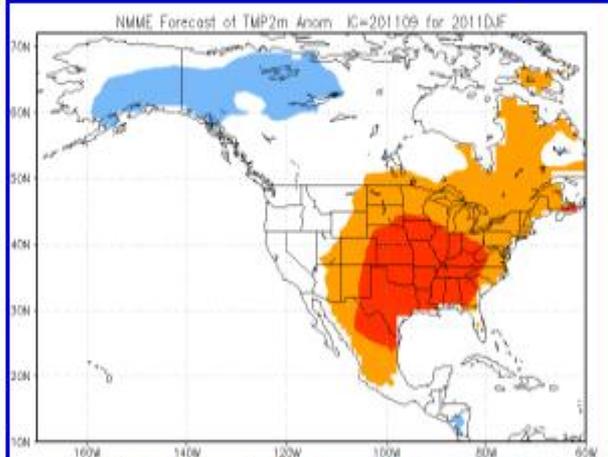
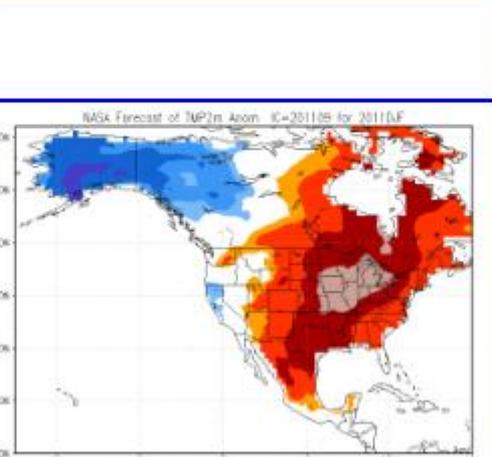
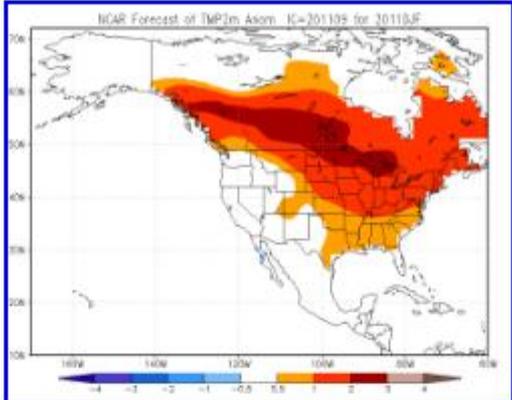
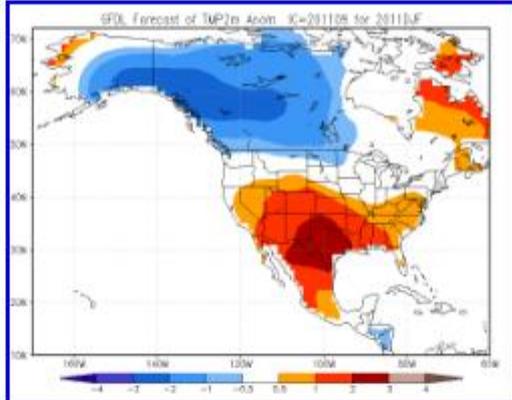
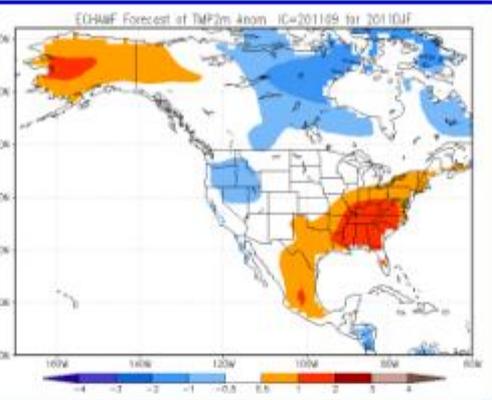
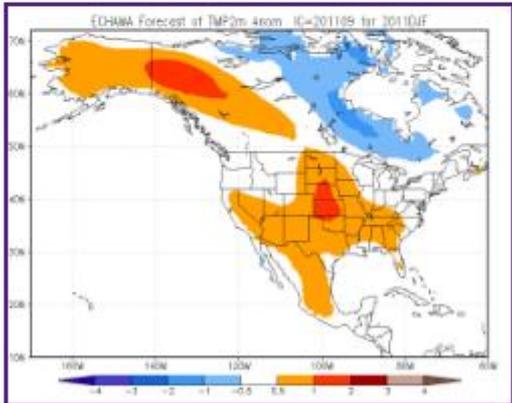
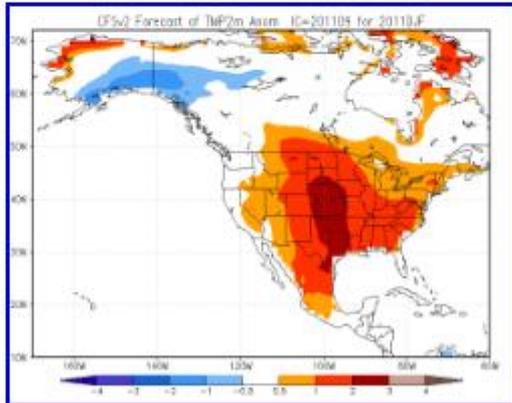
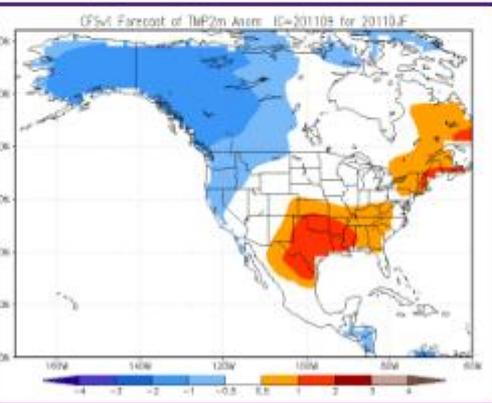
Lead 3



Lead 6

One model
all leads.

Season 3 tmp2m forecast



Fixed lead all models

TEMPERATURE:

Model #	Lead	Years	Members	Dallas	Dallas	Dallas	Dallas	Dallas
				Forthworth	Forthworth	Forthworth	Forthworth	Forthworth
				T-ave	sd-T	B	N	A
1	6	28	15	281.6	2.47	31.67	35.48	32.86
2	6	28	24	274.6	4	33.48	30.65	35.86
3	6	29	6	281.4	2.71	29.31	40.8	29.89
4	6	29	6	280.1	3.15	31.03	29.89	39.08
5	6	29	10	278	2.66	34.14	31.03	34.83
6	6	29	12	282.1	2.51	30.17	35.34	34.48
7	6	29	12	282.4	2.53	29.6	35.92	34.48

= March

Model#	T-Forecast		for			Mar-2011		Dallas Fortworth	
	B	N	A	B	N	A			
3	0	2	4	0	33.3	66.7			
4	1	2	3	16.7	33.3	50			
5	1	3	6	10	30	60			
6	2	1	9	16.7	8.3	75			
7	1	3	8	8.3	25	66.7			
NMME	5	11	30	10.6	23.4	76			

Observed was A in March 2011

PRECIPITATION:

Model #	Lead	Years	Members	P-ave	Dallas	Dallas	B	N	A
					Forthwort	Forthwort			
					h	h			
1	6	28	15	2.27	1.12	36.67	34.52	28.81	
2	6	28	24	2.6	1.22	36.31	34.38	29.32	
3	6	29	6	1.95	1.06	37.93	35.06	27.01	
4	6	29	6	3.28	1.3	33.91	37.93	28.16	
5	6	29	10	2.33	1.15	36.21	32.76	31.03	
6	6	29	12	2.44	0.95	36.78	31.61	31.61	
7	6	29	12	2.92	1.26	37.07	36.49	26.44	

March

Model#	P-Forecast	for	Mar-11	Dallas Forthworth		
	B	N	A	B	N	A
3	3	2	1	50	33.3	16.7
4	5	1	0	83.3	16.7	0
5	9	1	0	90	10	0
6	6	5	1	50	41.7	8.3
7	6	5	1	50	41.7	8.3
NMME	30	14	3	63.8	29.8	6.4

Observed was B in March 2011

IMME= CFS+ EUROSIP MODELS

	NCEP/CFSv1	NCEP/CFSv2	ECMWF	UKMET	METF
Atmospheric Model	T62L64	T126L64	Syst 3: T159L62	Glosea4 (120km) L85	T42L91 (T63-linear grid)
Ocean Model	MOM3 L40 0.3 deg Eq, 1deg 65N-75S	MOM4 L40 0.25 deg Eq, 0.5 deg global	HOPE L29 0.3 deg Eq 1 deg global	NEMO L75 0.3 deg Eq 1 deg global	ORCA 0.5 deg Eq 2 deg global
Atmosphere/Ocean Coupling Frequency	24 hours	30 minutes	NA*	NA*	NA*
Land Model	OSU 2-layer	NOAH 4-layer	NA*	NA*	NA*
Sea Ice Model	Climatological Seaice	3-layer interactive Seaice model	NA*	NA*	NA*
Period of Hindcasts	1981-2009 (29 years)	1982-2010 (29 years)	1981-2009 (29 years)	1989-2002 (14 years)	1981-2009 (29 years)
Number of hindcast members	15	24(28)	11	12	11
Number of Leads	0-9 months	0-9 months	0-7 months	0-6 months	0-6 months

NA* : Not Available, but information requested

Acknowledgement IMME

- Tim Stockdale ECMWF (many others thru him)
- No funding

Purpose of hindcasts:

	activity	Data requirements	Comment
1	Correct the mean	15-20 (30) years	WMO says 30
2			
3			
4			
5			

Purpose of hindcast:

	activity	Data requirements	Comment
1	Correct the mean	15-20 (30) years	WMO says 30
2	Correction pdf	45	WMO says 45
3			
4			
5			

Purpose of hindcast:

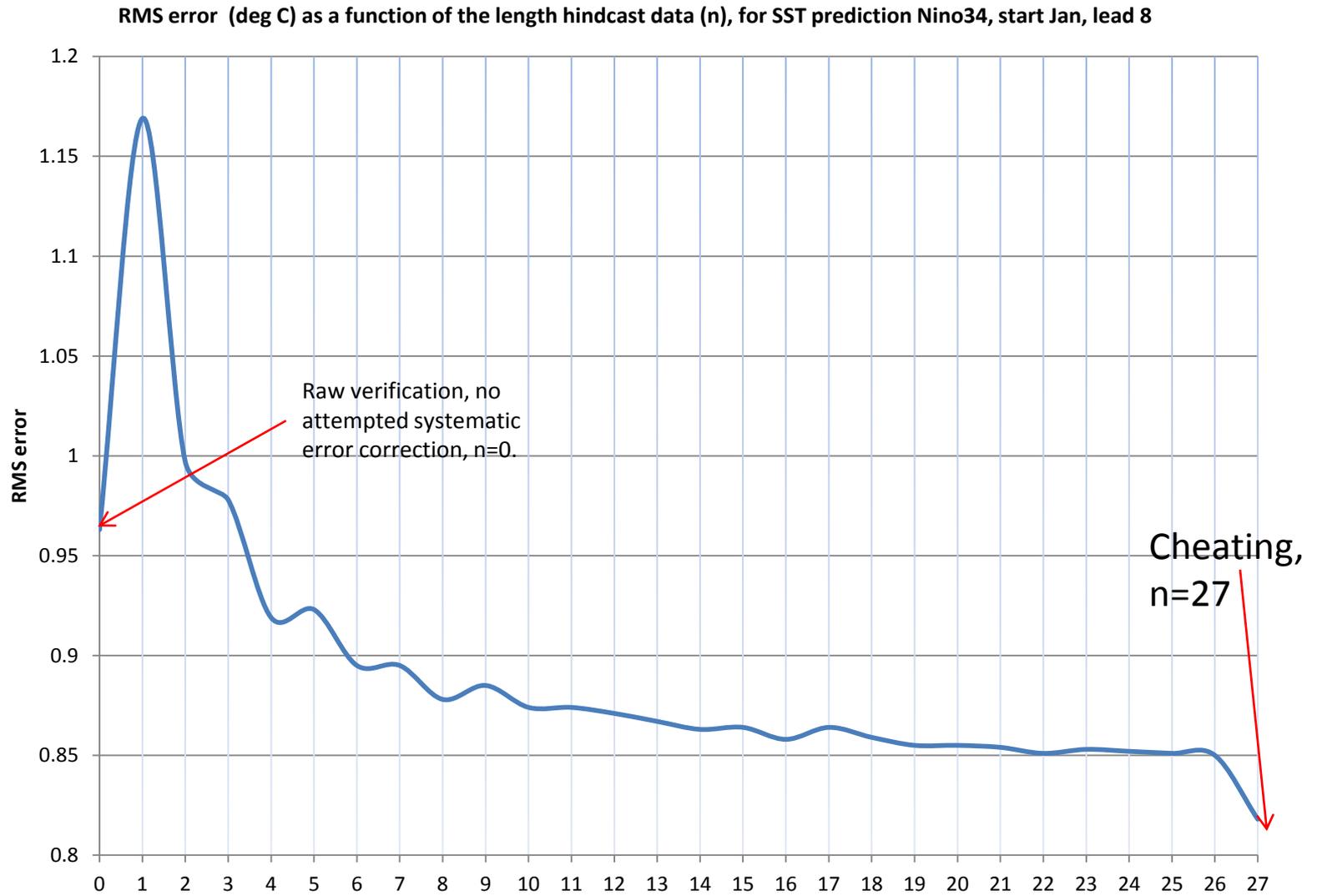
	activity	Data requirements	Comment
1	Correct the mean	15-20 (30) years	WMO says 30
2	Correction pdf	45	WMO says 45
3	Estimate of AC-skill to 0.15 accuracy	45	CPC rejects local forecasts ≤ 0.30
4			
5			

Purpose of hindcast:

	activity	Data requirements	Comment
1	Correct the mean	15-20 (30) years	WMO says 30
2	Correction pdf	45	WMO says 45
3	Estimate of AC-skill to 0.15 accuracy	45	CPC rejects local forecasts ≤ 0.30
4	To test whether we can tell AC-skill Mdl A > Mdl B by 0.1	More	
5			

Purpose of hindcast:

	activity	Data requirements	Comment
1	Correct the mean	15-20 (30) years	WMO says 30
2	Correction pdf	45	WMO says 45
3	Estimate of AC-skill to 0.15 accuracy	45	CPC rejects local forecasts ≤ 0.30
4	To test whether we can tell AC-skill Mdl A > Mdl B by 0.1	More	
5	Attempt to assign non-equal weights to models	100's to 1000's of years	Unless we become smarter



15-20 independent cases will do to correct the mean.

Threats to (any)MME in real time:

- Many

MME:? Better than the sum of the parts?

OR:

“A chain is only as strong as its weakest link”



Real-time QC is important