SOME RESULTS FROM A 14-MONTH RETROSPECTIVE ANALYSIS AND FORECAST SYSTEM UPGRADE FOR THE OPERATIONAL CFSv2 (JAN 2014 - FEB 2015)

Now 18 months. March 2015-August 2015 added

Update Sept 2015

Climate Forecast System Version 2.2 Upgrade

Project Status as of 09/01/2015

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Project Information and Highlights

Lead: Suranjana Saha, Jack Woollen, EMC and Steven Earle, NCO

Scope: Significant upgrade that includes:

- Install GSI REL-5.0.0 on top of version v2.1.10

Expected Benefits:

- Improvements and corrections to GSI analysis
- Improved satellite bias correction scheme
- Potential to include new or replacement data sources
- Analysis upgrade supports serviceability for up to 5 years

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Scheduling

Milestone (NCEP)	Date	Status
EE Coordination Meeting	11/15/2014 →02/27/2015	Complete
EMC testing complete / EMC CCB	11/30/2014 → 01/31/2015 →05/15 -->07/15 -->10/15	
Final Code Delivered to NCO	12/01/2014 → 02/01/2015 →05/16 →07/15 →10/15	
Technical Information Notice Issued	01/02/2015 → 03/01 → 08/01 →11/01	
SPA begins prep work for 30 day test	12/02/2014 → 03/02/2015 → 05/18 →07/16 →10/16	
30-day evaluation begins	01/05/2015 → 03/31 → 06/15 →08/10 →11/10	
30-day evaluation ends	02/03/2015 → 04/29 → 07/14 → 09/08 → 12/08	
IT testing ends	01/02/2015 → 04/29 →07/14 →08/10 →11/10	
Management Briefing	02/20/2015 → 05/08 →07/24 →09/14 →12/14	
Operational Implementation	02/24/2015 → 05/12 →07/28 →09/15 →12/15	
Add/modify AWIPS products	N/A	N/A

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Issues/Risks

Issues:.
Risks:
Mitigation:

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Finances

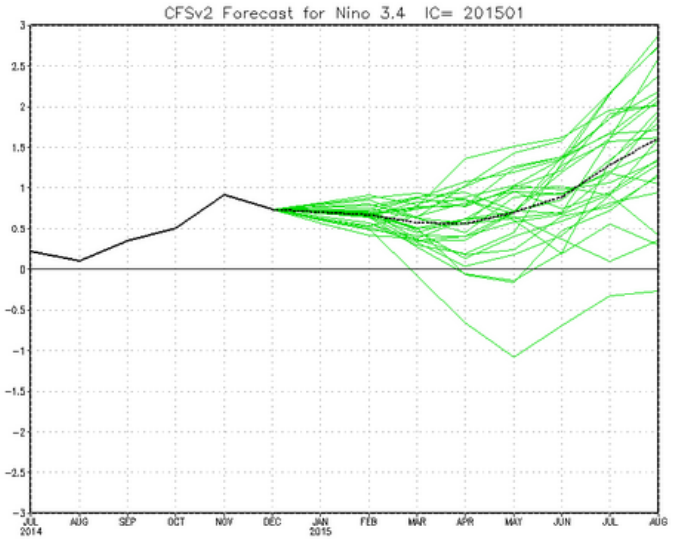
Associated Costs:

Funding Sources: EMC Base: T2O 3 man-months NCO Base: 1 man-months for implementation, 1 man-month annually for maintenance.

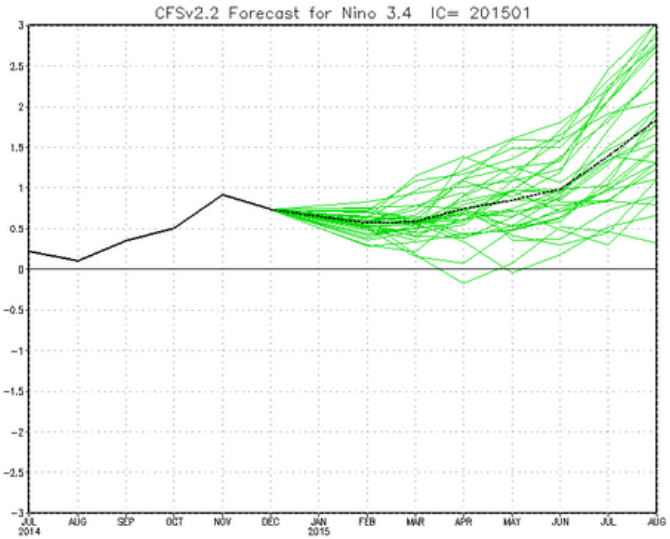
R	Y	G

Nino3.4 forecast

CFSv2

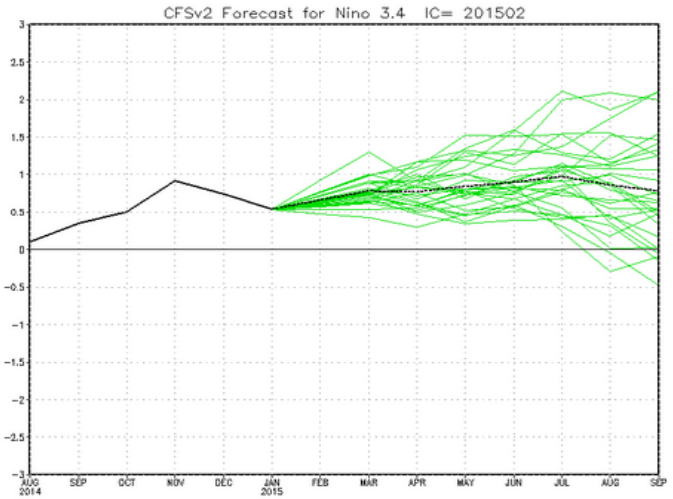


CFSv2.2

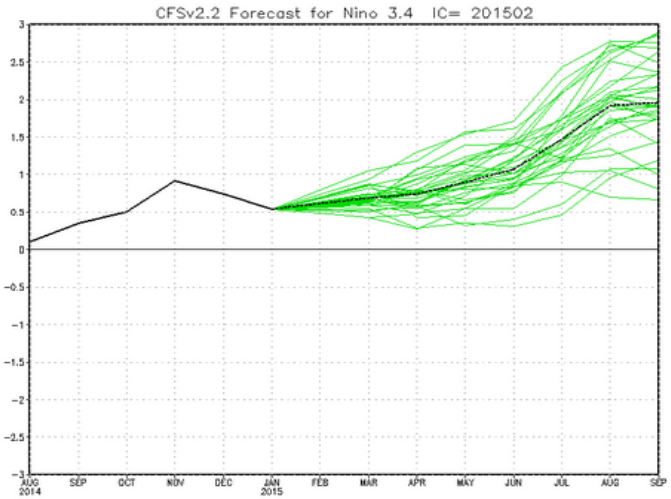


Plume from January 2015

CFSv2



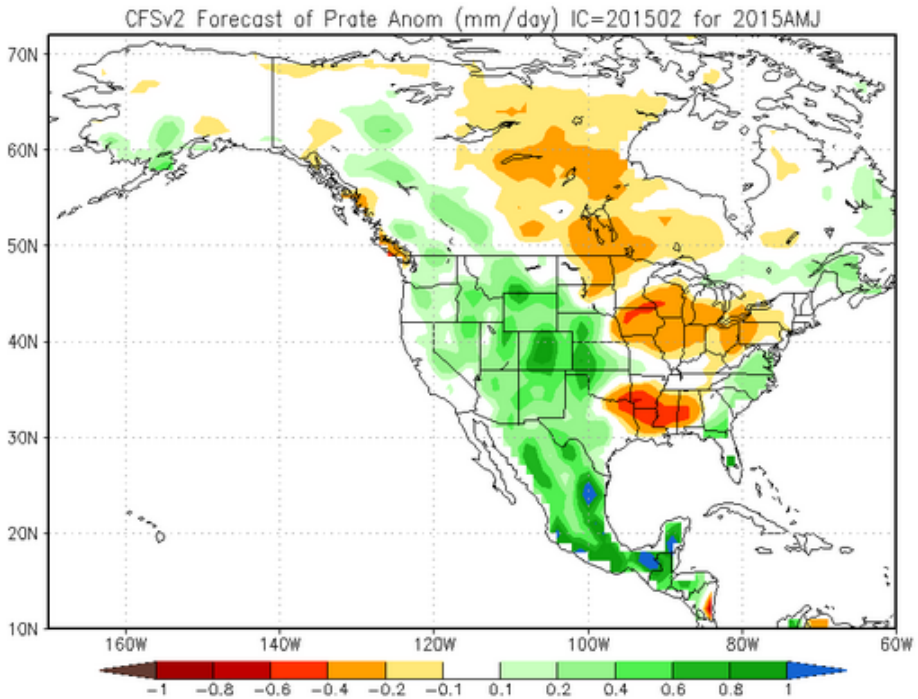
CFSv2.2



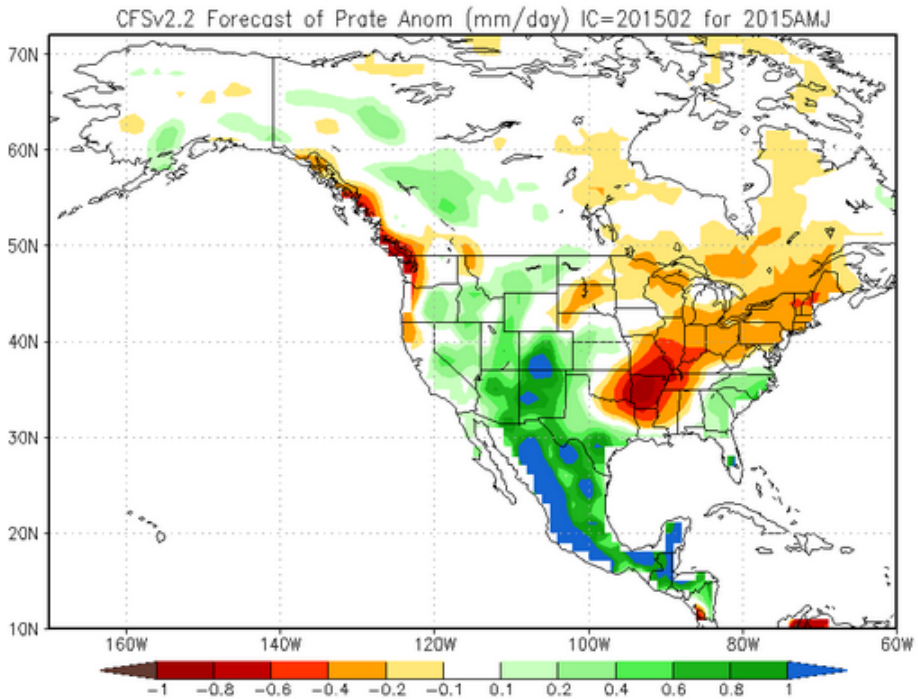
Plume from February 2015

Nino 3.4 SST
V2 and v2.2
are about the same
for Jan 2015 start.
While v2.2 may
be better for
Feb 2015 start.

CFSv2



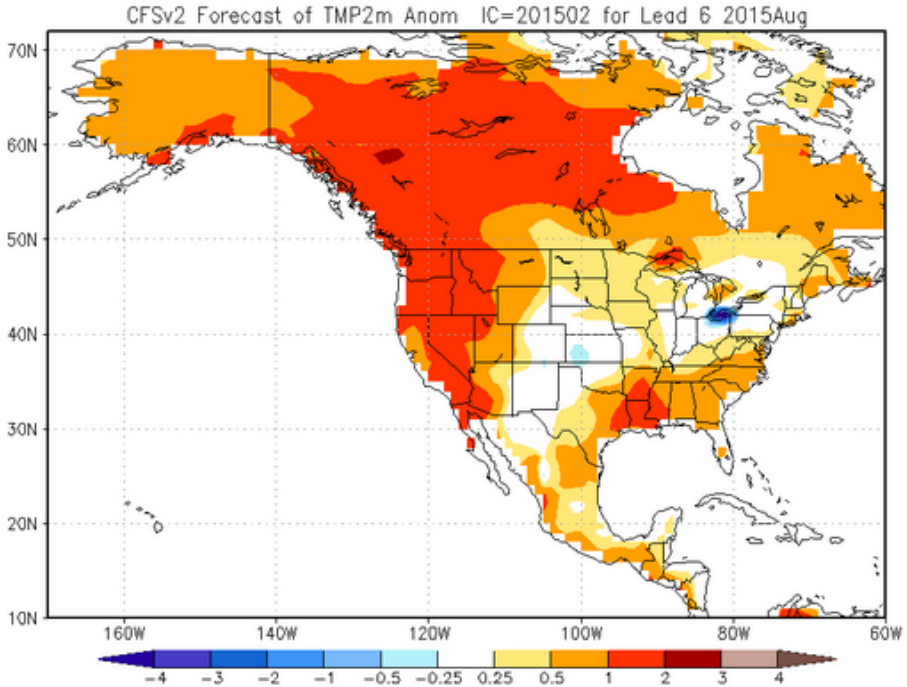
CFSv2.2



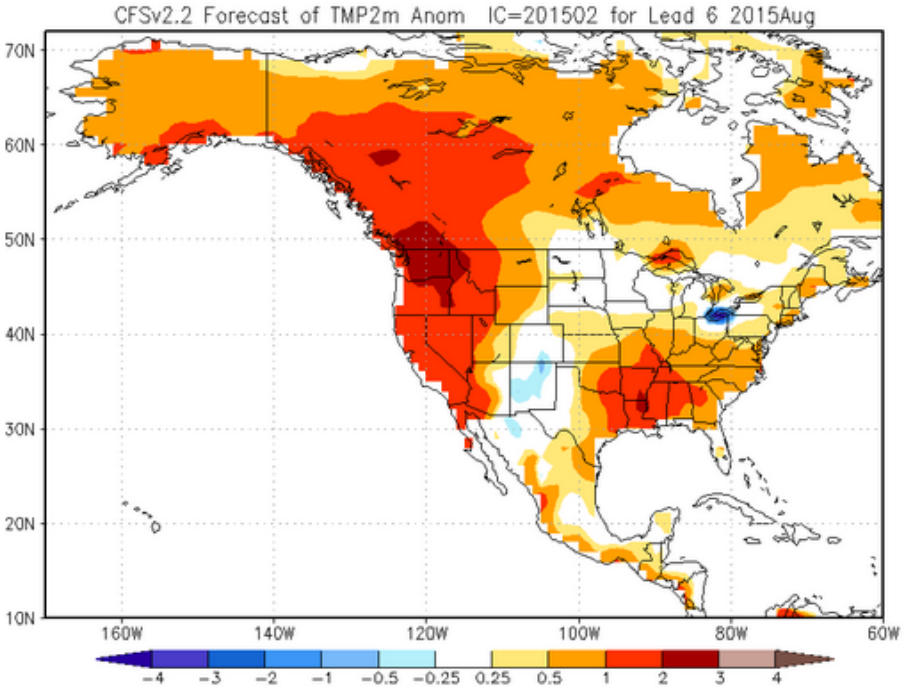
Precip (Feb IC, lead 1 for AMJ season)

Systems continue to be reasonably similar (40 member ensemble average). Both systems were forecasting a wet late spring/early summer across central/southern US.

CFSv2



CFSv2.2

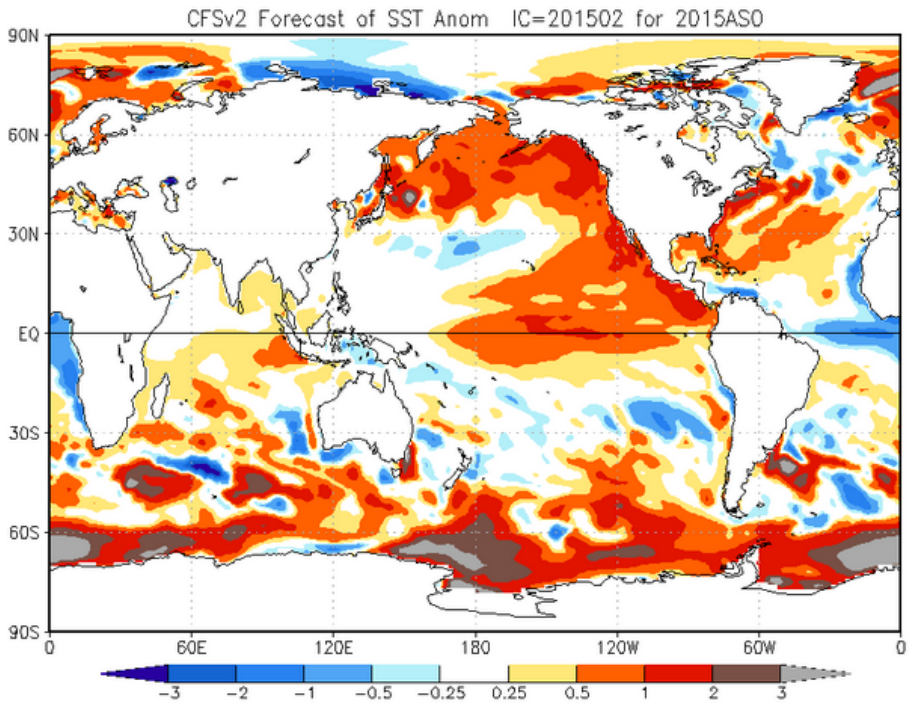


2m-Temp (Feb IC, lead 6 for August month)

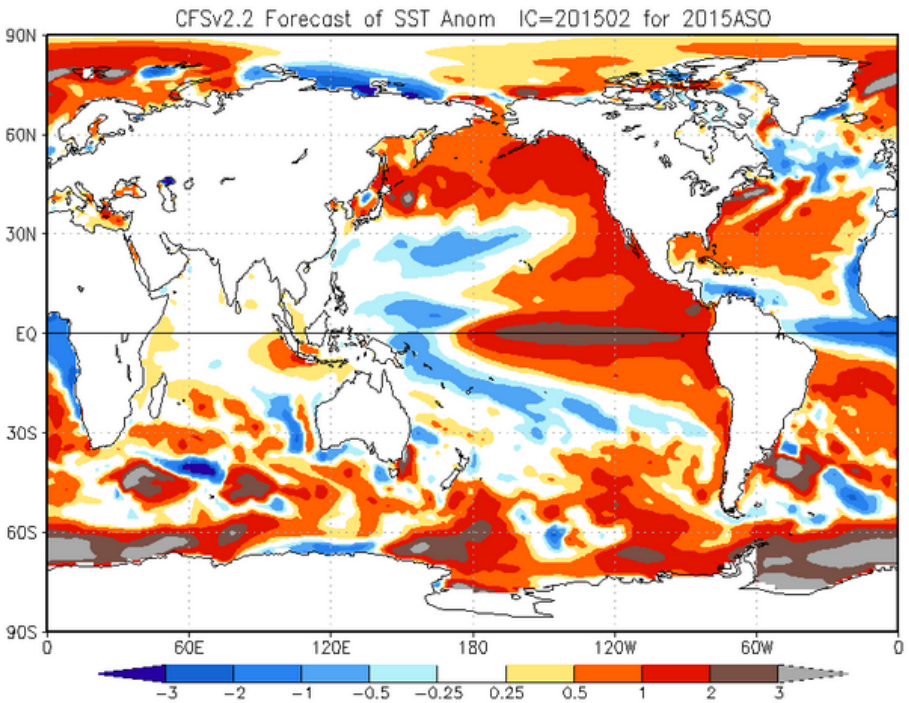
Both systems similar

Global forecasts from February IC lead 3 for ASO

CFSv2

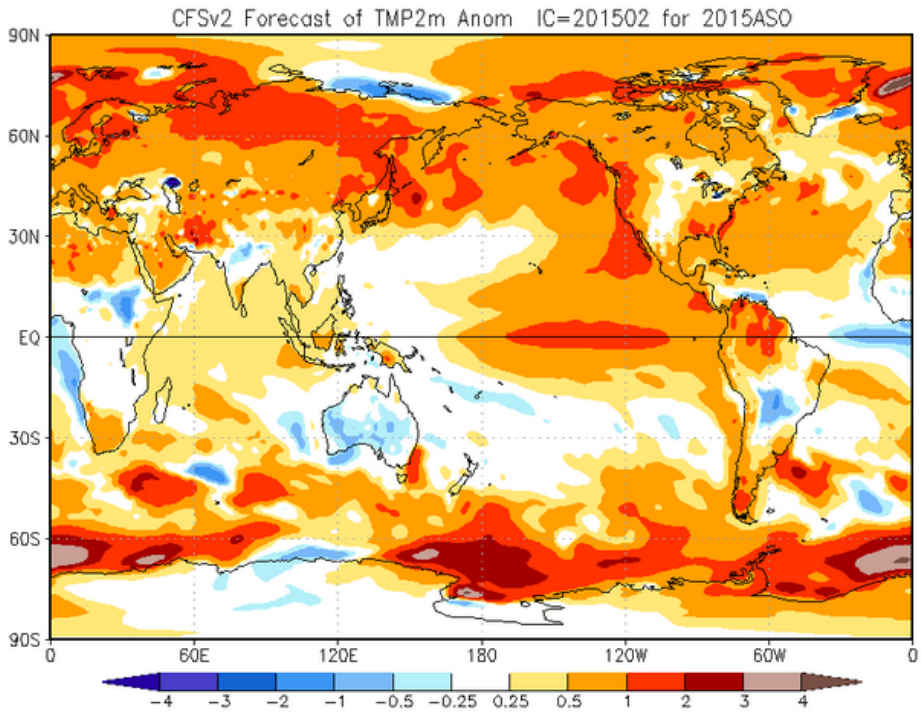


CFSv2.2

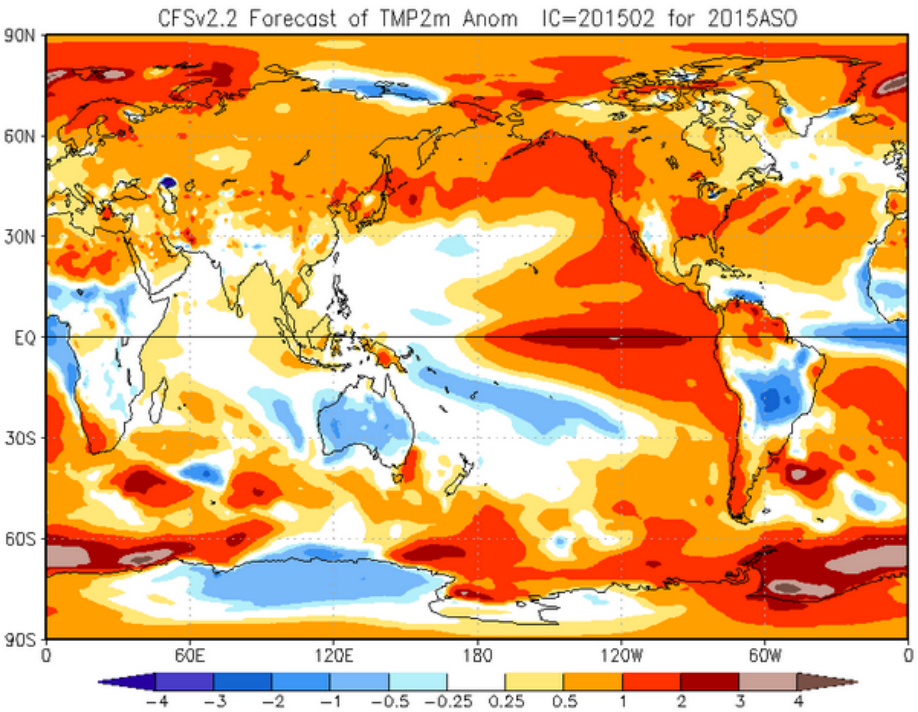


SST

CFSv2

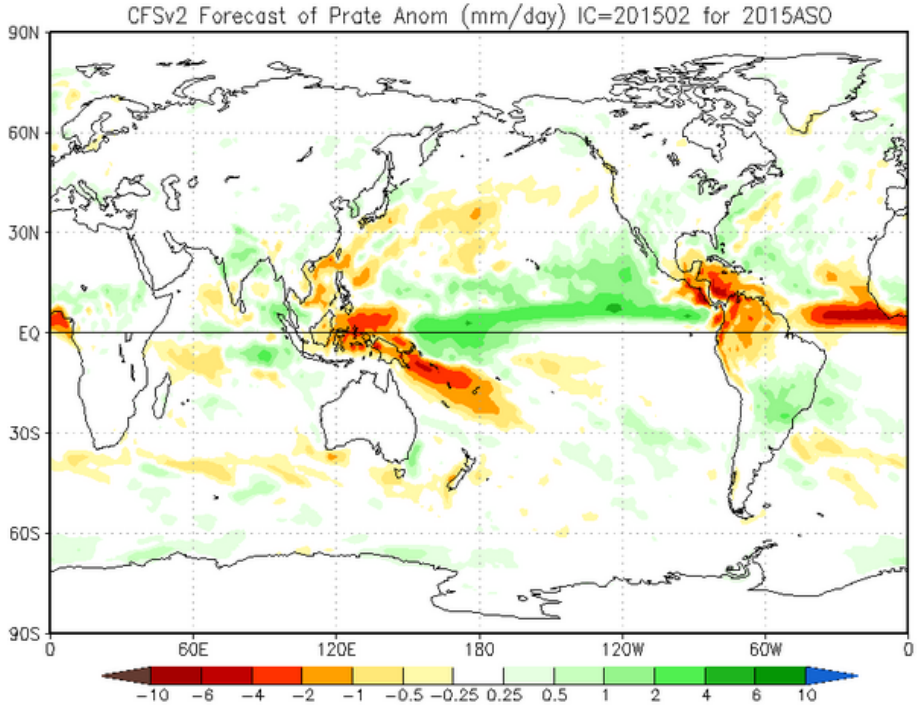


CFSv2.2

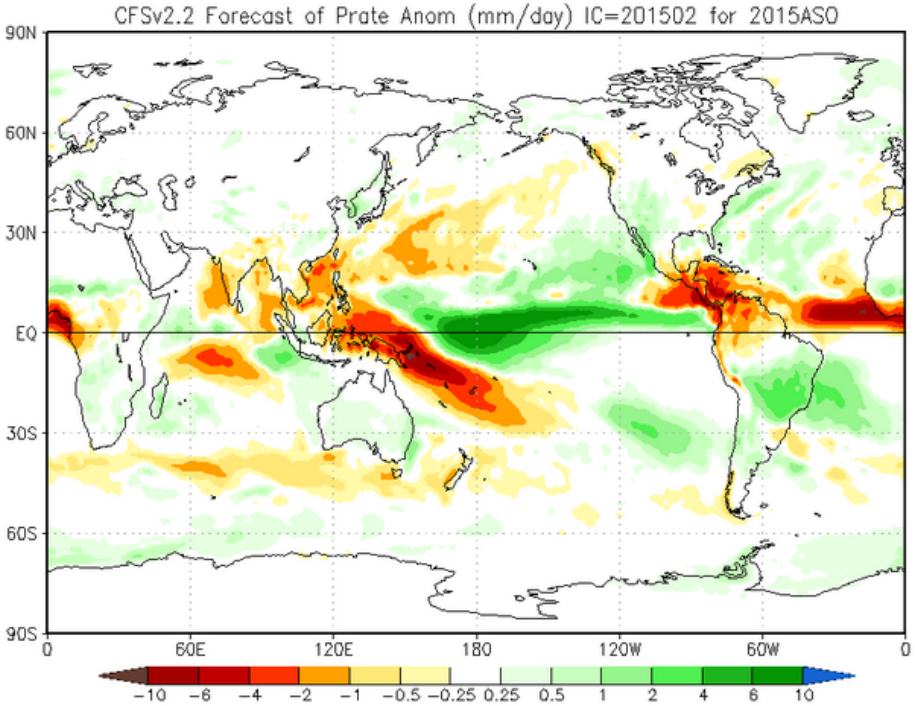


T2m

CFSv2



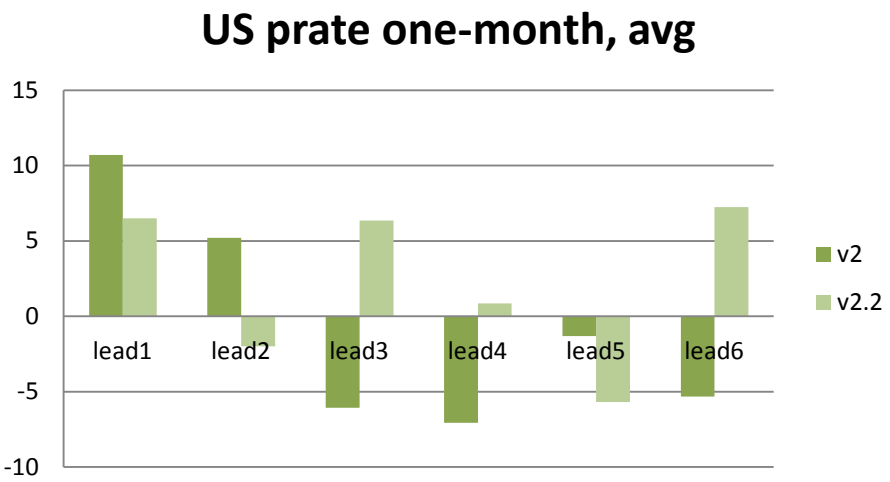
CFSv2.2

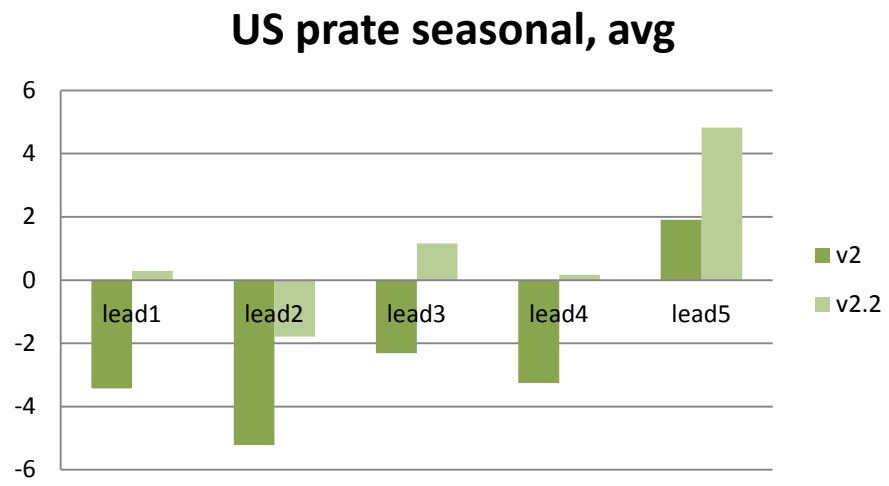


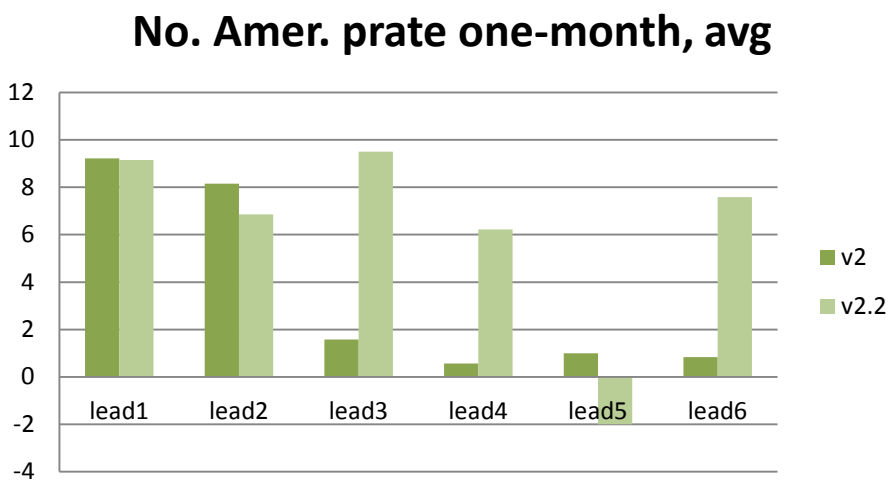
PRATE

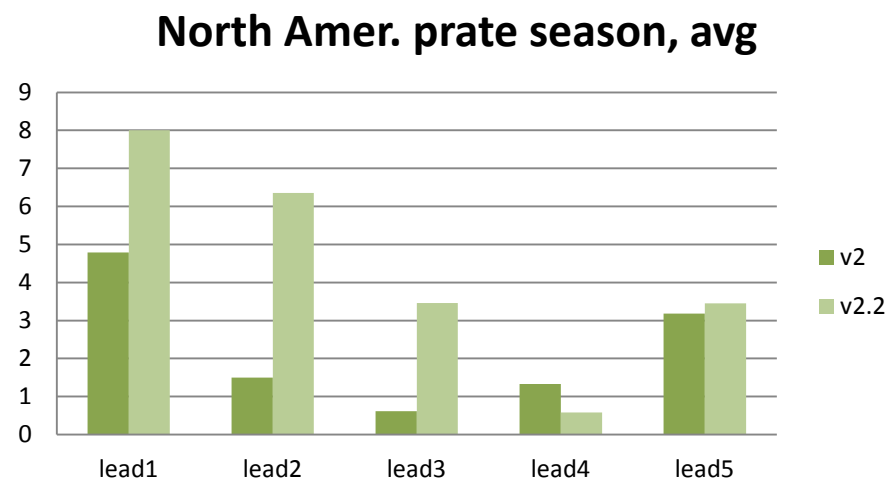
Verification v2 vs v2.2 for all 14 start months (Jan 2014-Feb2015)

No harm done. V2.2 possibly better.



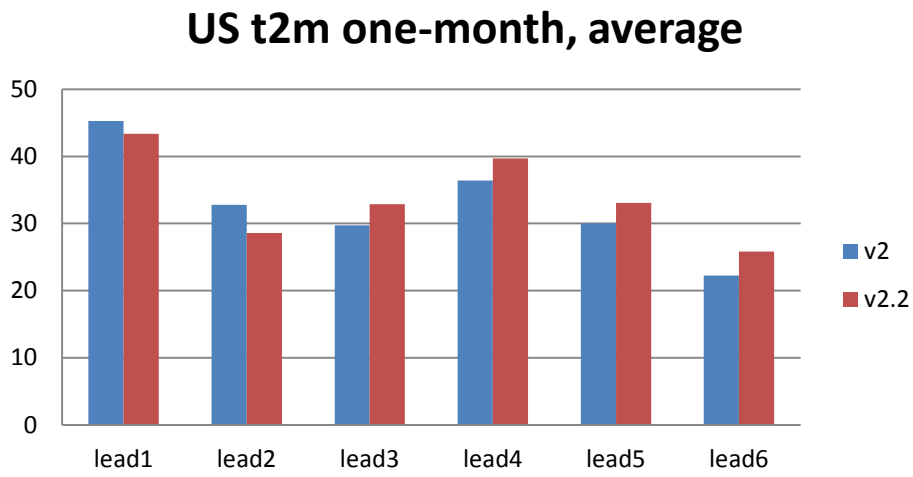


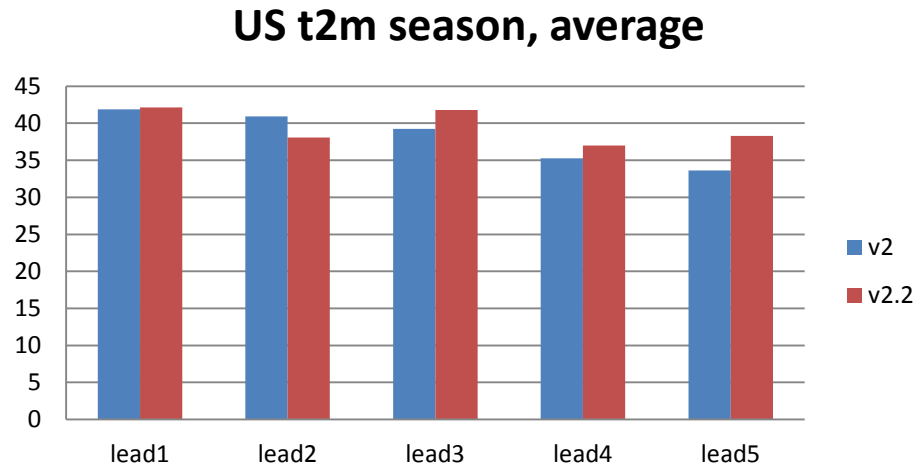


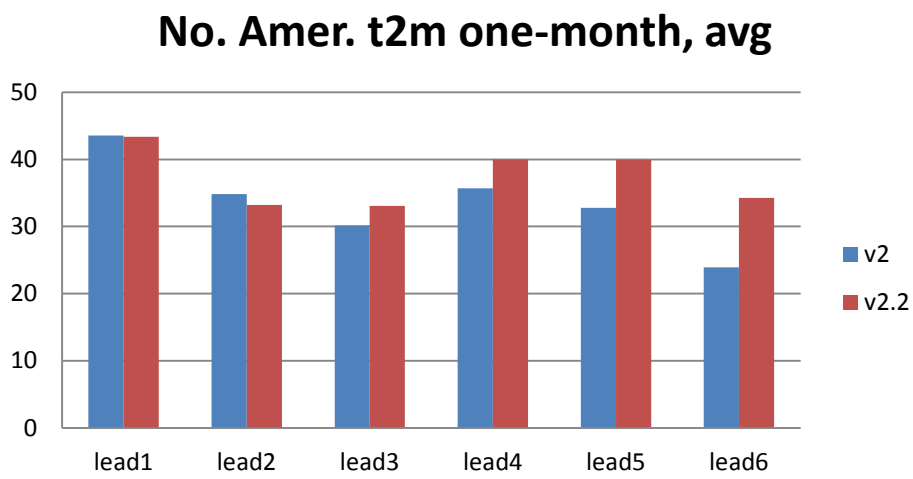


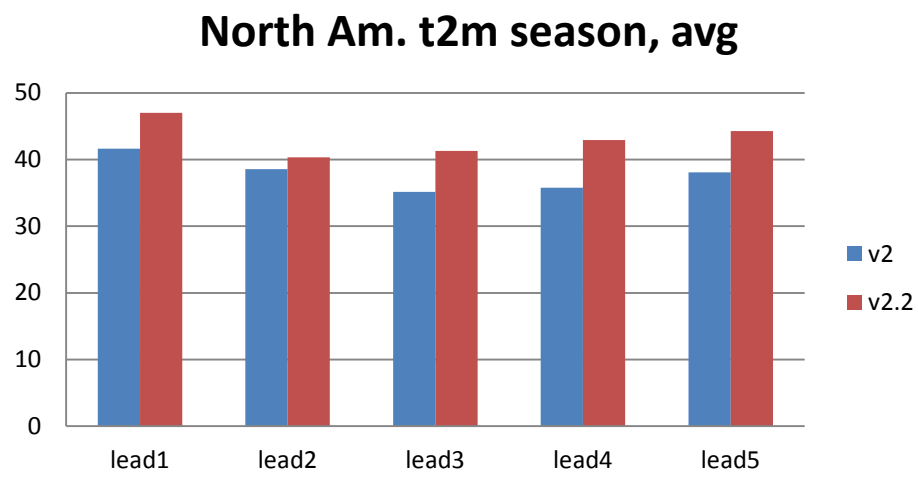
Verification v2 vs v2.2 for all 14 start months (Jan 2014-Feb2015)

No harm done. V2.2 possibly better.



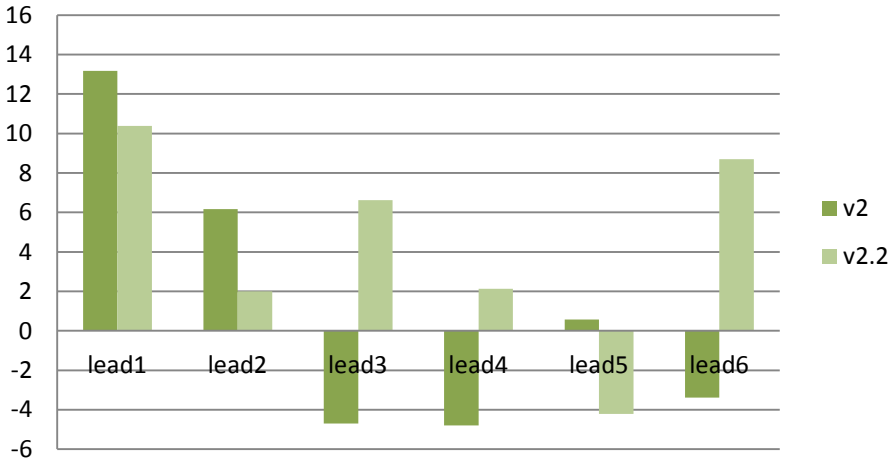




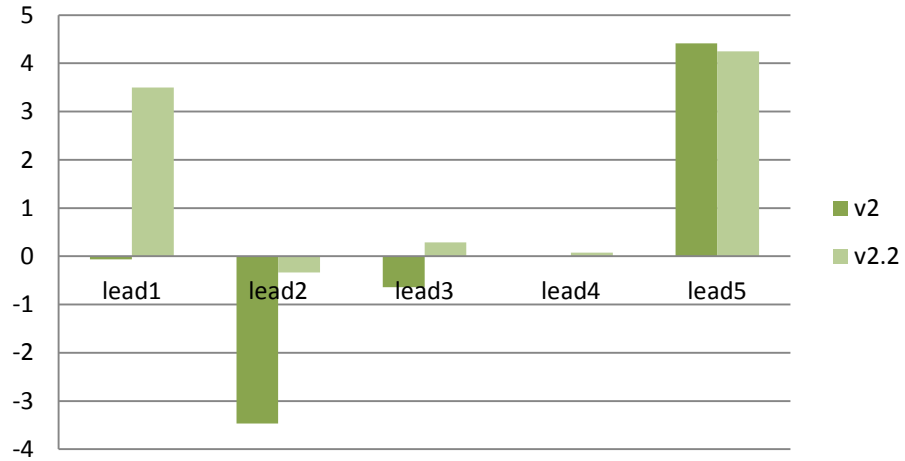


Updated through Aug, 2015 starts, 6 more months.
Slide 13-17 are new

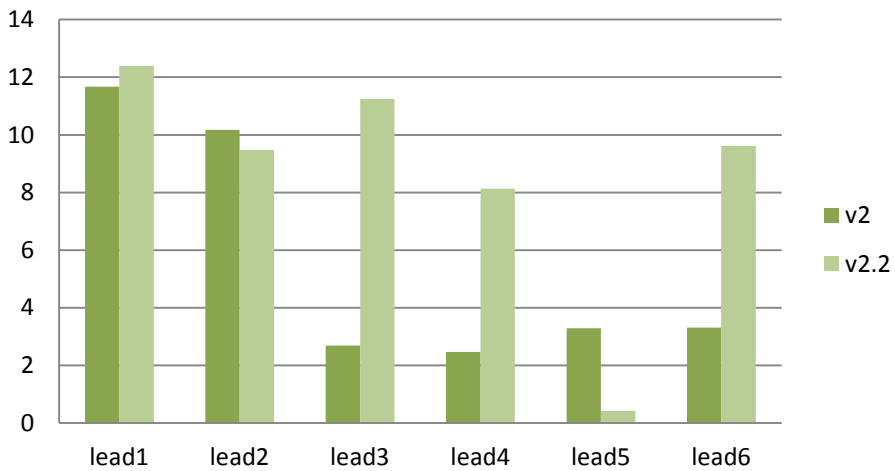
US prate one-month, 2014-15 avg



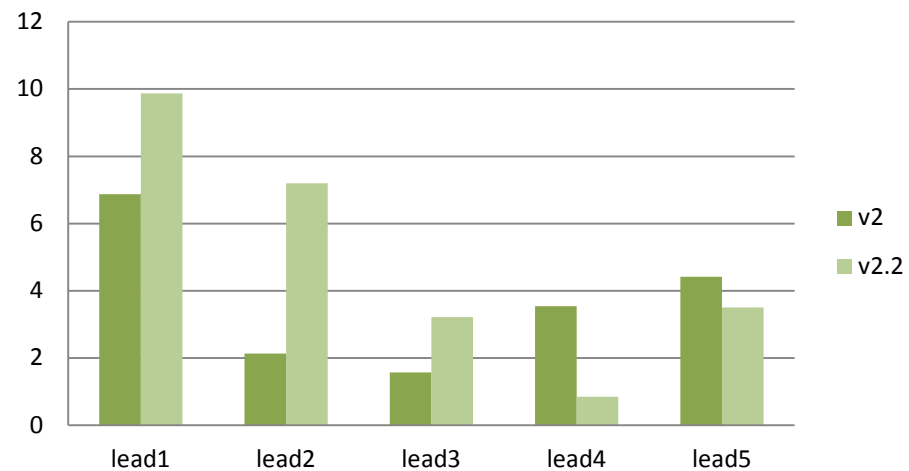
US prate seasonal, 2014-15 avg



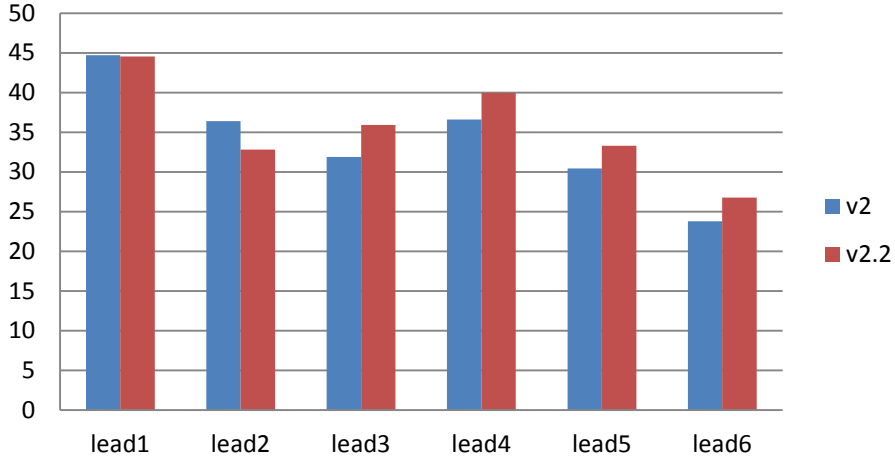
No. Amer. prate one-month, 2014-15 avg



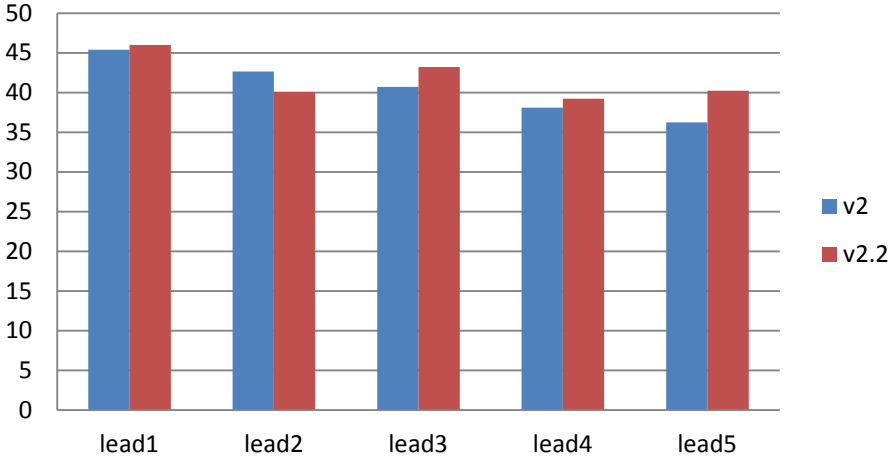
North Amer. prate season, 2014-15 avg



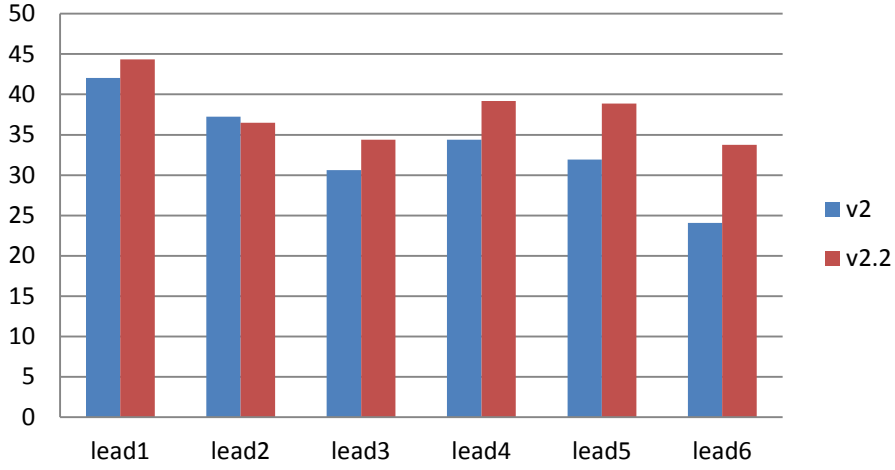
US t2m one-month 2014-15 average



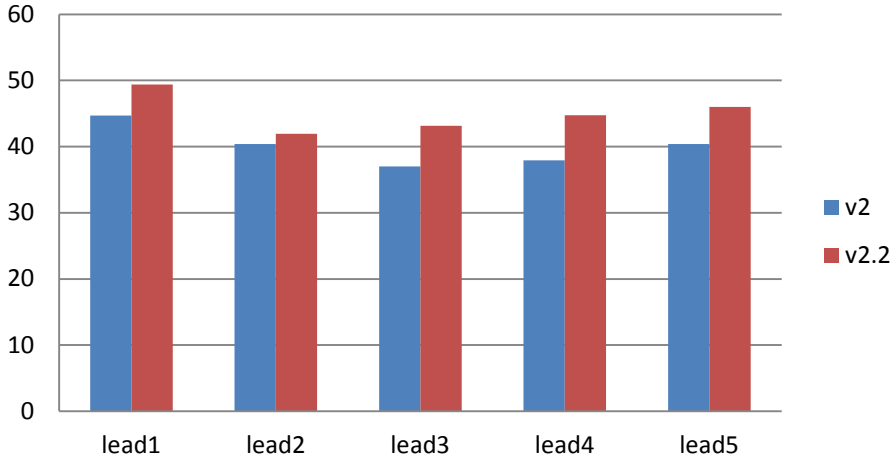
US t2m season, 2014-15 average



No. Amer. t2m one-month, 2014-15 avg



North Am. t2m season, 2014-15 avg



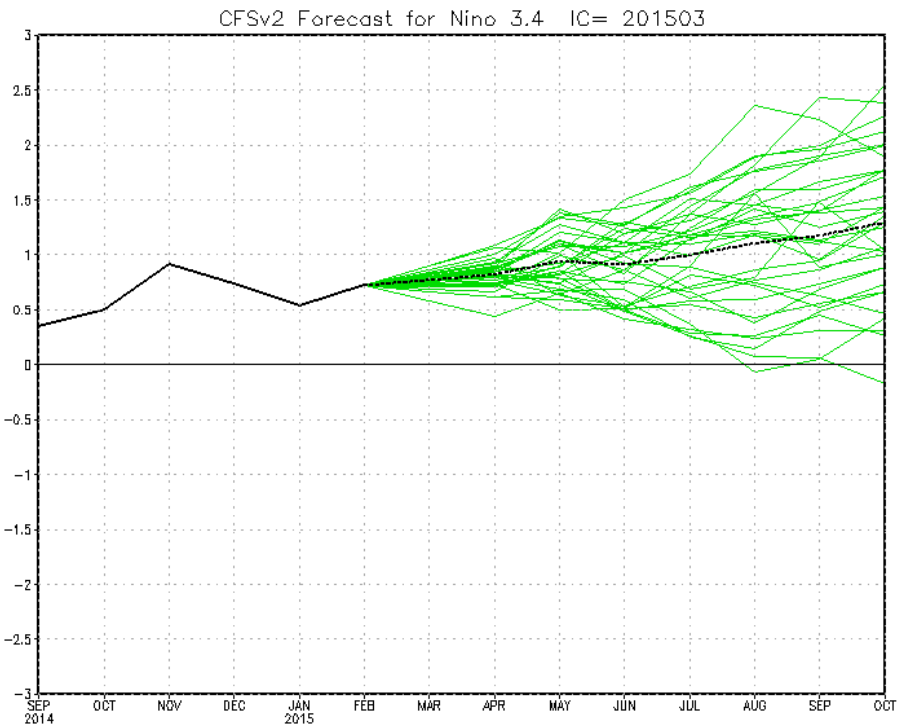
The 6 added cases change very little in the overall impression

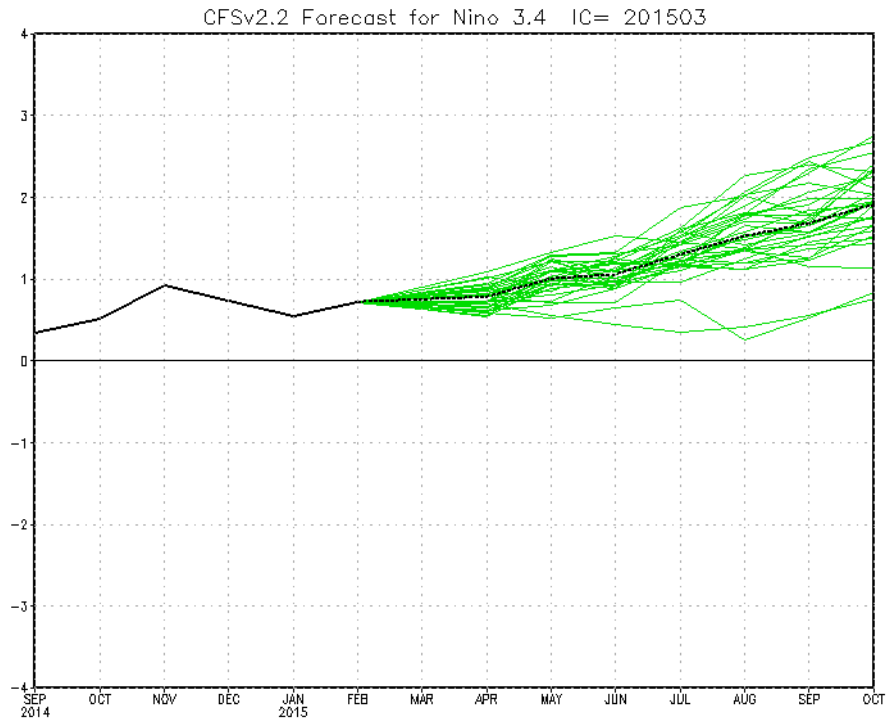
a) No harm done
b) Verification over US and North America similar, if anything v2.2 may be a little better
c) Global SST, T2m and prate are rather similar between v2 and v2.2

Some points of possible interest: (next 2 slides for examples).

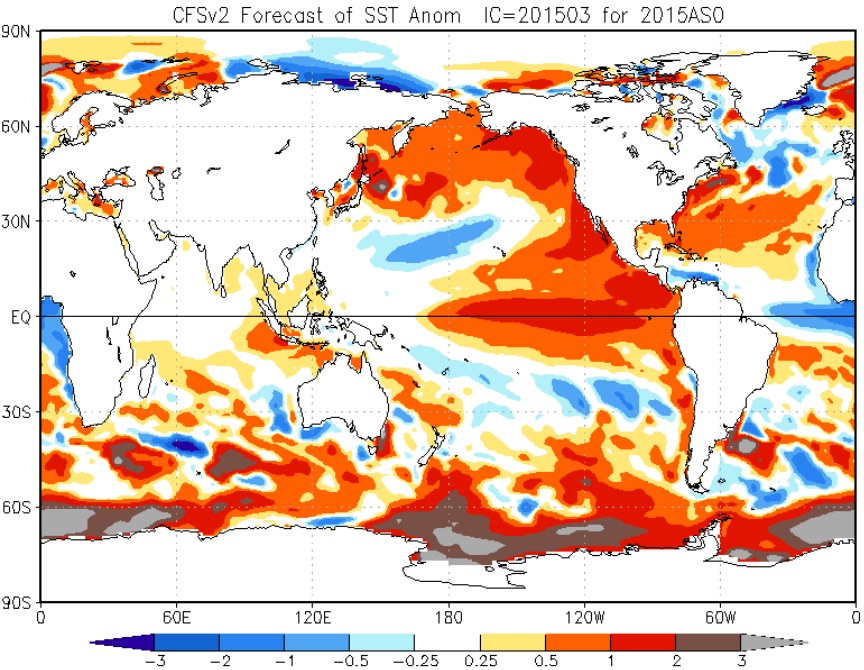
1. The v2.2 has much lower spread than v2 in ENSO plume from several spring start months in 2015. This may be good since a strong warm event has emerged.
(i.e. v2.2 was more certain about it.)
2. CFSv2 had a cool down along the equator for many forecasts, sofar not observed.
V2.2 is NOT better in this feature.

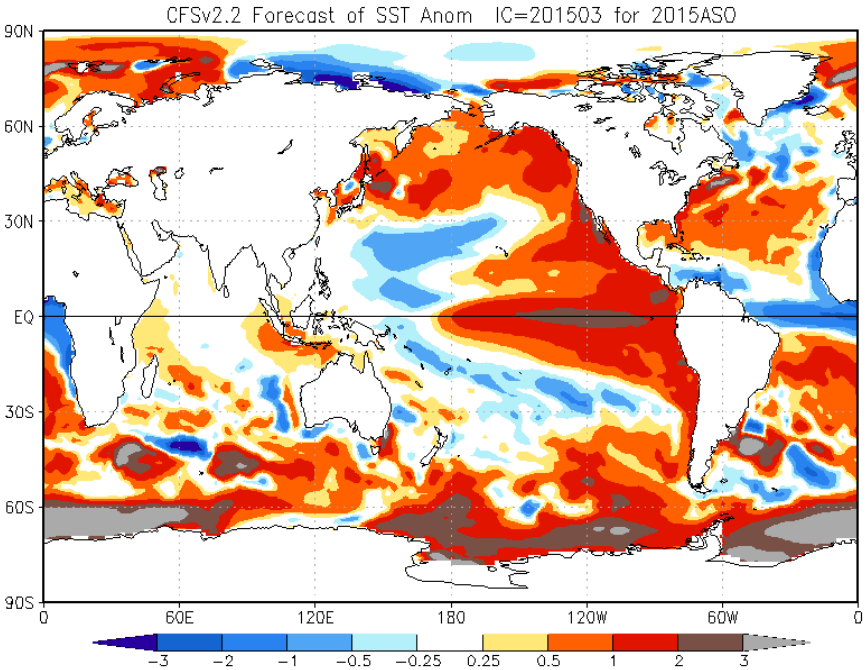
Spread much less in v2.2 than in v2.



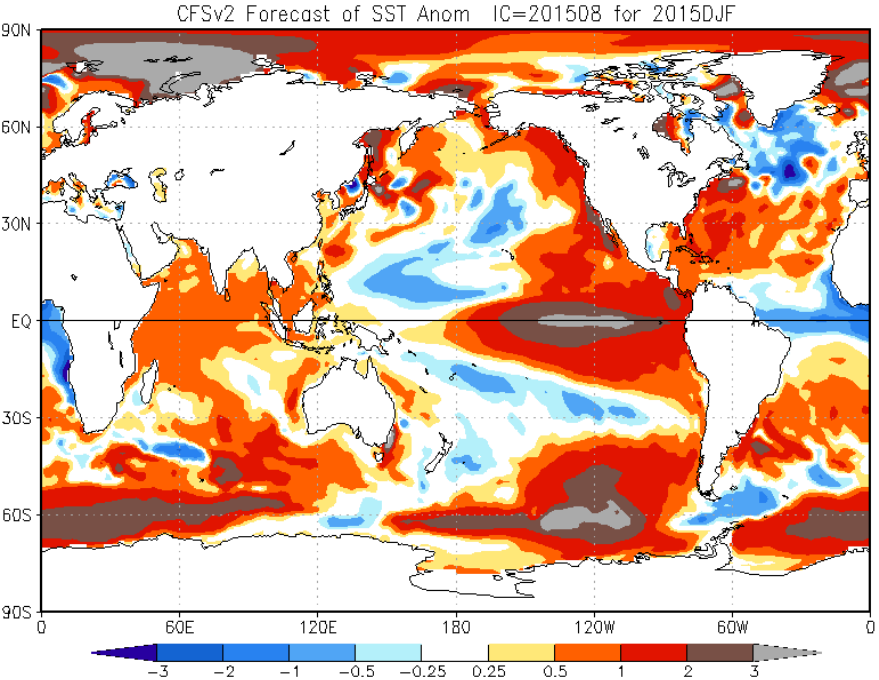


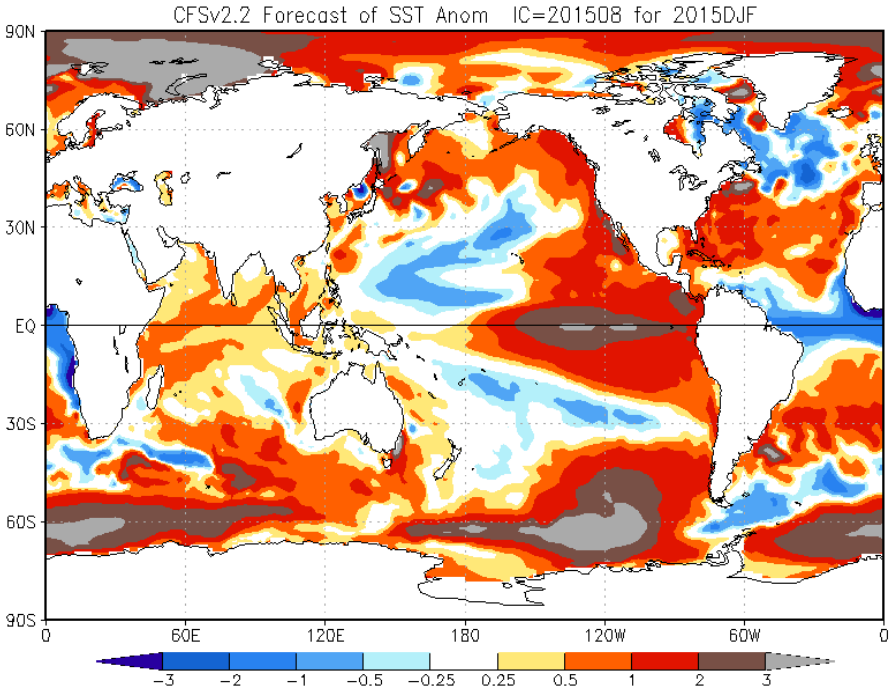
SST anomaly forecasts lead 4 from March 2015 broadly similar in v2 and v2.2.
A cold area along the equator in the Atlantic (presumably unrealistic) is present in both systems.





SST anomaly forecasts lead 4 from August 2015 broadly similar in v2 and v2.2.
A cold area along the equator in the Atlantic (presumably unrealistic) is present in both systems.





PREPBUFR difference between cfs.v2.1 and gdas
Shows current operational GDAS vs CDAS

```
< /com/gfs/prod/gdas.20151005/gdas1.t00z.prepbufr
> /com/cfs/prod/cdas.20151005/cdas1.t00z.prepbufr

> P 180 11992| 11158|   180|    65|     0|     0     0     0     0     0   589|     0|     0
< P 180 11992| 11847|     0|    71|     0|     0     0     0     0     0    74|     0|     0
> Q 180  2613|  2130|   233|     0|     0|     0     0     0     0     0   249|     0|     1
< Q 180  2613|  2565|     0|     0|     0|     0     0     0     0     0    47|     0|     1
> T 180  7593|  6157|   865|    14|   249|     0     0     0     0     0   308|     0|     0
< T 180  7593|  7502|     0|    20|    47|     0     0     0     0     0    24|     0|     0
> W 280  6499|  5939|    28|     6|     0|     0     0     0     0     3   523|     0|     0
< W 280  6499|  6420|     0|    11|     0|     0     0     0     0     3    65|     0|     0

> Q 133 18707|     0|     0|     0| 17471|     0     0     0  1090   146     0|     0|     0
< Q 133 18707| 11074|     0|     0|  6266|     0     0     0  1090   146   131|     0|     0

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> W 254 24460|     0|     0|     0| 24460|     0     0     0     0     0     0|     0|     0
< W 254 24460| 24460|     0|     0|     0|     0     0     0     0     0     0|     0|     0
```

PREPBUFR difference between v2.2.a and v2.2.b
Shows consequence of using obsproc.v3.5.0

```
< v2.2.a  2015072200
> v2.2.b  2015072200

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> Q 180  2542|  1999|   514|     1|     0|     0     0     0     0     0    28|     0|     0
< T 180  7715|  6190|   972|    15|   200|     0     0     0     0     6   332|     0|     0
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```

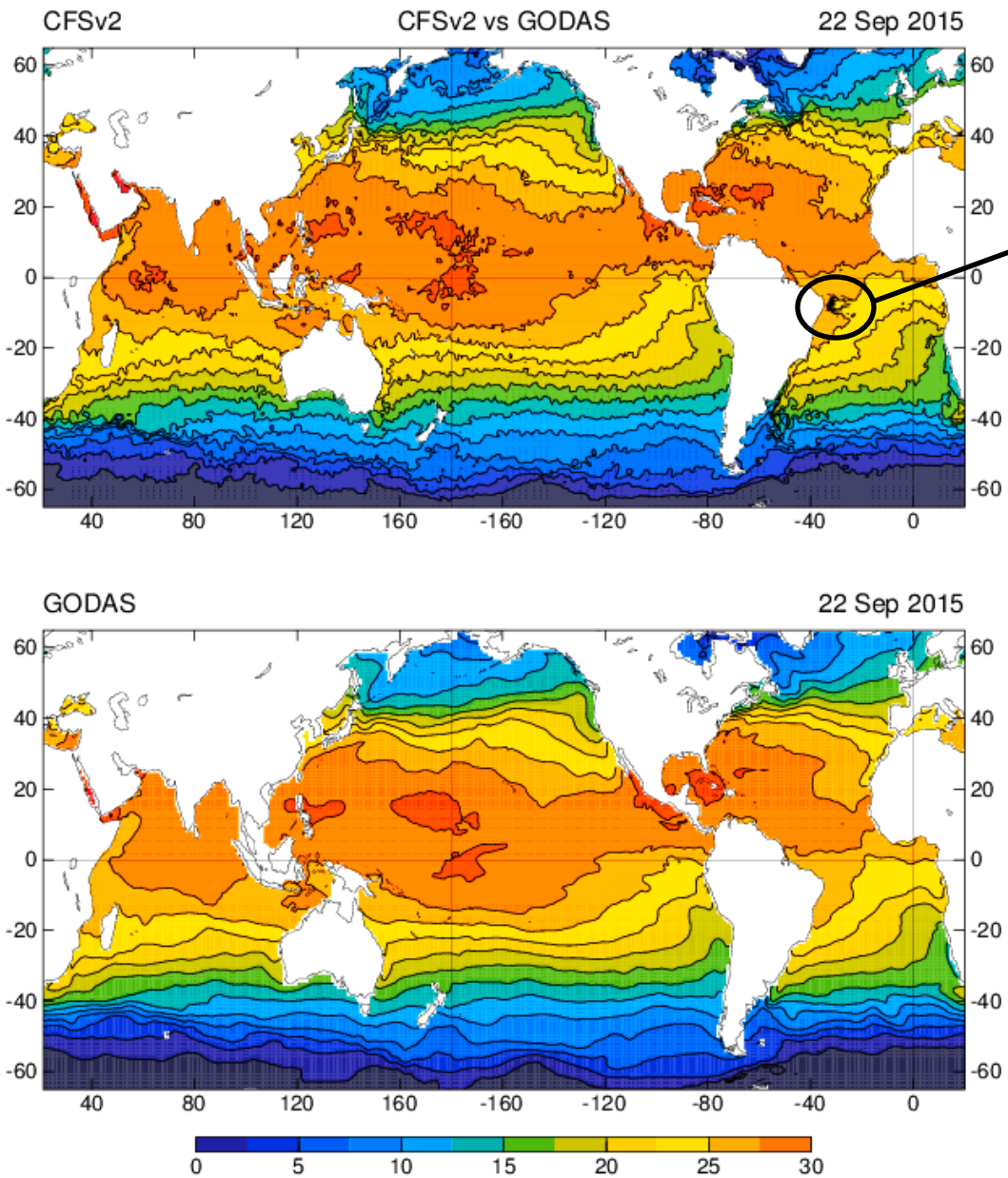
GSI.v5.0.3 SATINFO (satellite usage) DIFFERENCES vs current CFS

CFS.V2.2								CFS.V2.1						
amsua_n15	1	1	3.000	9.100	4.500	1		amsua_n15	1	*	3.000	4.500	10.00	0.000
amsua_n18	1	1	2.500	9.100	4.500	1		amsua_n18	1	*	2.500	4.500	10.00	0.000
mhs_n18	1	1	2.500	0.000	6.000	1		mhs_n18	1	*	2.500	6.000	10.00	0.000
hirs4_metop-a	2	1	0.600	0.000	2.500	1		hirs4_metop-a	2	*	0.600	2.500	10.00	0.000
amsua_metop-a	1	1	2.500	9.100	4.500	1		amsua_metop-a	1	*	2.500	4.500	10.00	0.000
mhs_metop-a	1	1	2.500	0.000	6.000	1		mhs_metop-a	1	*	2.500	6.000	10.00	0.000
iasi616_metop-a	16	1	1.380	0.000	3.000	1		iasi616_metop-a	16	*	1.380	3.000	10.00	0.000
airs281SUBSET_aqua	7	1	1.500	0.000	3.500	1		airs281SUBSET_aqua	7	*	1.500	3.500	10.00	0.000
amsua_aqua	6	1	0.400	0.230	2.000	1		amsua_aqua	6	*	0.400	2.000	10.00	0.000
sndrD1_g11	1	1	0.850	0.000	2.000	1		sndrD1_g11	1	*	0.850	2.000	10.00	0.000
sndrD2_g11	1	1	0.850	0.000	2.000	1		sndrD2_g11	1	*	0.850	2.000	10.00	0.000
sndrD3_g11	1	1	0.850	0.000	2.000	1		sndrD3_g11	1	*	0.850	2.000	10.00	0.000
sndrD4_g11	1	1	0.850	0.000	2.000	1		sndrD4_g11	1	*	0.850	2.000	10.00	0.000
sndrD1_g12	1	1	0.950	0.000	2.000	1		sndrD1_g12	1	*	0.950	2.000	10.00	0.000
sndrD2_g12	1	1	0.950	0.000	2.000	1		sndrD2_g12	1	*	0.950	2.000	10.00	0.000
sndrD3_g12	1	1	0.950	0.000	2.000	1		sndrD3_g12	1	*	0.950	2.000	10.00	0.000
sndrD4_g12	1	1	0.950	0.000	2.000	1		sndrD4_g12	1	*	0.950	2.000	10.00	0.000
								hirs4_n19	2	*	0.600	2.500	10.00	0.000
amsua_n19	1	1	2.500	9.100	4.500	1		amsua_n19	1	*	2.500	4.500	10.00	0.000
mhs_n19	1	1	2.500	0.000	6.000	1		mhs_n19	1	*	2.500	6.000	10.00	0.000
ssmis_f17	1	1	1.500	0.000	6.000	1	<							
sndrD1_g15	1	1	0.900	0.000	2.000	1	<							
sndrD2_g15	1	1	0.900	0.000	2.000	1	<							
sndrD3_g15	1	1	0.900	0.000	2.000	1	<							
sndrD4_g15	1	1	0.900	0.000	2.000	1	<							
seviri_m10	2	1	2.500	0.000	2.000	1	<							
atms_npp	1	1	5.000	0.000	4.500	1	<							
cris_npp	37	1	0.847	0.000	2.000	1	<							
amsua_metop-b	1	1	2.500	9.100	4.500	1	<							
mhs_metop-b	1	1	2.500	0.000	6.000	1	<							
iasi616_metop-b	16	1	1.380	0.000	3.000	1	<							

The CFSv2.1 Tropical Atlantic Cold Spot Causes and a Solution

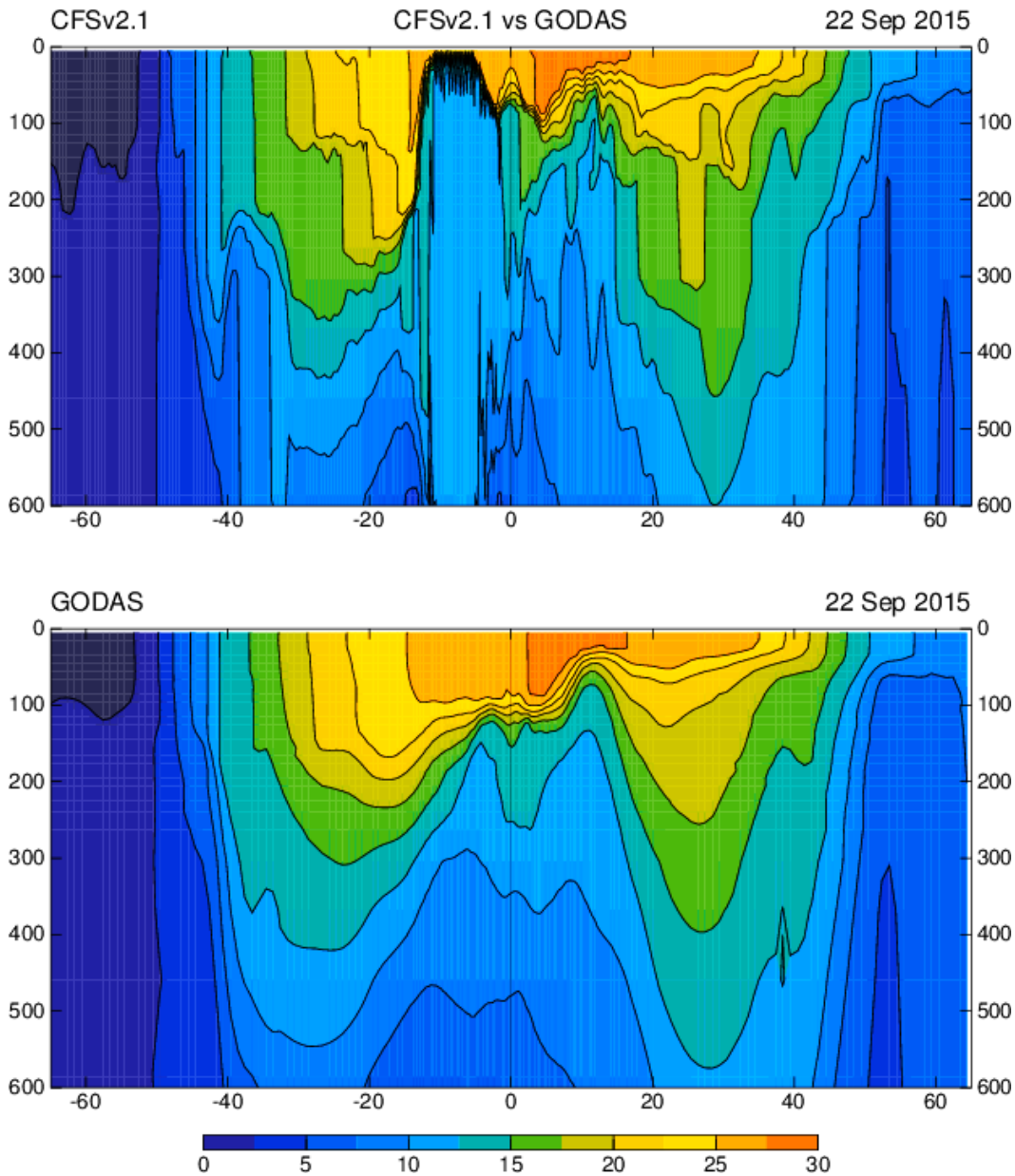
D. W. Behringer

September 6, 2015



In this view CFSv2 and GODAS are similar except for isolated cold spot in the tropical South Atlantic

30 W
In this view the cold spot extend down ~600m.
The problem is largely confined to the tropics in a dynamically active region and where the grid resolution is 1/4°



Causes

- Dynamically active region
- 1/4° resolution permits mesoscale variability
- Model bias
- Sparse in situ observations

Proposed Solution

- Control model bias via nudging toward climatology
- Improve the estimate of the background error covariance

Both of these strategies have been successfully tested in an uncoupled context. They will need to be tested in the CFS.