

EMC Annual Review: CPC's Forecasts 2007

Edward O'Lenic
Chief, Operations Branch
NOAA-NWS-Climate Prediction Center
December 12, 2007

Top 20 CPC Web Products – Nov 2007

1.) CPC Home page	(150,730 hits)
2.) 6-10 Day Outlook	(126,958)
3.) 8-14 Day Outlook	(119,752)
4.) U.S. Hazards Assessment	(58,890)
5.) ENSO Evolution, Status.....(PDF)	(52,864)
6.) 90-Day Outlook	(46,558)
7.) Forecasts & Outlooks Home page	(45,625)
8.) 6-10 Day Outlook (PMD)	(38,491)
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10.) UV Index Forecast (text version)	(31,487)
11.) ENSO Diagnostic Discussion	(31,011)
12.) 30-Day Outlook (Lead 01)	(29,214)
13.) Color Seasonal Outlook (multiple images)	(27,224)
14.) Seasonal Drought Outlook	(26,120)
15.) U.S. Daily Data (text)	(20,957)
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19.) Atlantic Hurricane Outlook	(13,030)
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Outline

- Atlantic Tropical Storm Outlook
- U.S. Seasonal Drought Outlook
- U.S. Hazards Assessment
- Extended Range – 6-10, 8-14-Day
- Intra-Seasonal Outlooks
- 3-Month Outlooks

2007 Atlantic Tropical Storm Season

	May 16 Forecast	August 2 Forecast	2007 Actual	Average Season	Obs.% Normal
Tropical Storms	13-17	13-16	14	11	-27
Hurricanes	7-10	7-9	6	6	100
Major Hurricanes	3-5	3-5	2	2	100

2007 was close to average. After several successful forecasts, this is the second consecutive year in which the forecast's expectations were not met.

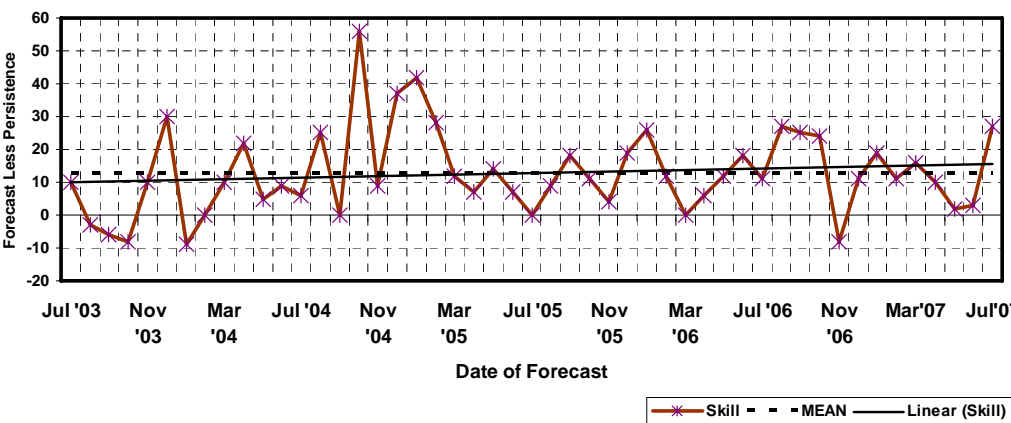
U.S. Seasonal Drought Outlook

- DM is produced collaboratively each by NOAA, USDA, NDMC.
- Seasonal Drought Outlook is produced monthly at CPC.
- Outlook is zero-lead.
- Describes expected changes to the DM, based on CPC's seasonal outlook.
- Uses up-to-the-minute model forecasts, as well as the 3-month P outlook.

% DO gridpoints correct minus % persistence gridpoints correct

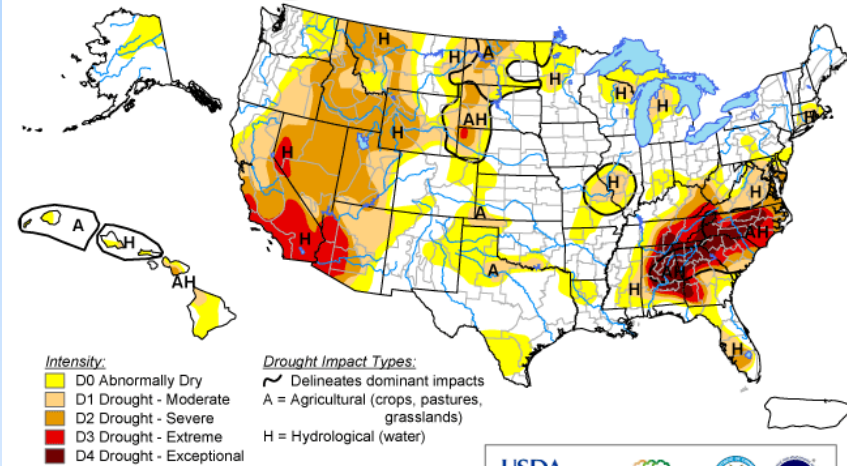
Average: 13 % better than climatology

Drought Outlook -- Forecast minus Persistence



U.S. Drought Monitor

November 27, 2007
Valid 7 a.m. EST



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://drought.unl.edu/dm>

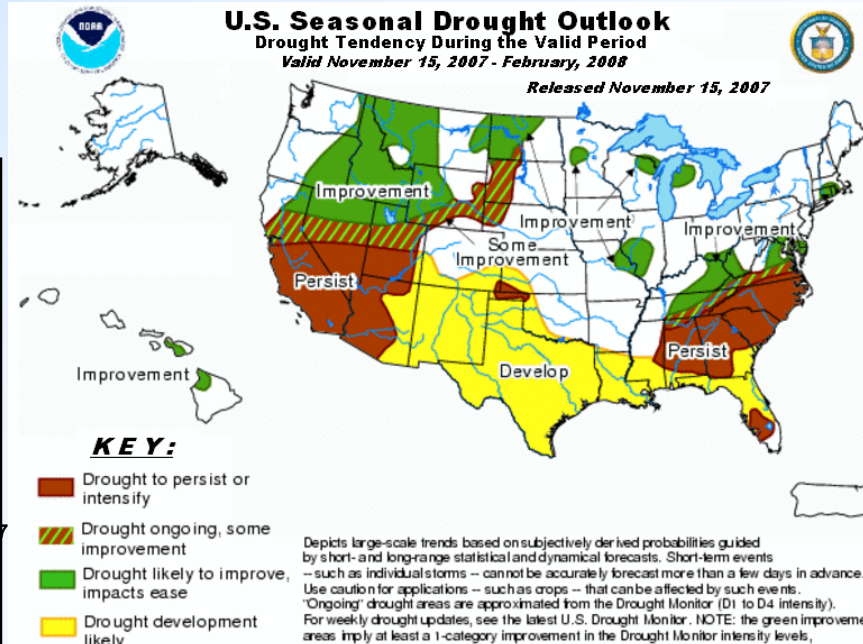


Released Thursday, November 29, 2007
Author: Brad Rippey, U.S. Department of Agriculture

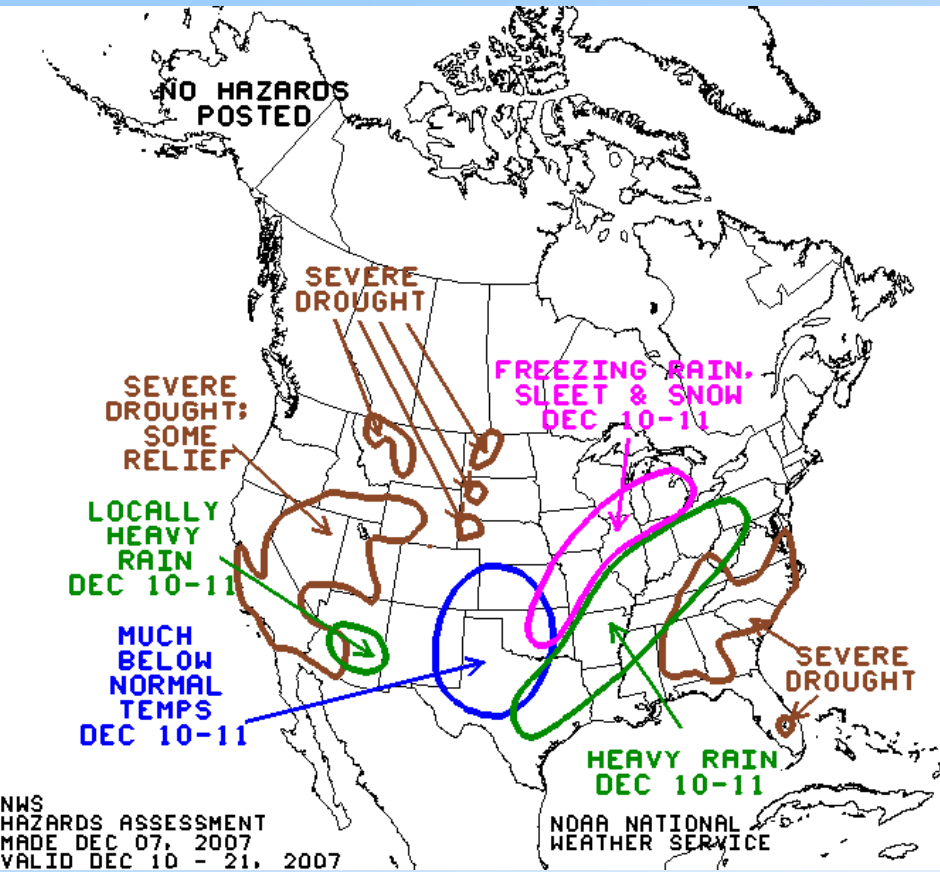
U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period
Valid November 15, 2007 - February, 2008

Released November 15, 2007



U.S. Hazards Assessment



CONTINGENCY TABLE
HEAVY PRECIPITATION HAZARDS
2002-2007

	Observed	Not observed
Forecast	2086 a	7306 b
Not forecast	41753 c	307685 d

Hit Rate, heavy
Precipitation events = $a/(a+c)$
= # hits/(# fcst and obs)
= 0.05

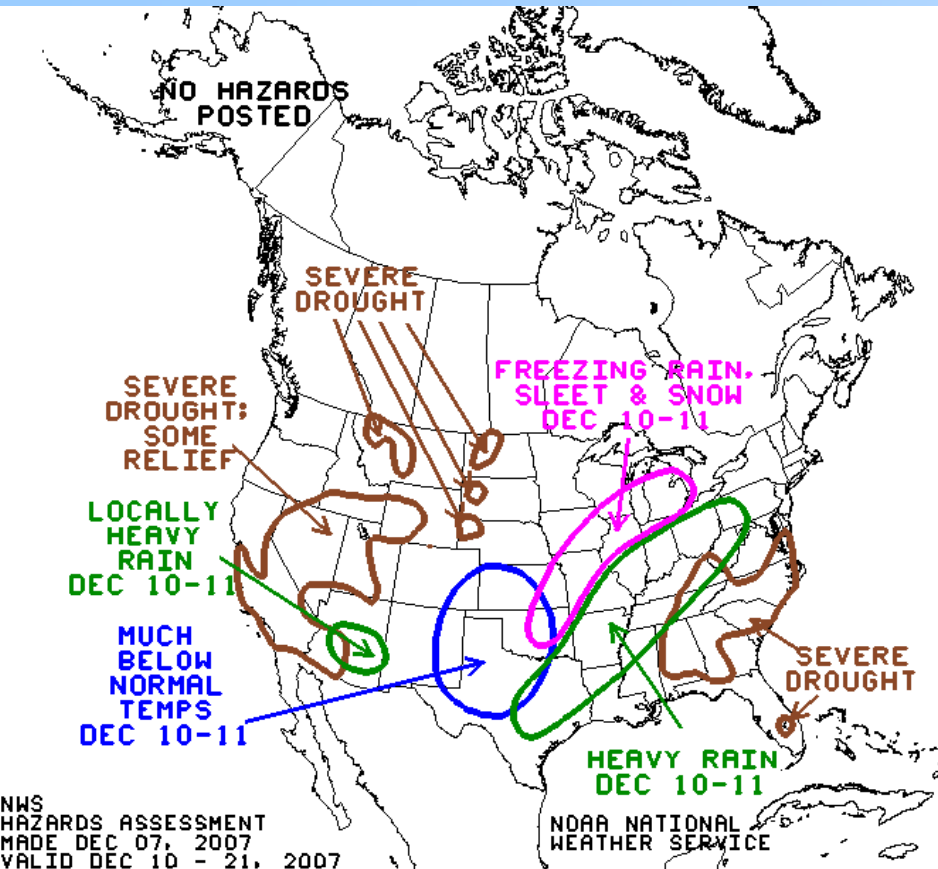
False Alarm rate, heavy
Precipitation events = $b/(b+d)$
= # miss/(# all forecasts)
= 0.02

Bias, heavy
Precipitation events = $(a+b)/(a+c)$
= # yes fcsts/(# yes obs)
= 0.21

Heavy precipitation is defined as the greater of the 95th percentile, or 1 inch per day.

Updated each Mon-Fri, using daily GFS forecasts of extreme events.

U.S. Hazards Assessment



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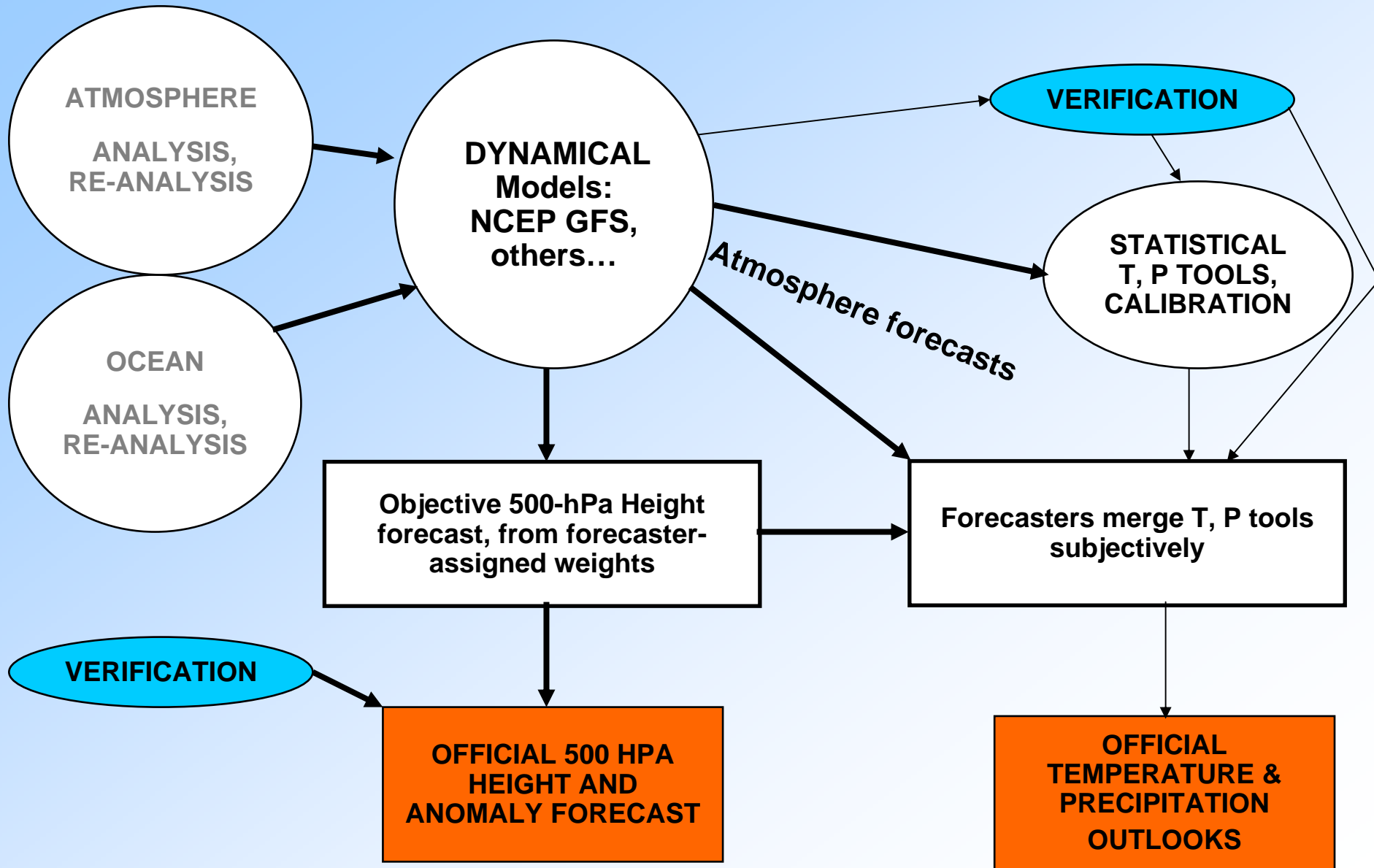
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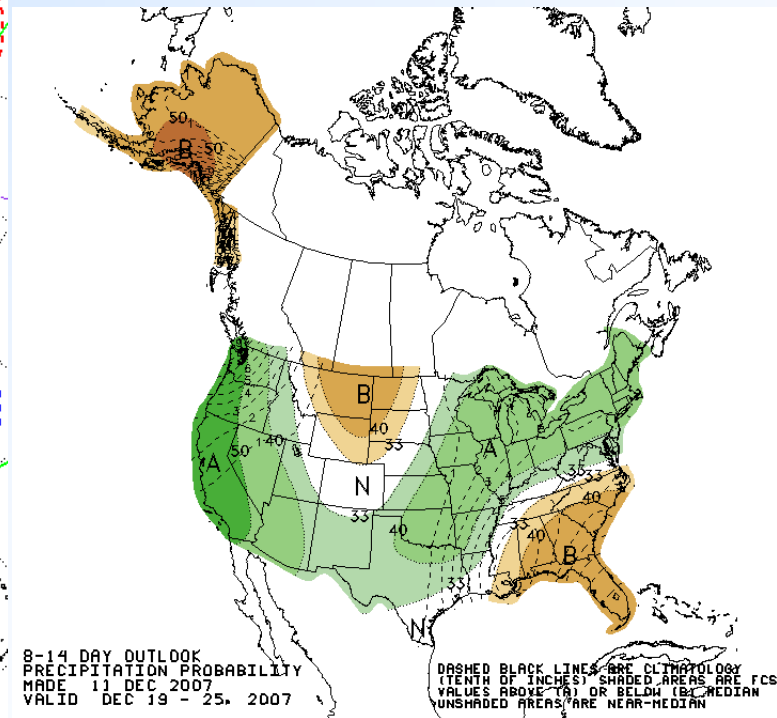
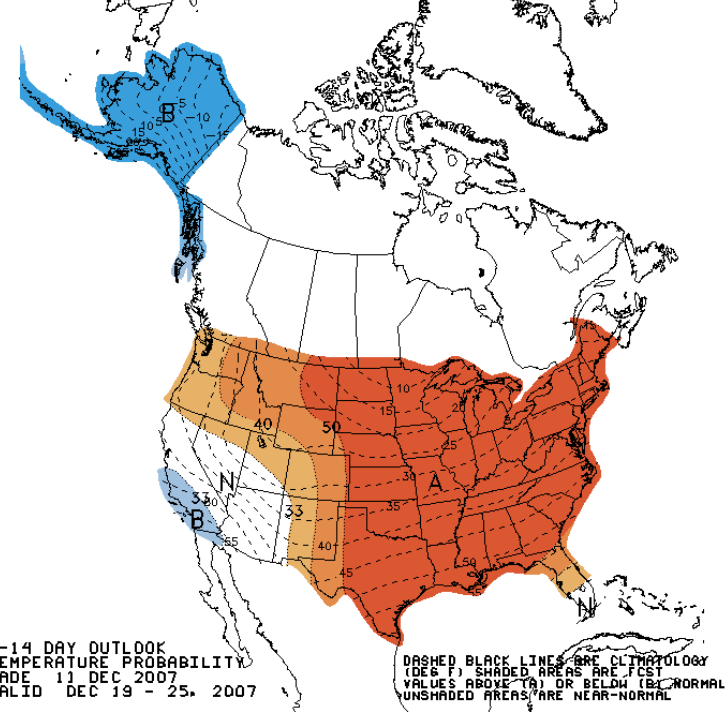
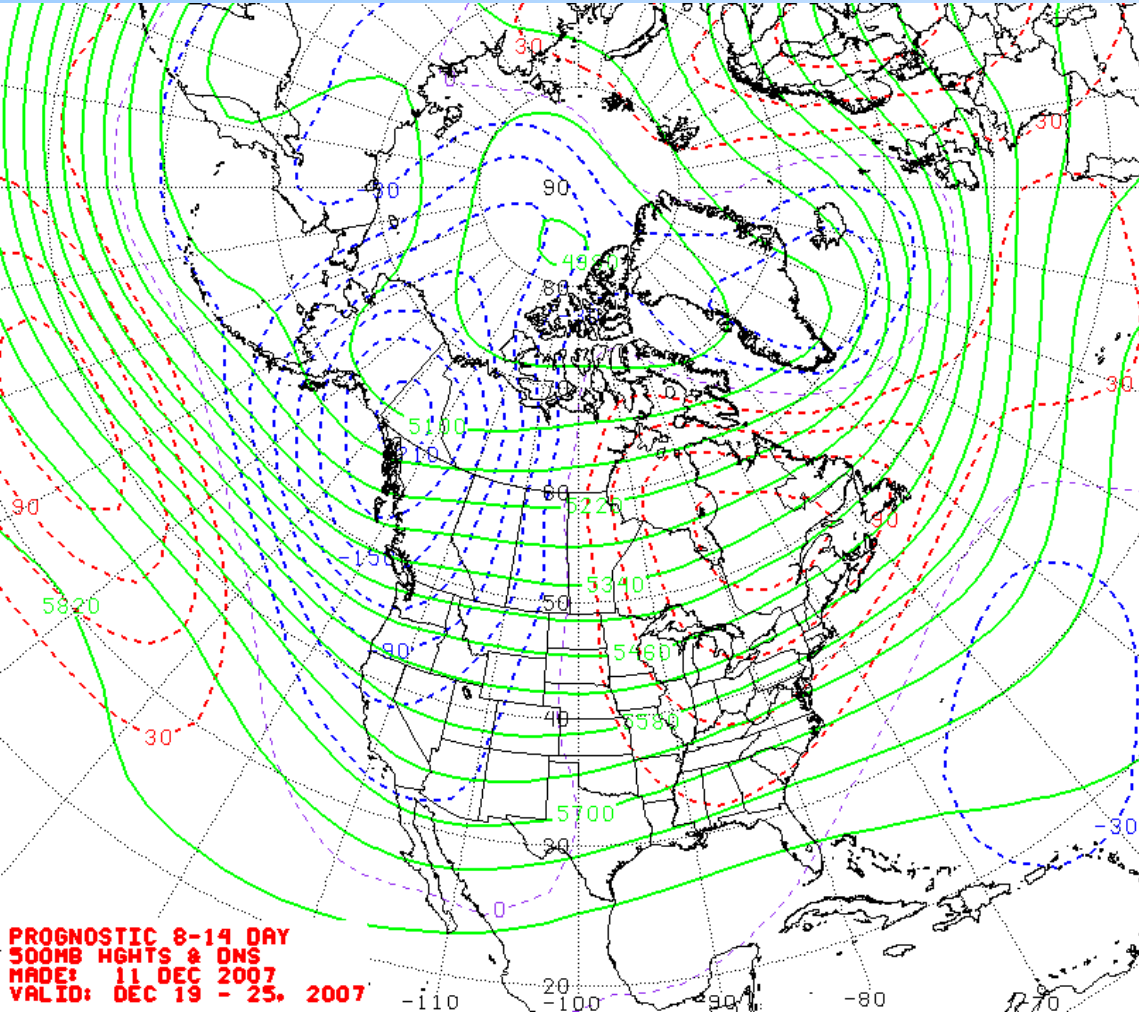
Heavy precipitation is defined as the greater of the 95th percentile, or 1 inch per day.

Updated each Mon-Fri, using daily GFS forecasts of extreme events.
Needed: Calibrated extreme event forecast probabilities from the GEFS

NCEP- CPC Extended-Range (6-10-, 8-14-Days) Forecast Operations

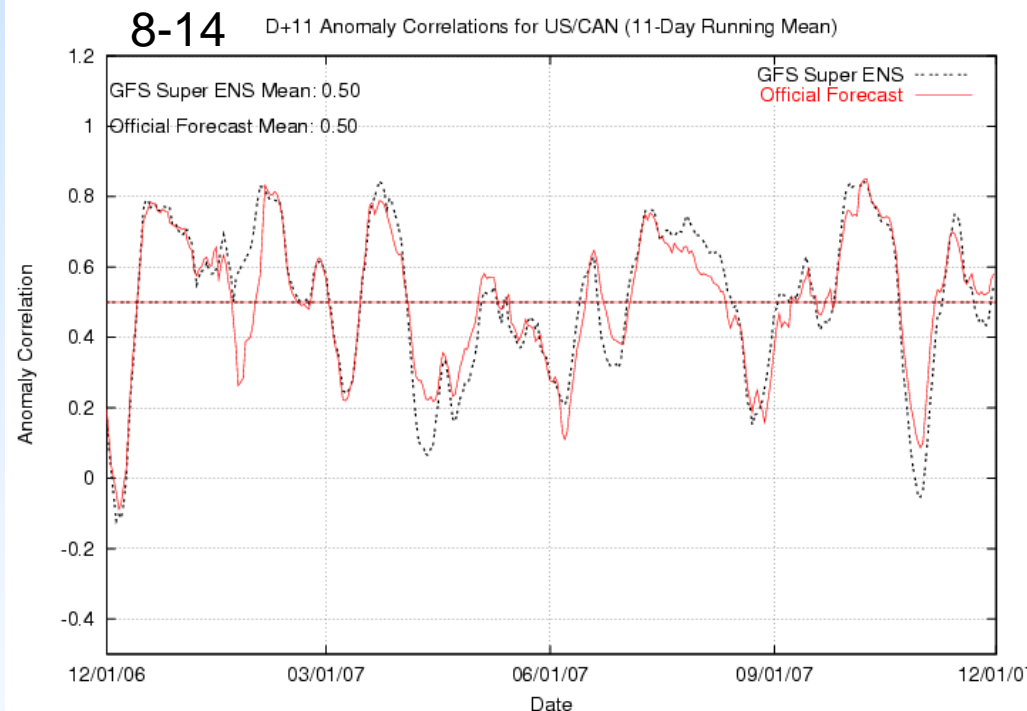
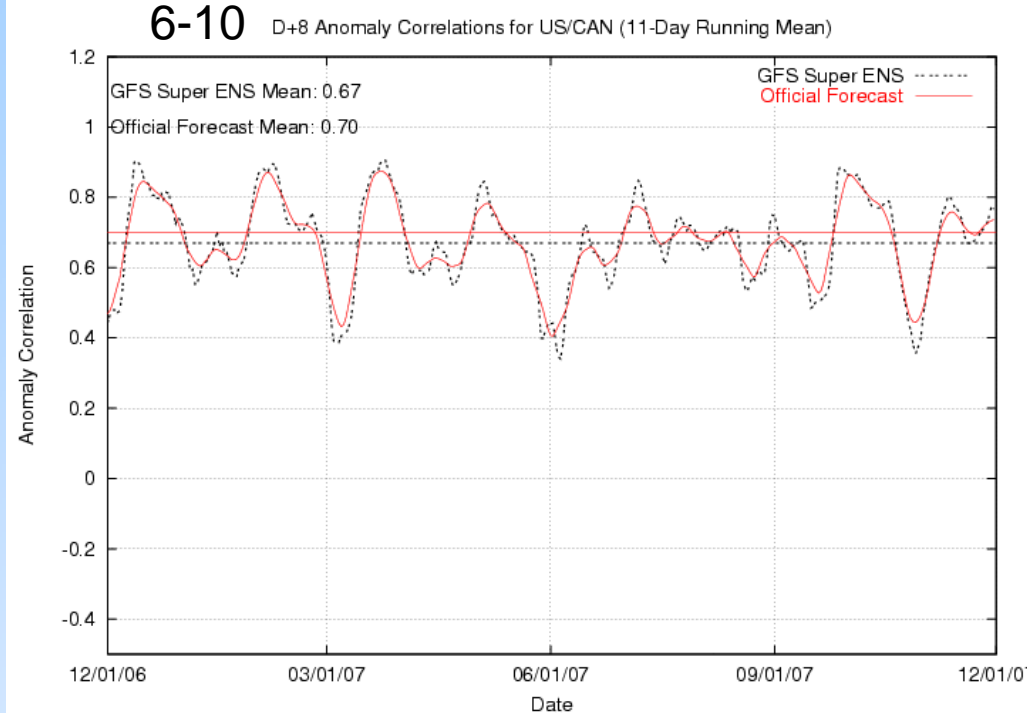


8-14-day (D+11) Forecast for Dec 19-25



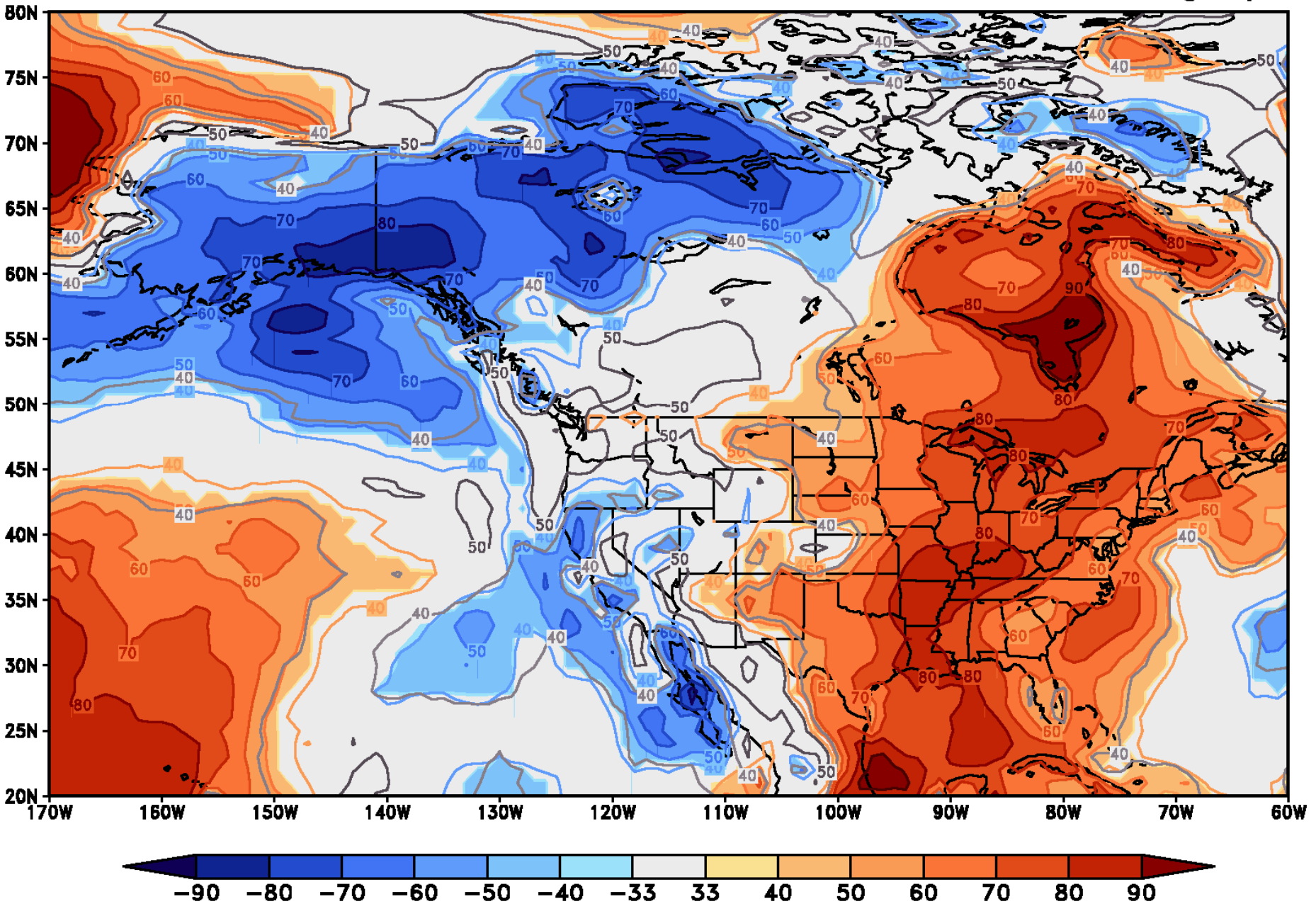
ER Z-500 AC Official, GFS

Height forecasts are made by calculating a weighted average of GFS, ECMWF, Canadian models, with weights selected by the forecaster. GFS, Canadian, ECMWF are the choices. GFS is usually the major component. No subjective modifications are made to the weighted mean by the forecaster.

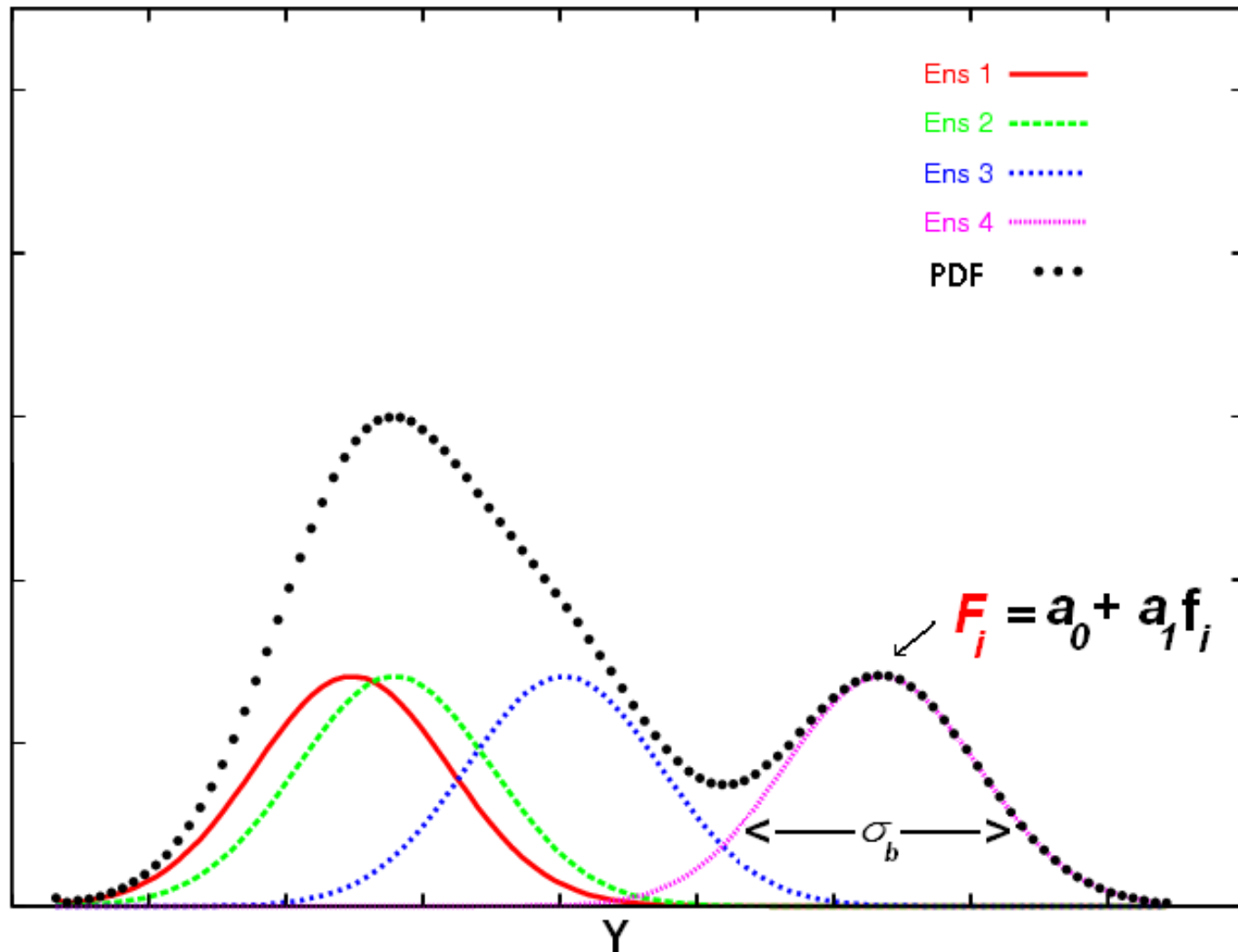


Calibration (Downscaling) is Extremely Important in Climate Forecasting

20071211.06Z NAEFS D+11 2m T Most Probable Category

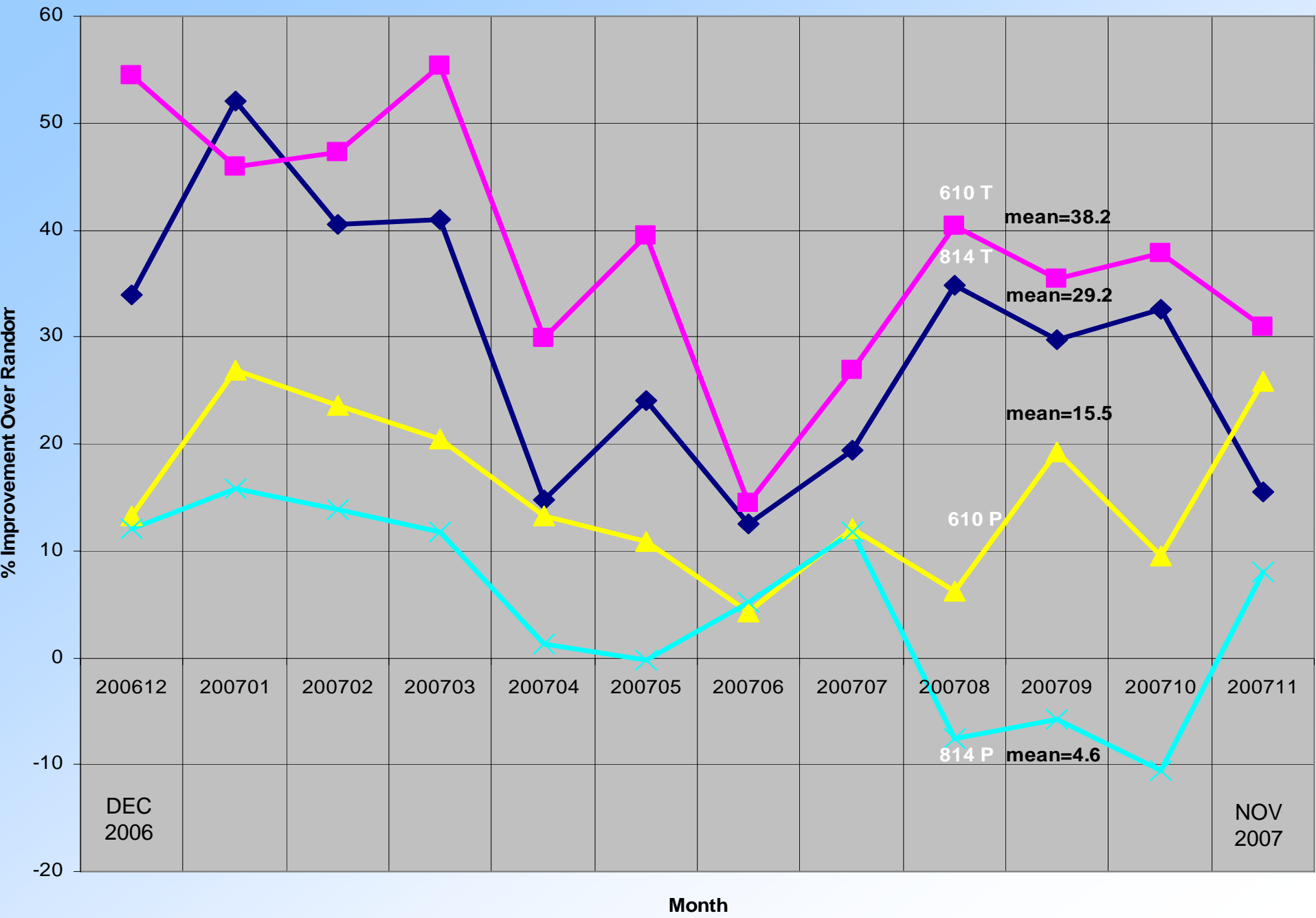


Ensemble Regression Assembles an Optimal Distribution Based on Spread of the Members and on the Skill of the Forecast system.

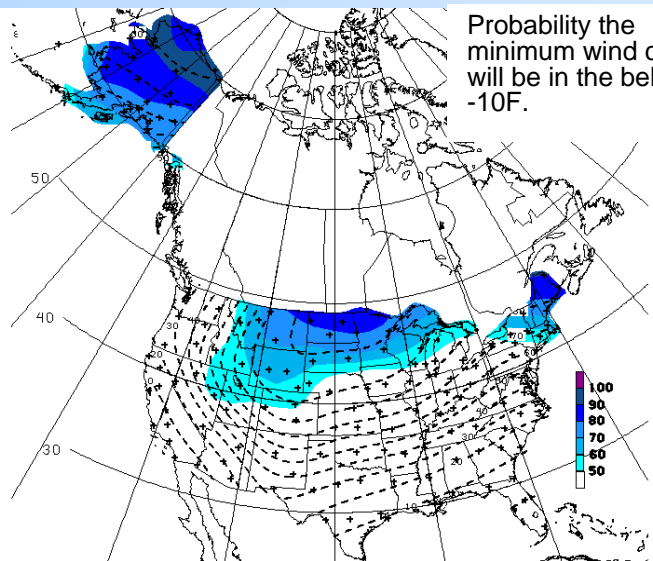
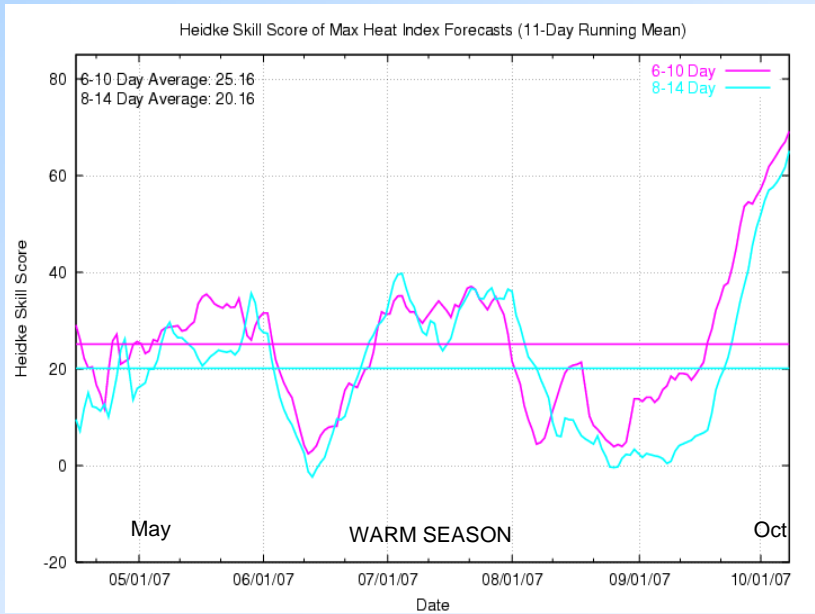
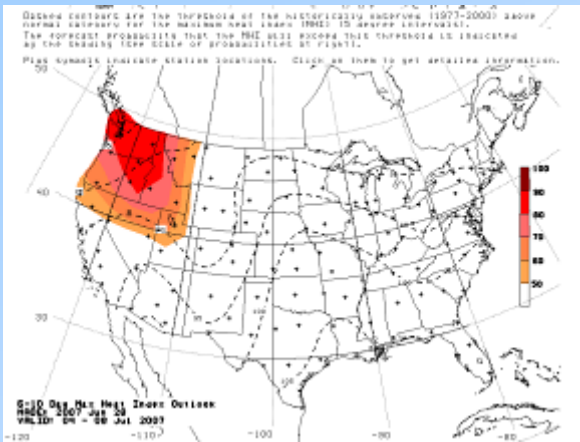


Official ER Forecast Heidke SS, 6-10-/8-14-Day T, P

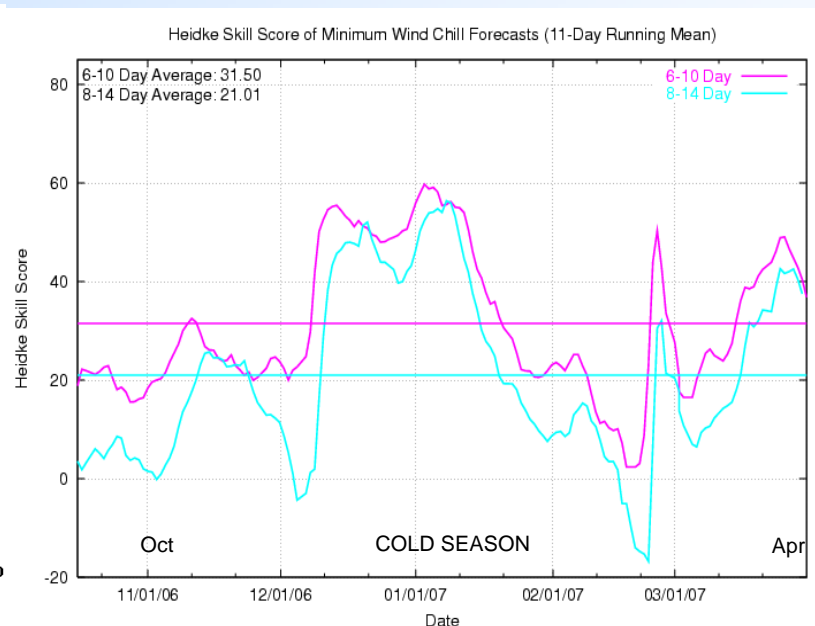
Monthly Means, Dec 2006-Nov 2007



Daily 6-10- and 8-14-day Heat Index (Wind Chill) Outlooks are prepared by calculating the heat index (wind chill) from GFS 2-meter T, RH (GFS 2-meter T, 10-meter wind) and then calibrating using 45 days of observed heat index (wind chill) and GFS forecasts.

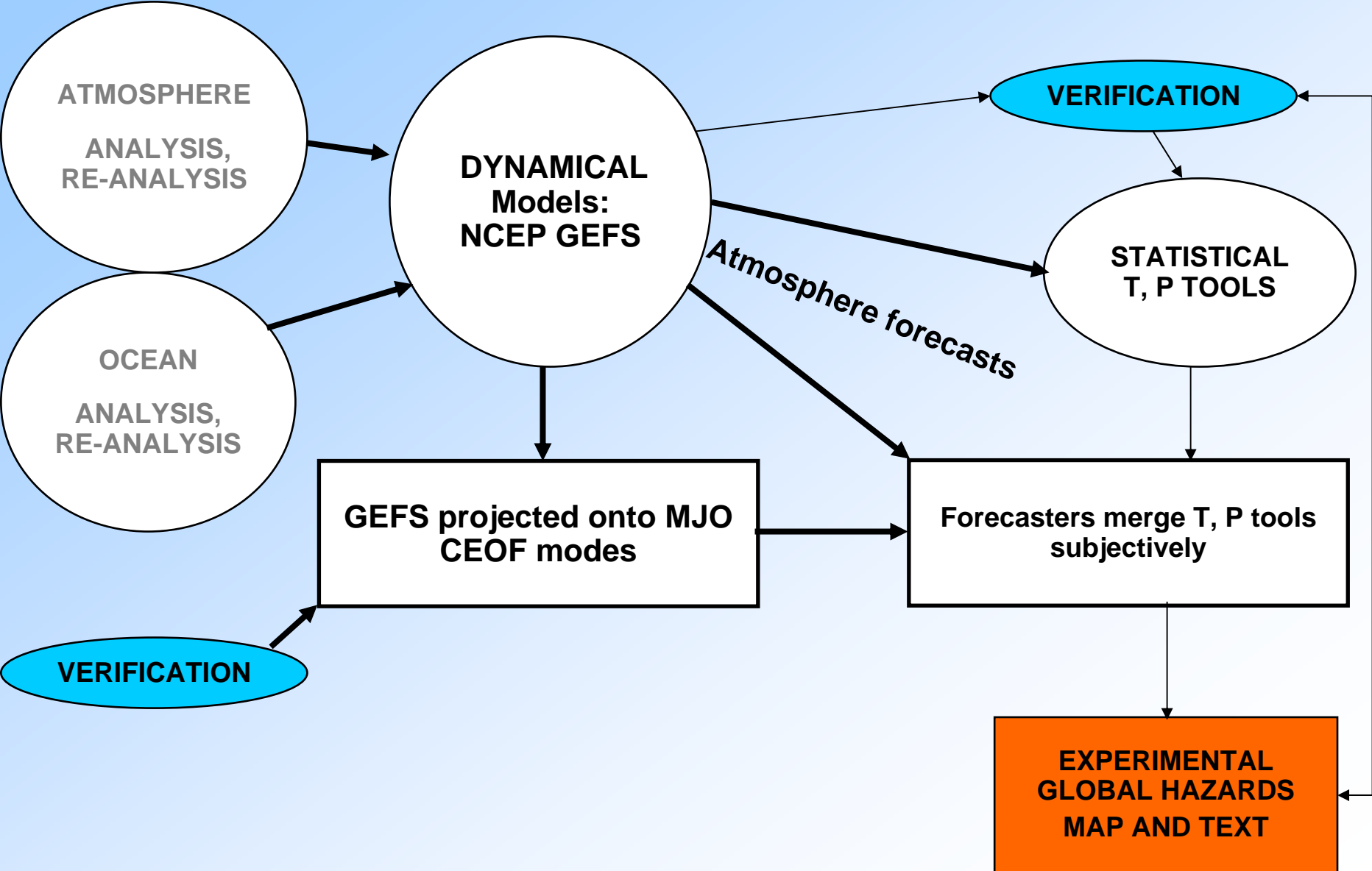


Probability the minimum wind chill will be in the below -10F.



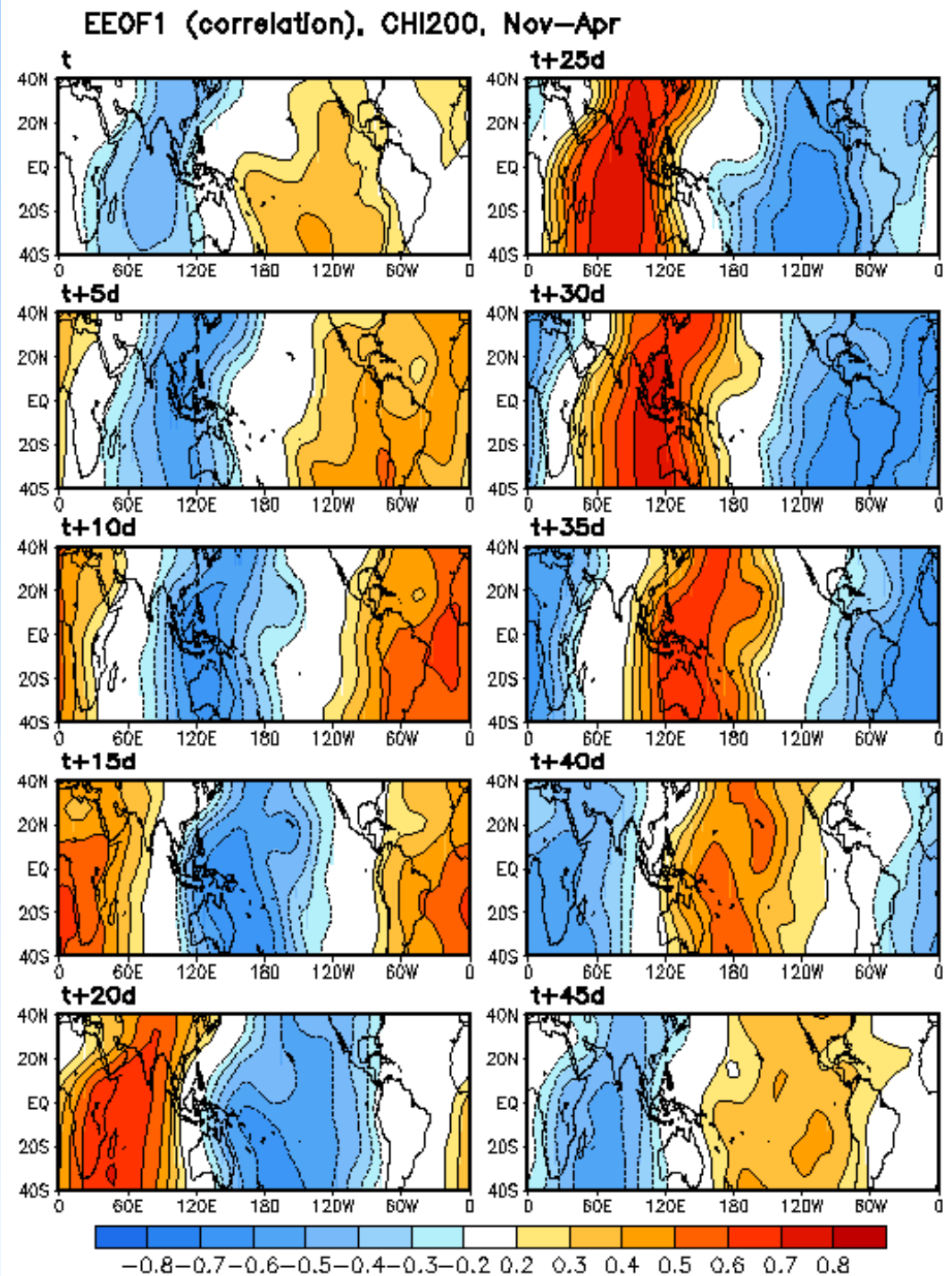
Dashed contours are the climatological (1977-2000) probability that the minimum wind chill will be less than or equal to 10 deg F. Shaded lines give the forecast probability of the minimum wind chill being less than or equal to 10

NCEP- CPC Intra-Seasonal Forecast Operations

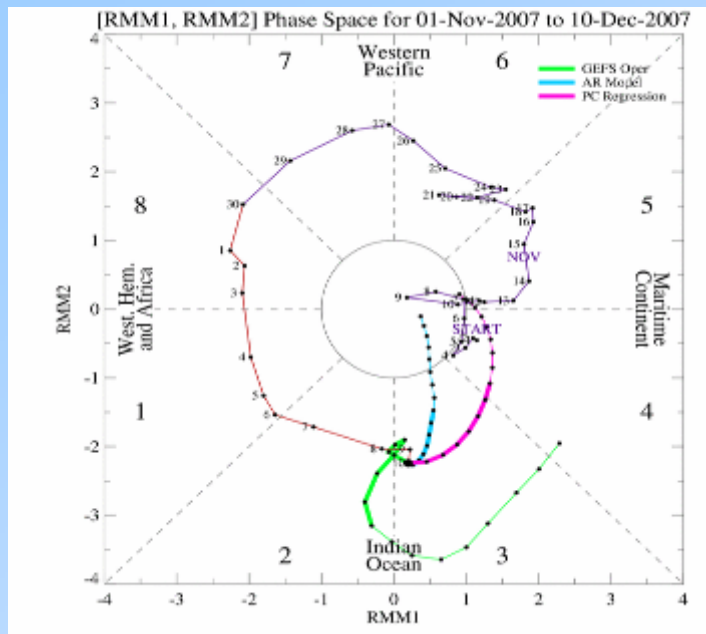


Experimental MJO Forecasts

Daily GEFS
forecasts are
projected onto
modes resulting
from a CEOF
analysis of U200,
U850, OLR.



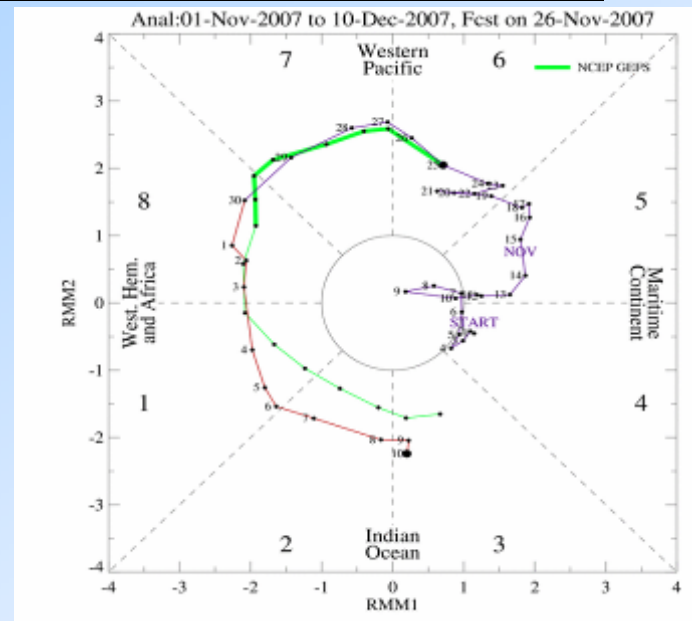
GEFS Based MJO Forecast Tool



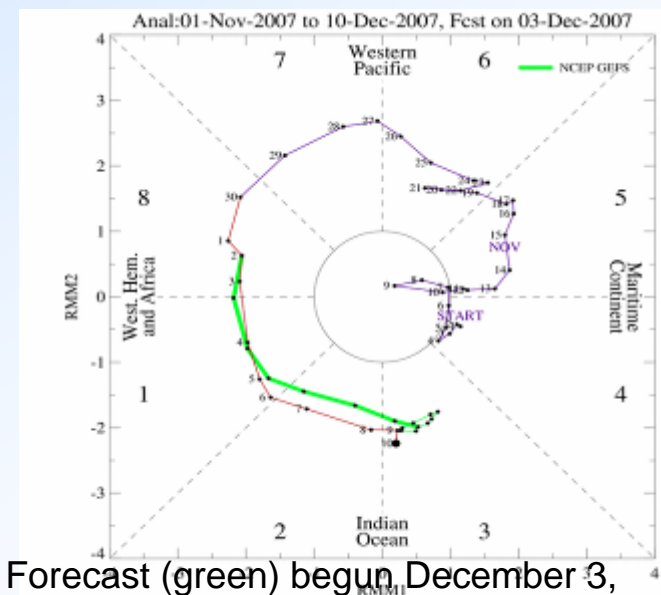
Current GEFS MJO index forecast

Used as part of weekly CPC MJO weekly update and hazard assessment products. Recently, GEFS MJO forecasts have been remarkably accurate.

Recent MJO Event Verification



Forecast (green) begun Nov 26, 2007. Others are observations.



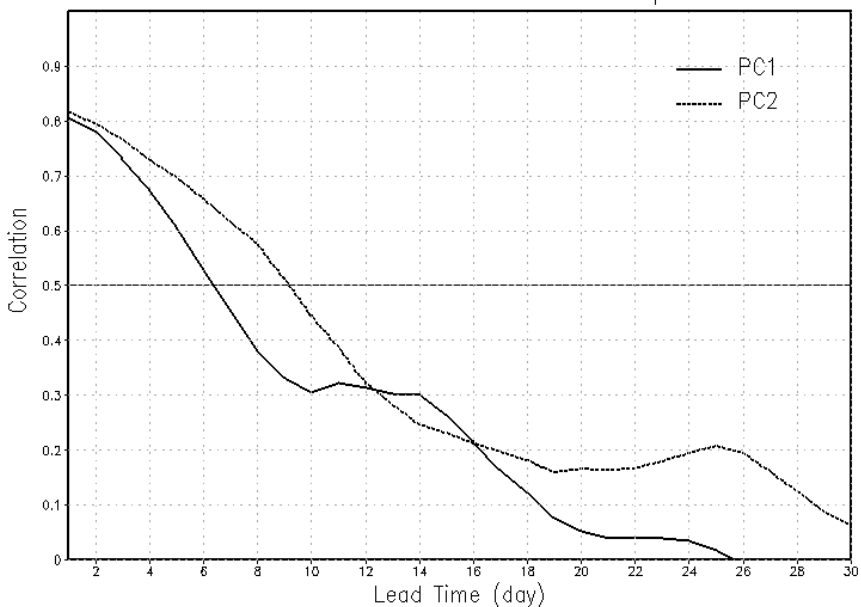
Forecast (green) begun December 3, 2007

Verification, January-September, 2007

The success of the GFS in forecasting the latest MJO reflects, in part, the impact of the information in the initialization. Ensemble Regression can be applied to the ensemble members.

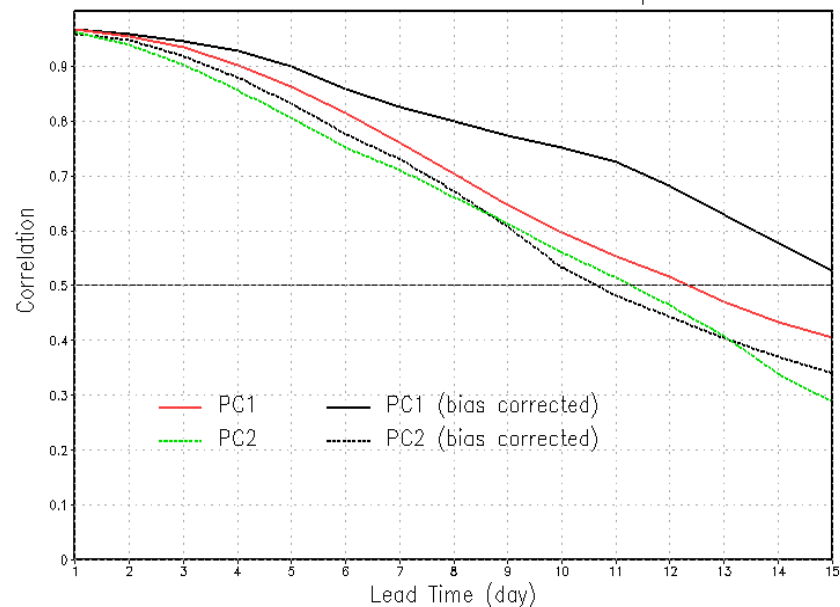
CFS

CFSOP Forecast Skill for 01Jan2007–30Sep2007



GFS

GFSOP Forecast Skill for 01Jan2007–30Sep2007



Weekly MJO Update

Global Tropics Hazards/Benefits Assessment



Madden-Julian Oscillation: Recent Evolution, Current Status and Predictions

Update prepared by
Climate Prediction Center / NCEP
December 3, 2007

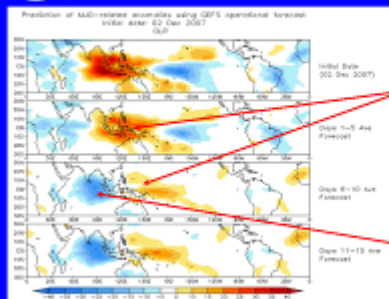


Overview

- The MJO has strengthened to a moderate level during the past week.
- The enhanced phase has shifted eastwards and is now centered in the western hemisphere while large-scale suppressed convection is evident across much of the eastern hemisphere.
- Forecast tools, both statistical and dynamical, indicate continued propagation of the MJO at moderate strength for at least the next week with enhanced convection slowly shifting into the Indian Ocean by week 2.
- Likely near-term impacts across the global tropics include wet conditions for northeast South America and central and southeast Africa. Dry conditions can be expected from the eastern Maritime continent into the western Pacific Ocean.
- Other than the short-term cold across eastern areas, MJO associated impacts for the US are expected to be minimal during the upcoming week.



Experimental GFS MJO OLR Forecast

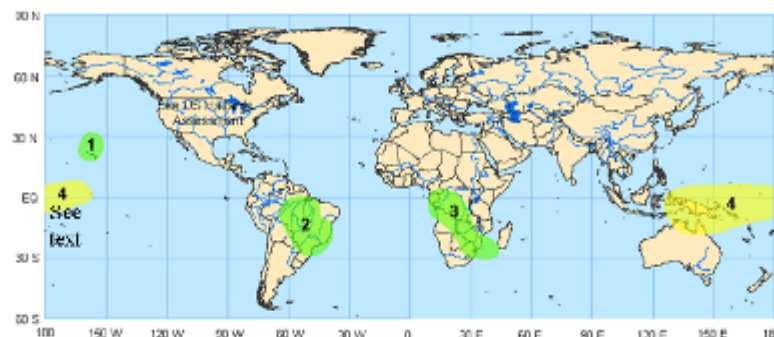


The GFS forecasts a moderate MJO for the coming 1-2 weeks with suppressed convection impacting the Maritime continent and the western Pacific Ocean during much of the period.

Wet conditions are expected across northeast South America early in the period while convection is forecast to enter the Indian Ocean during week 2.

Issued: 12/3

Week 1 Outlook – Valid: December 4 – 10, 2007



1. An increased chance for above average rainfall for Hawaii and nearby waters mainly to the north. An upper-level cutoff low is expected to become established to the west-southwest of the Hawaiian Islands and result in rather persistent surface low pressure and so the potential for enhanced rainfall in this region during the period. **Confidence: High**

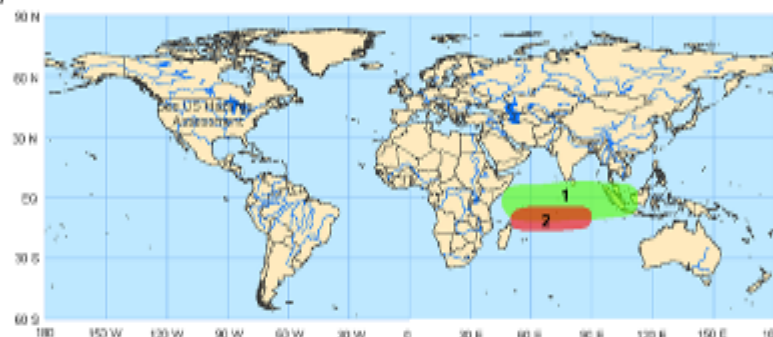
2. An increased chance for above average rainfall for east central Brazil. Low-latitude frontal systems and a large-scale environment favorable for convection associated with the MJO is expected to continue to produce beneficial rains across this region during the period. **Confidence: High**

3. An increased chance for above average rainfall for sections of interior and southern Africa. The enhanced phase of the MJO will produce a favorable environment for convection especially across interior Africa. Southern hemisphere frontal activity will likely increase the flow of moisture southeast towards southern Africa resulting in enhanced rainfall during the period. **Confidence: High**

4. An increased chance for below-average rainfall for the eastern Maritime continent, northern Australia, and the western Pacific Ocean. The suppressed phase of the MJO and cool sea surface temperatures associated with La Niña is expected to result in drier-than-average conditions across this region. **Confidence: High**

Issued: 12/3

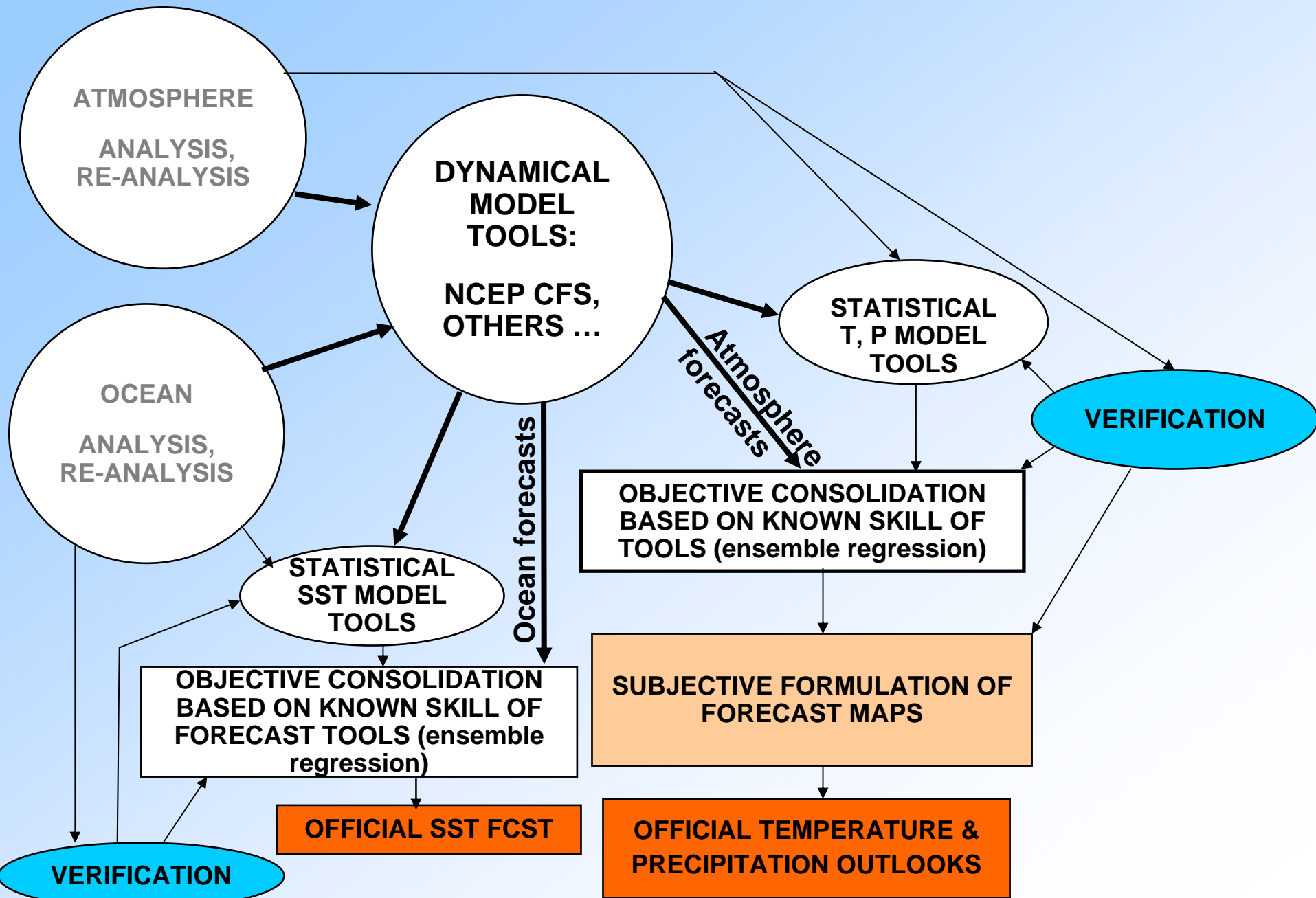
Week 2 Outlook – Valid: December 11 – 17, 2007



1. An increased chance for above-average rainfall for the equatorial Indian Ocean and western Maritime continent. The enhanced phase of the MJO is expected to continue shifting eastward during the period and provide a favorable large-scale environment for convection in this region. **Confidence: High**

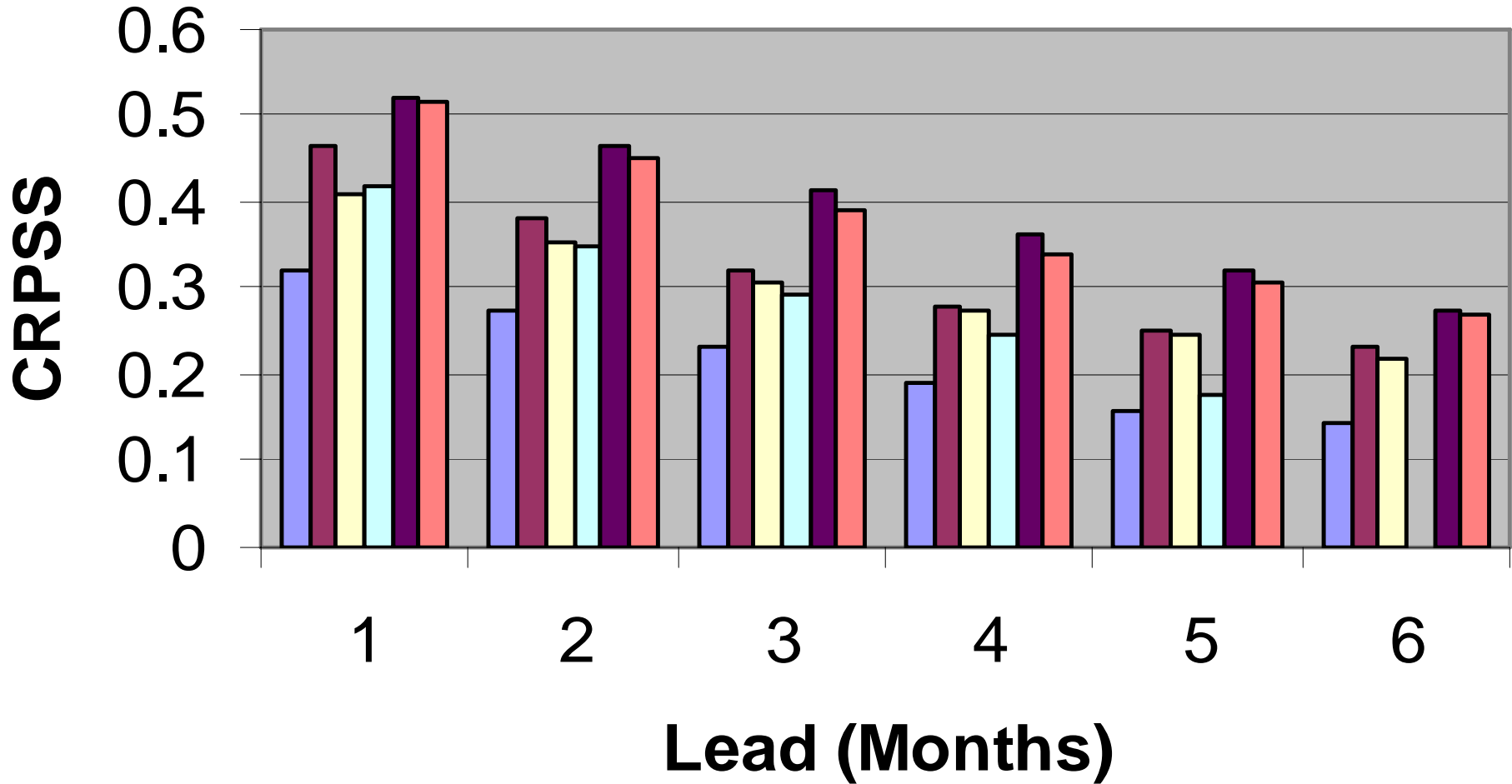
2. Favorable conditions exist for tropical cyclogenesis across the western Indian Ocean. The enhanced phase of the MJO is expected to result in active convection in this region and result in a greater likelihood for low-level westerly flow, upper-level divergence, and other factors favorable for tropical development. Sea surface temperatures are also warmer than average in this region. **Confidence: High**

NCEP- CPC Seasonal Forecast Operations



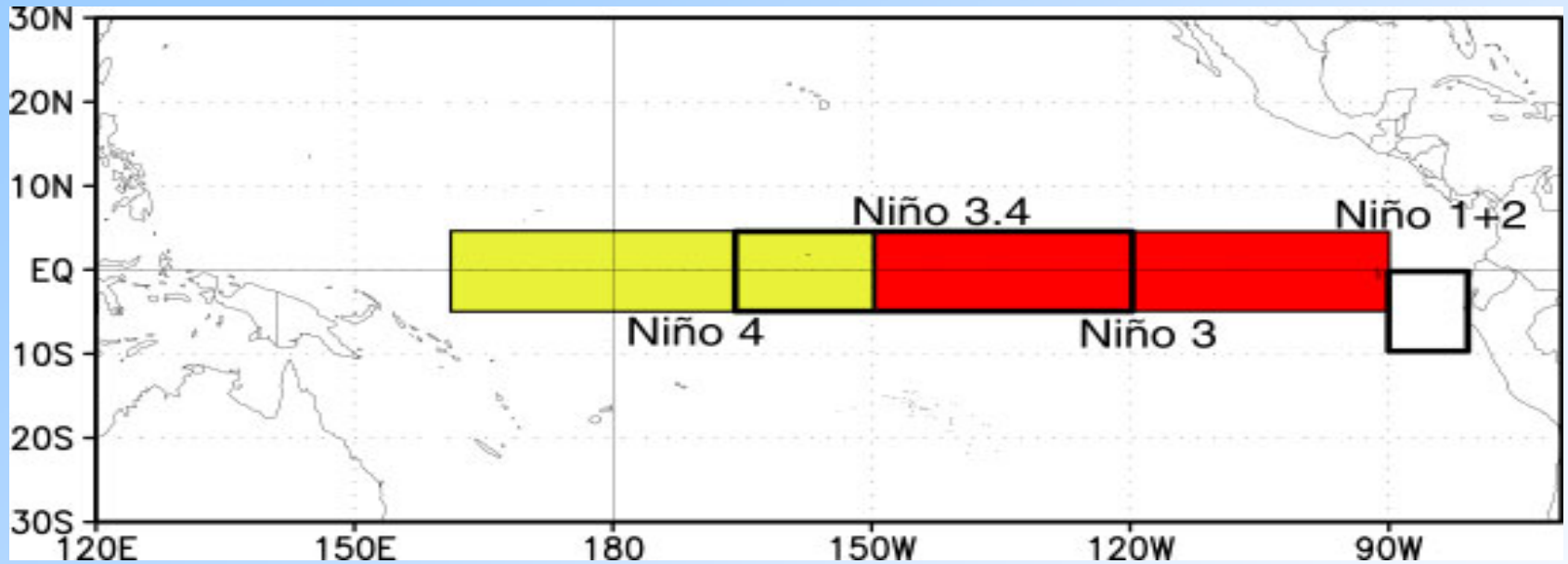
CFS Nino 3.4 SST Forecasts 1995-2006

Ensemble Regression Calibration Improves CFS SST Forecasts



CCA CA MKV CFS-Uncal CFS ALL

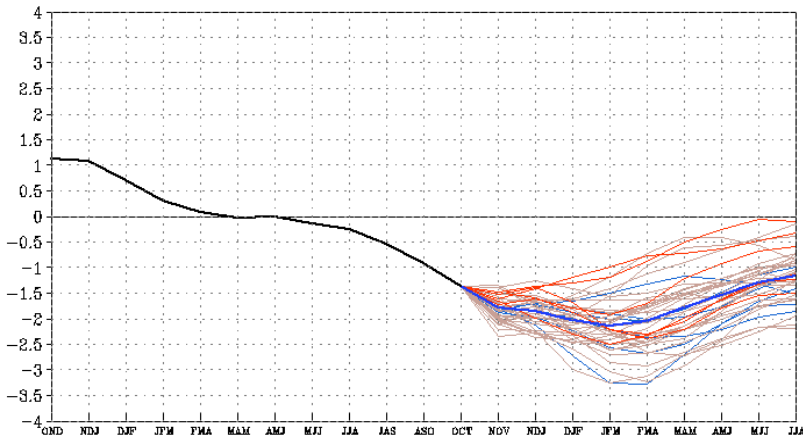
CFS & Official SST Forecasts



NWS/NCEP

Last update: Fri Nov 9 2007
Initial conditions: 13Oct2007-01Nov2007

Forecast Niño3.4 SST anomalies from CFS



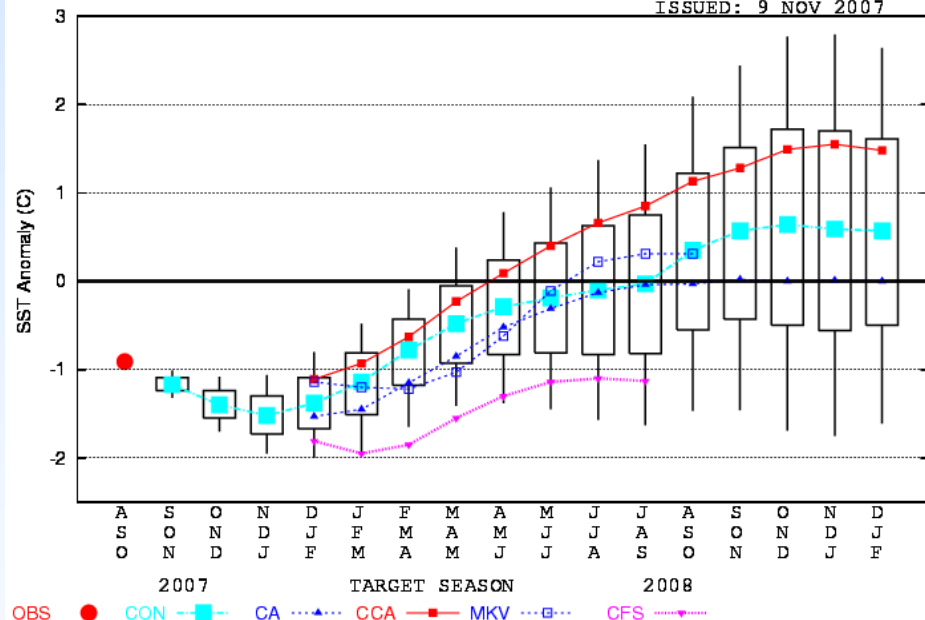
- Latest 6 forecast members
- Forecast ensemble mean
- Earliest 8 forecast members
- OIv2 observation
- Other forecast members

Forecast initial conditions: 13Oct2007 to 01Nov2007.

Base period for climatology is 1971-2000. Base period for bias correction is 1982-2003.

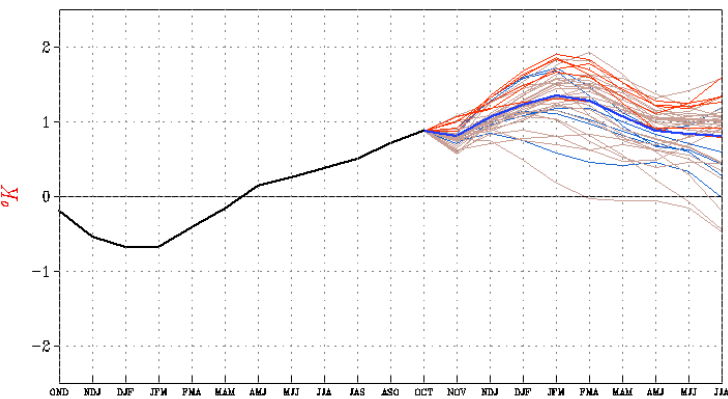
SST CONSOLIDATION NINO 3.4

ISSUED: 9 NOV 2007



- OBS ●
- CON ■
- CA ▲
- CCA ■
- MKV ▲
- CFS ▲

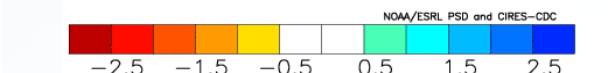
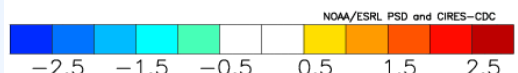
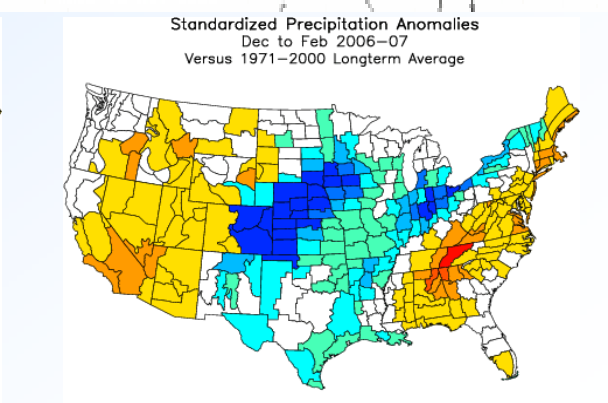
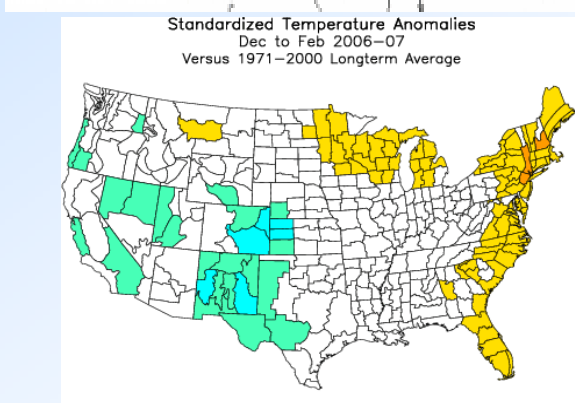
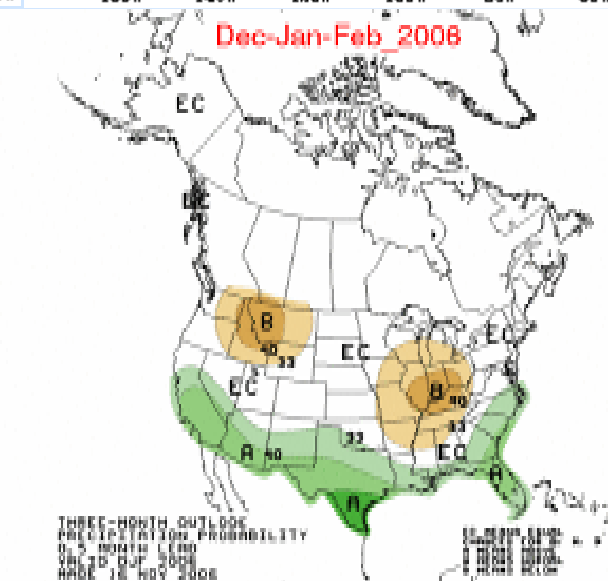
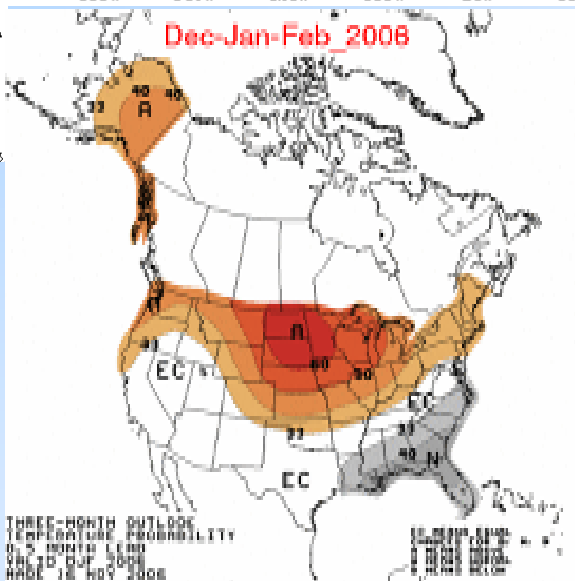
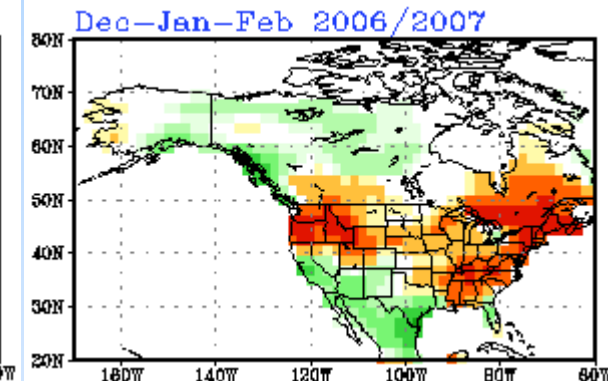
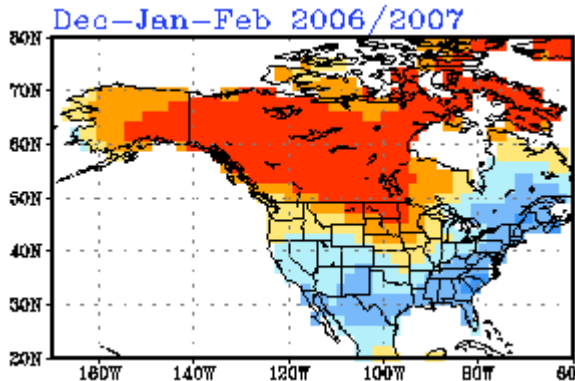
Forecast Nino3.4 SST anomalies from CFS



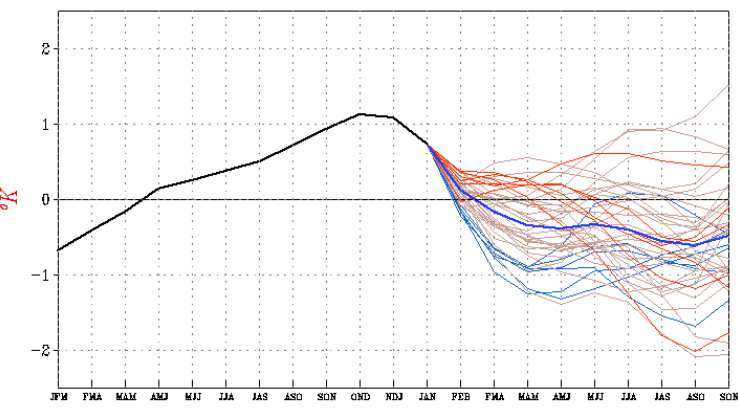
— Latest 6 forecast members — Forecast ensemble mean
— Earliest 6 forecast members — OIv2 observation
— Other forecast members

Forecast initial conditions: 13Oct2006 to 01Nov2006.

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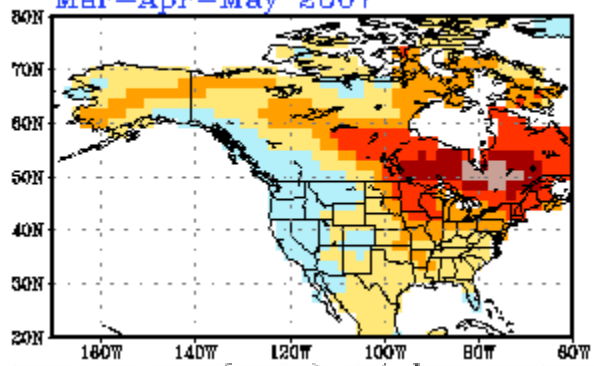
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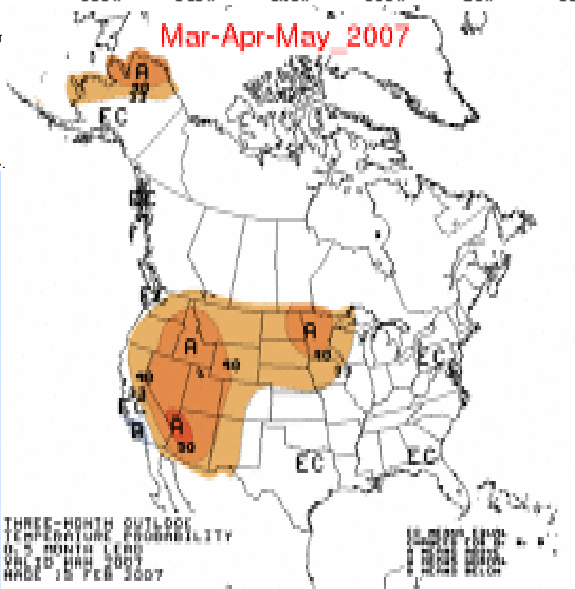
— Latest 8 forecast members — Forecast ensemble mean
 — Earliest 8 forecast members — OIv2 observation
 — Other forecast members

Forecast initial conditions: 13Jan2007 to 01Feb2007.
 Base period for climatology is 1971–2000. Base period for bias correction is 1982–2003.

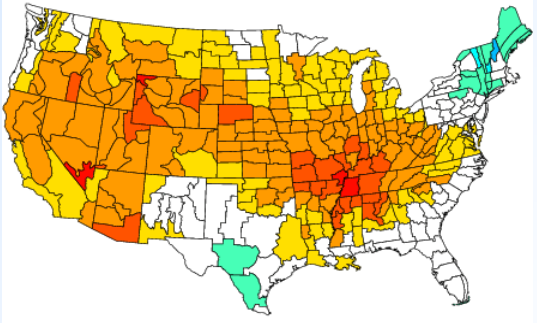
Mar-Apr-May 2007



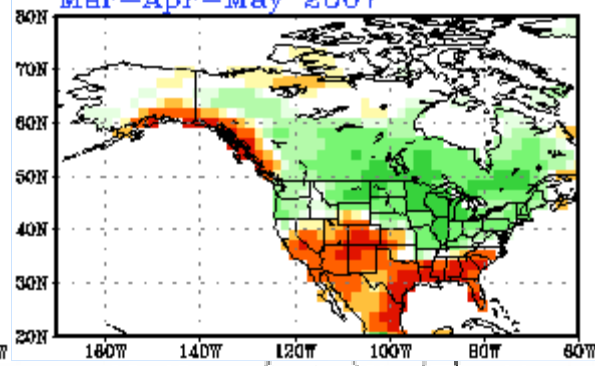
Mar-Apr-May 2007



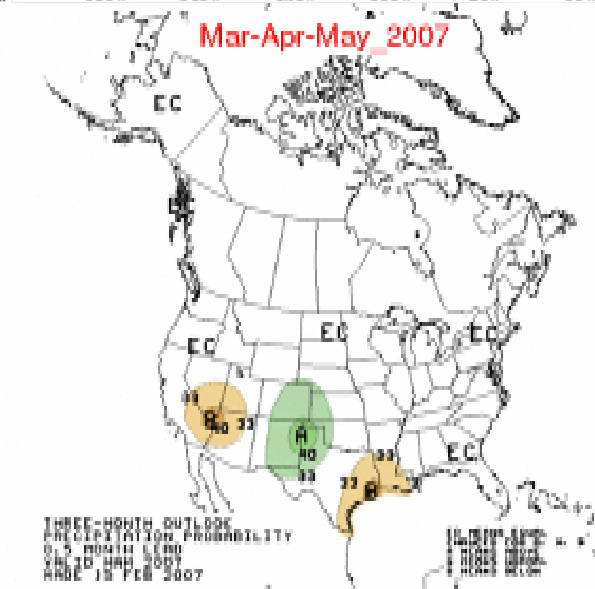
Standardized Temperature Anomalies
 Mar to May 2007
 Versus 1971–2000 Longterm Average



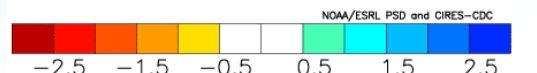
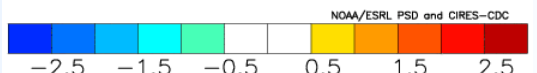
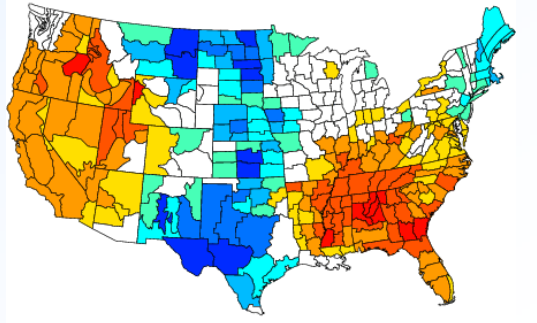
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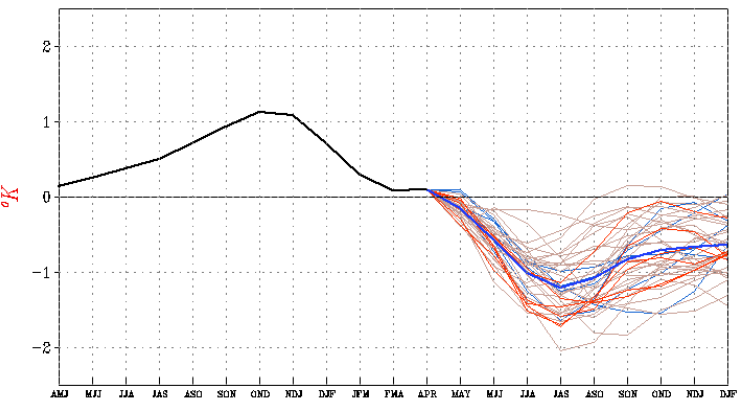
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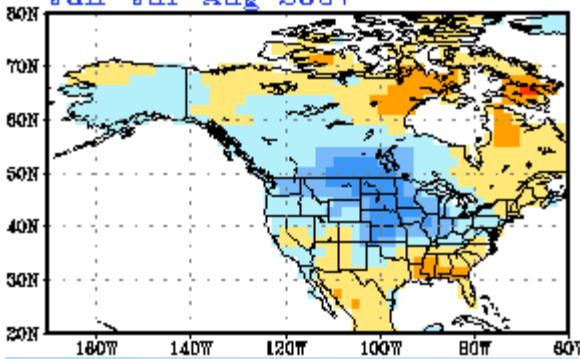


- Latest 6 forecast members
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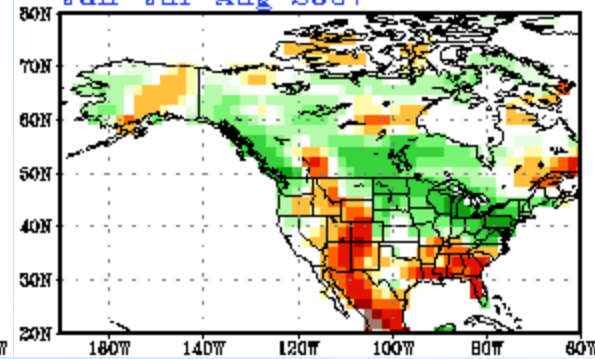
Forecast initial conditions: 12Apr2007 to 01May2007.

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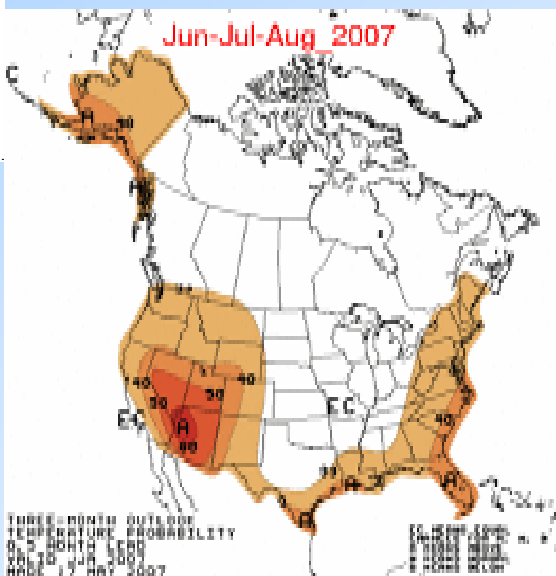
Jun-Jul-Aug 2007



Jun-Jul-Aug 2007



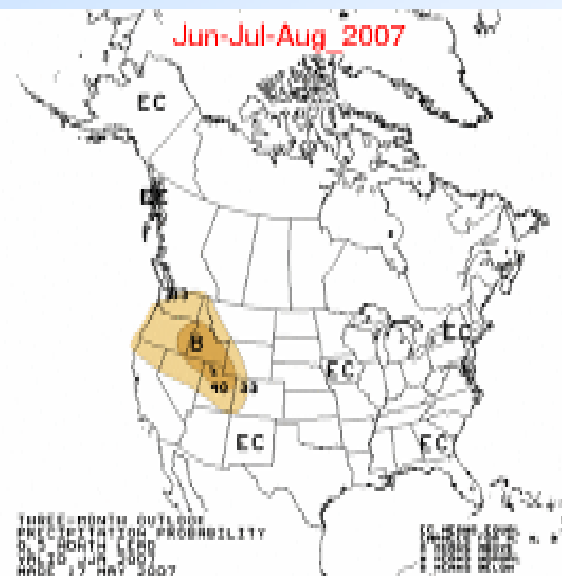
Jun-Jul-Aug 2007



THREE-MONTH OUTLOOK
TEMPERATURE PROBABILITY
0% 10% 20% 30%
40% 50% 60%
70% 80% 90%
HML 17 MAY 2007

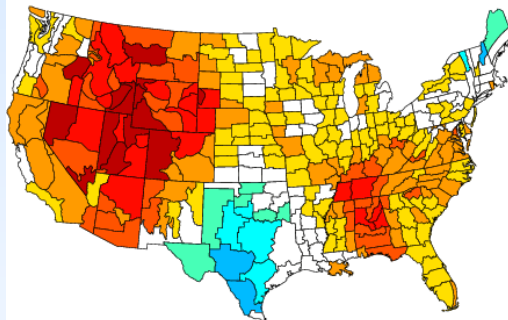
Standardized Temperature Anomalies
Jun to Aug 2007
Versus 1971–2000 Longterm Average

Jun-Jul-Aug 2007

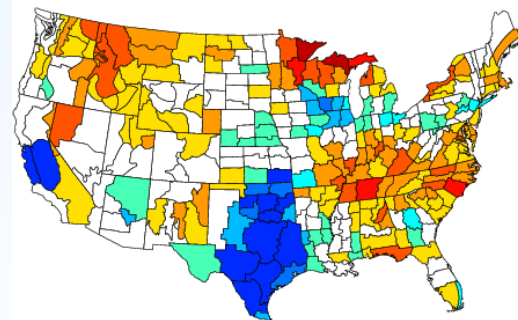
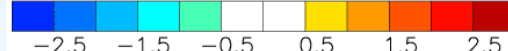


THREE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
0% 10% 20% 30%
40% 50% 60%
70% 80% 90%
HML 17 MAY 2007

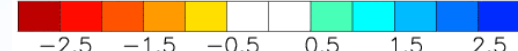
Standardized Precipitation Anomalies
Jun to Aug 2007
Versus 1971–2000 Longterm Average



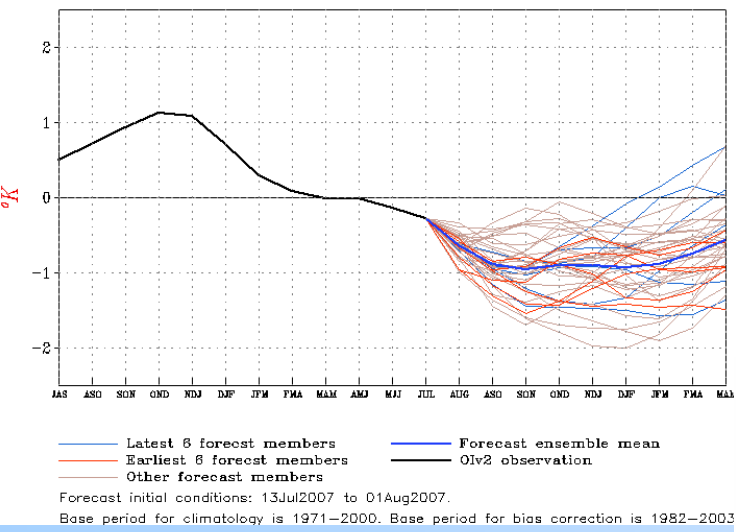
NOAA/ESRL PSD and CIRES-CDC



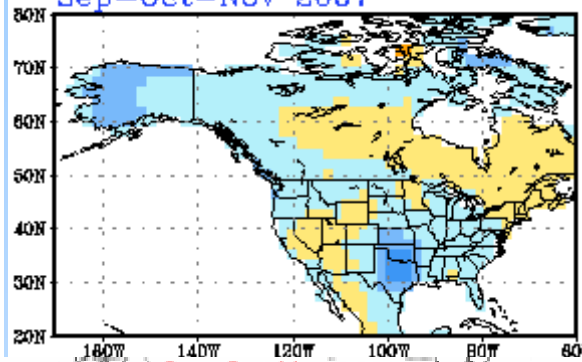
NOAA/ESRL PSD and CIRES-CDC



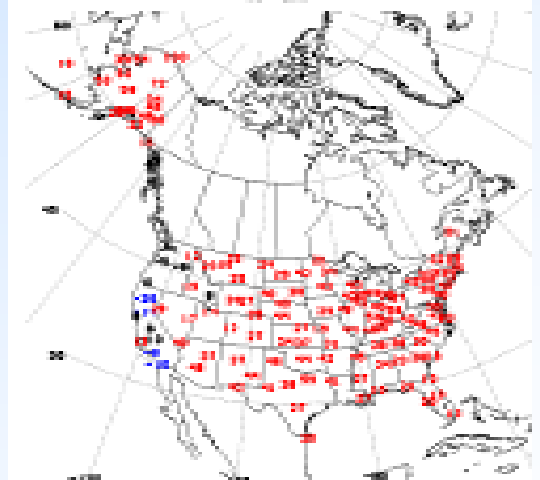
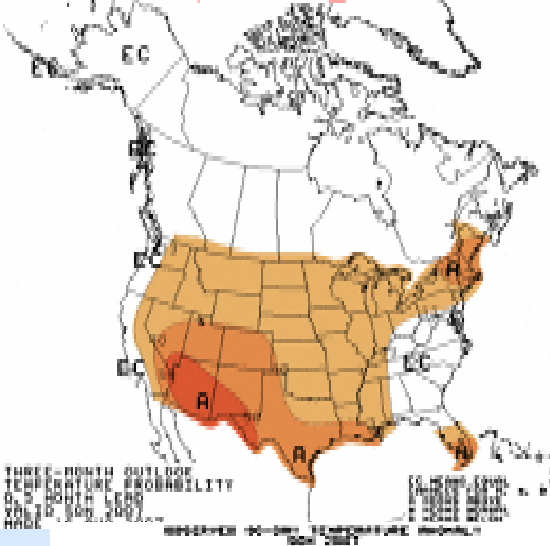
Forecast Nino3.4 SST anomalies from CFS



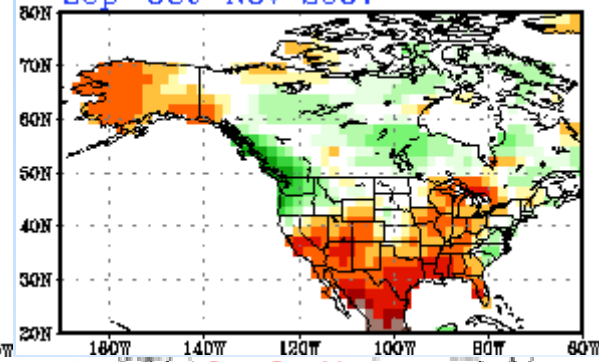
Sep-Oct-Nov 2007



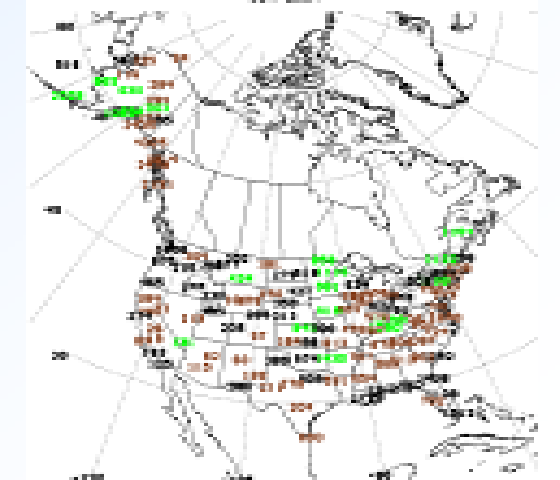
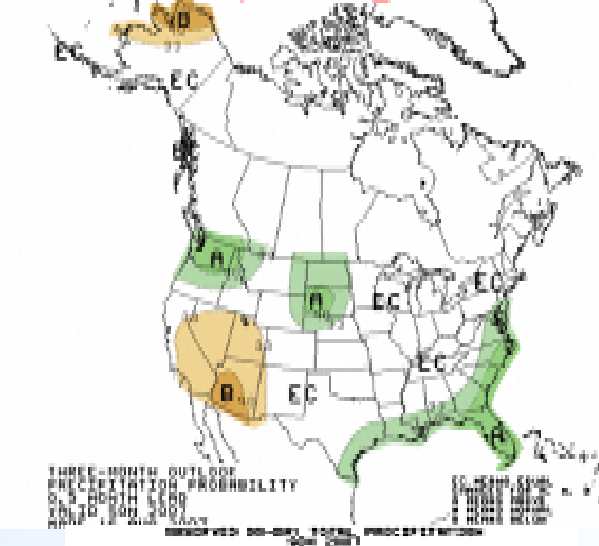
Sep-Oct-Nov 2007



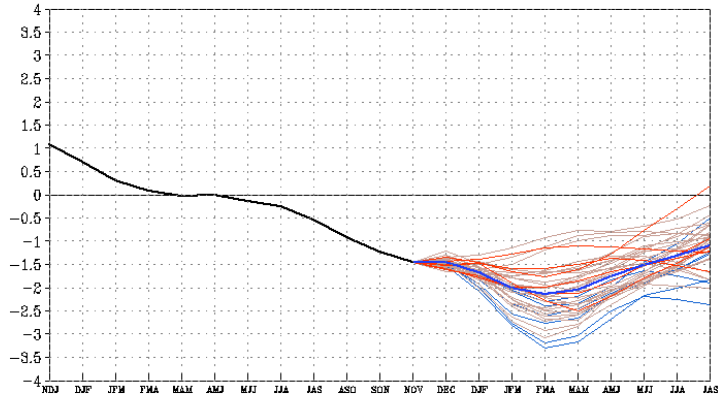
Sep-Oct-Nov 2007



Sep-Oct-Nov 2007



Forecast Nino3.4 SST anomalies from CFS

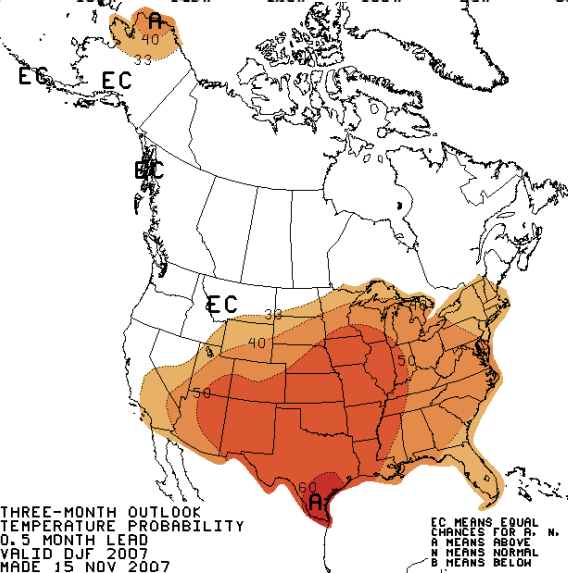
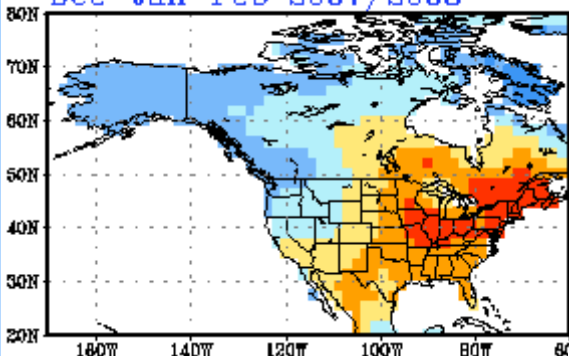


— Latest 6 forecast members — Forecast ensemble mean
— Earliest 6 forecast members — OIv2 observation
— Other forecast members

Forecast initial conditions: 14Nov2007 to 03Dec2007.

Base period for climatology is 1971–2000. Base period for bias correction is 1982–2003.

Dec-Jan-Feb 2007/2008



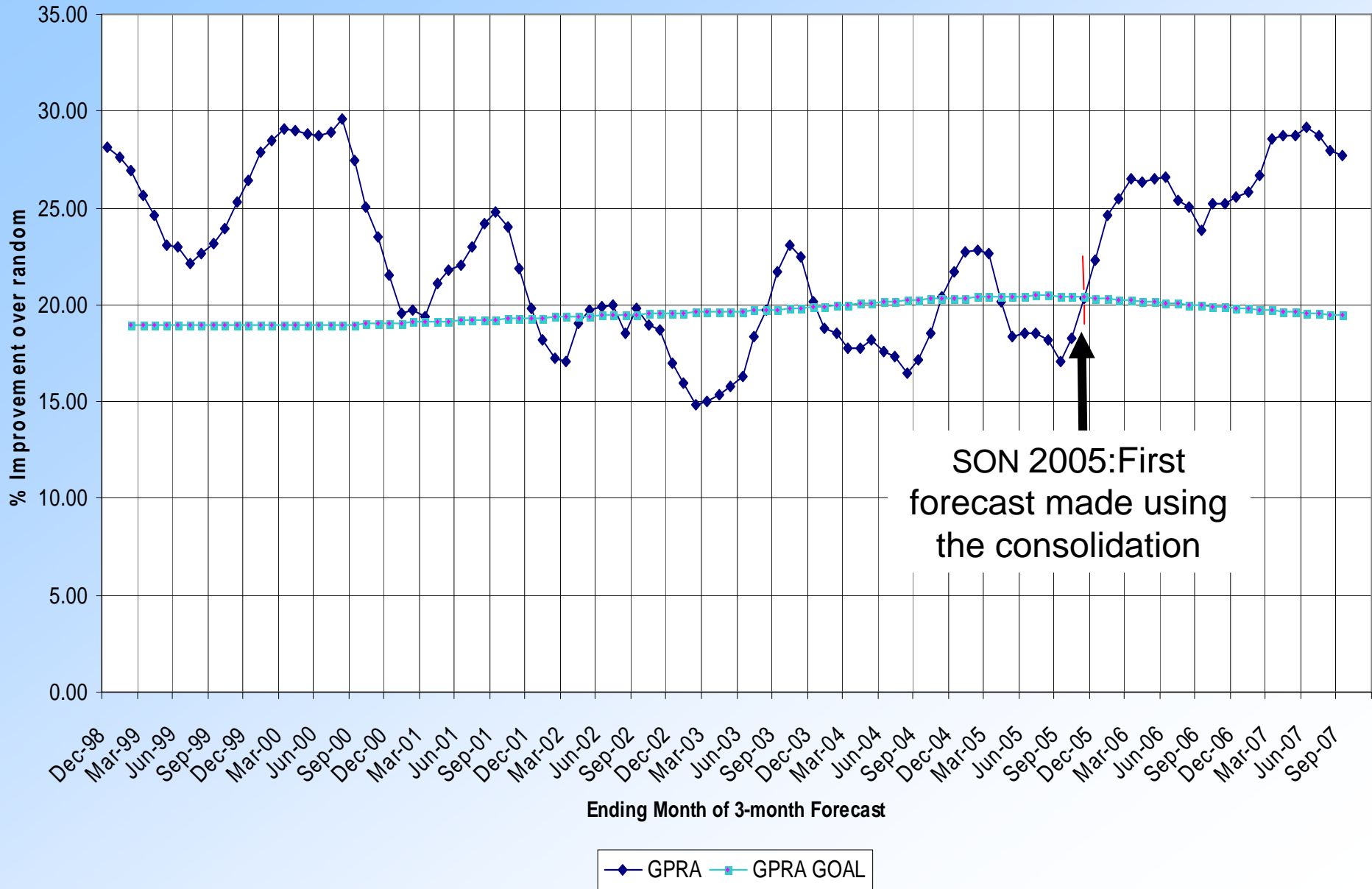
THREE-MONTH OUTLOOK
 TEMPERATURE PROBABILITY
 0.5 MONTH LEAD
 VALID DJF 2007
 MADE 15 NOV 2007

EC MEANS EQUAL
 CHANCES FOR A, N, B
 A MEANS ABOVE
 N MEANS NORMAL
 B MEANS BELOW

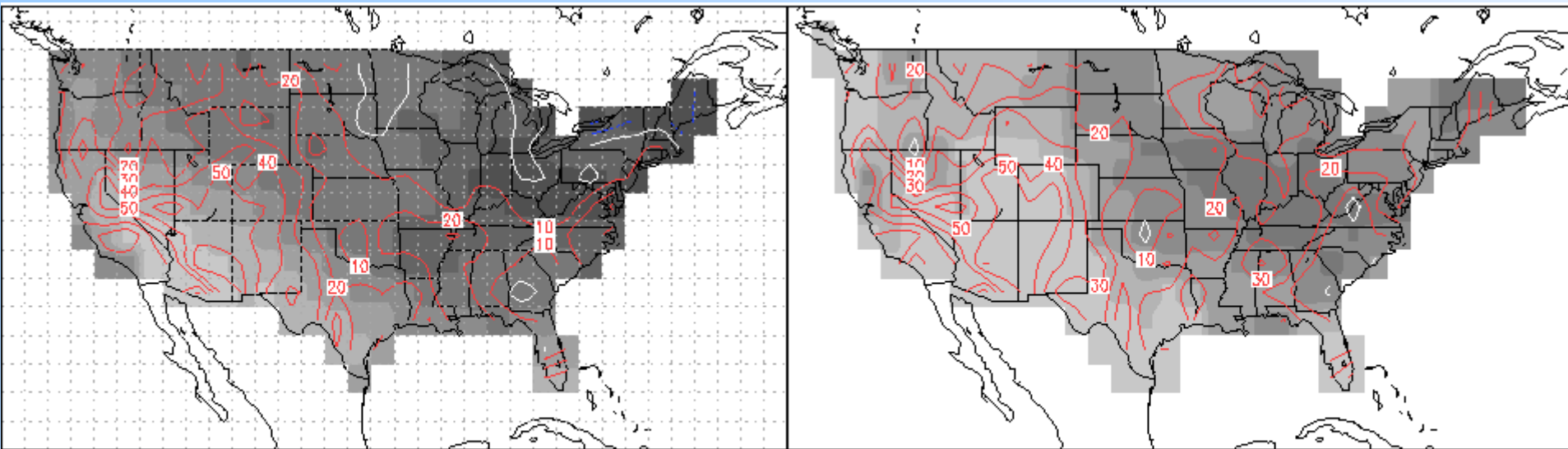
THREE-MONTH OUTLOOK
 PRECIPITATION PROBABILITY
 0.5 MONTH LEAD
 VALID DJF 2007
 MADE 15 NOV 2007

EC MEANS EQUAL
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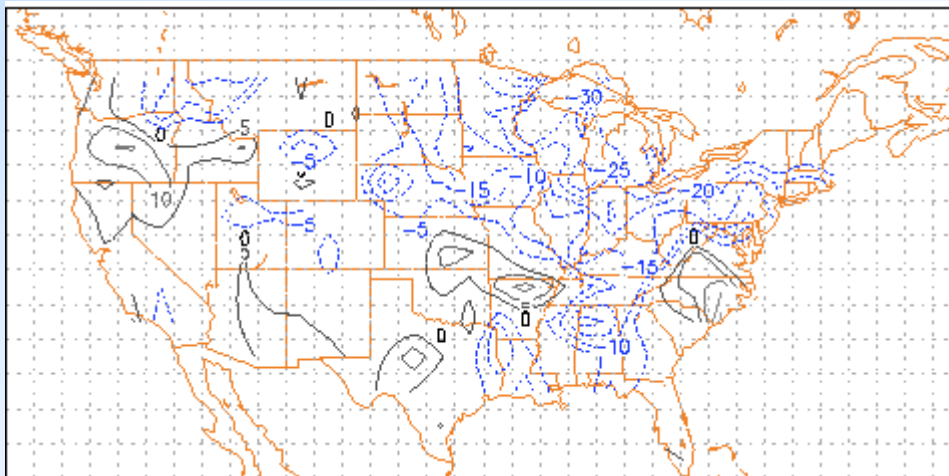
Heidke Skill Score 48 Month Running Mean Official 3-month T Outlooks NDJ 1998-SON 2007



Regional % Improvement by the ½-month Lead 3-Month Mean Temperature Forecast over Climatology Official and Consolidation – 1995-2004



Difference: Official minus Consolidation



Prospects for the (Present &) Future

- Probabilistic Extreme Events forecasts (U.S. Hazards Assessment)
- Disaggregated ½-Month Lead 3-Month Temperature Outlooks
- Operational MJO Outlooks for the Tropics
- CPC Forecasts and Climatologies on NDFD available to users via SOAP
- Gridded 3-Month Outlooks for the Pacific and Caribbean
- Expansion of Ensemble Regression Calibration to Alaska 3-Month Outlooks
- Probability of Exceedance for ER forecasts