CPC's Week-2 Probabilistic Forecasts of Wind Hazards and Extremes

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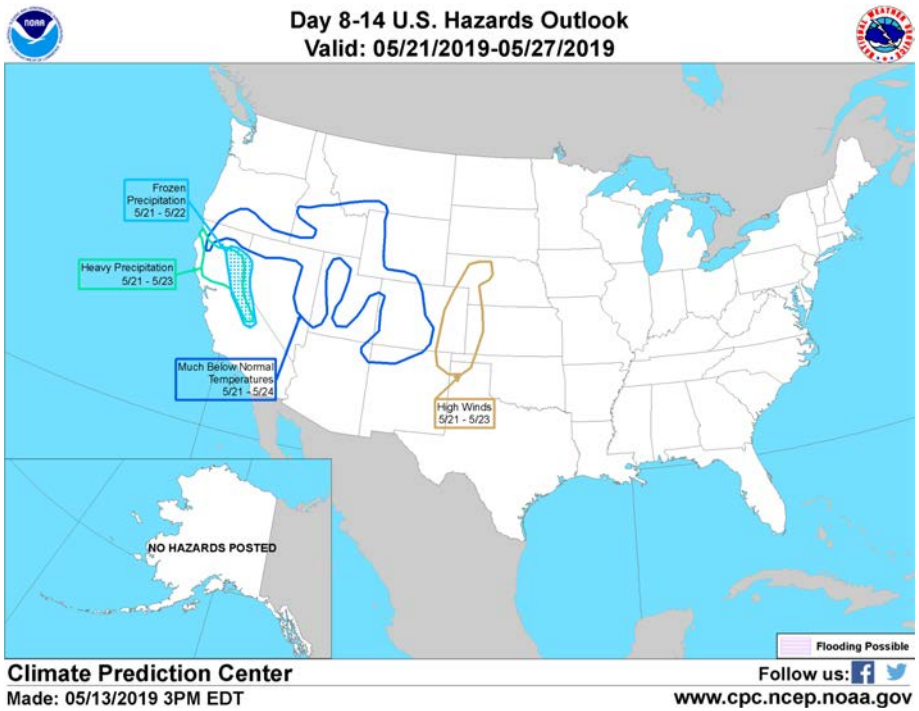
Outline

- CPC’s Week-2 U.S. Hazards Outlook
- New probabilistic high winds hazards outlook
- Wind extremes tool and methodology
- Public week-2 extremes tool
- Get feedback!

CPC Week-2 U.S. Hazards Outlook

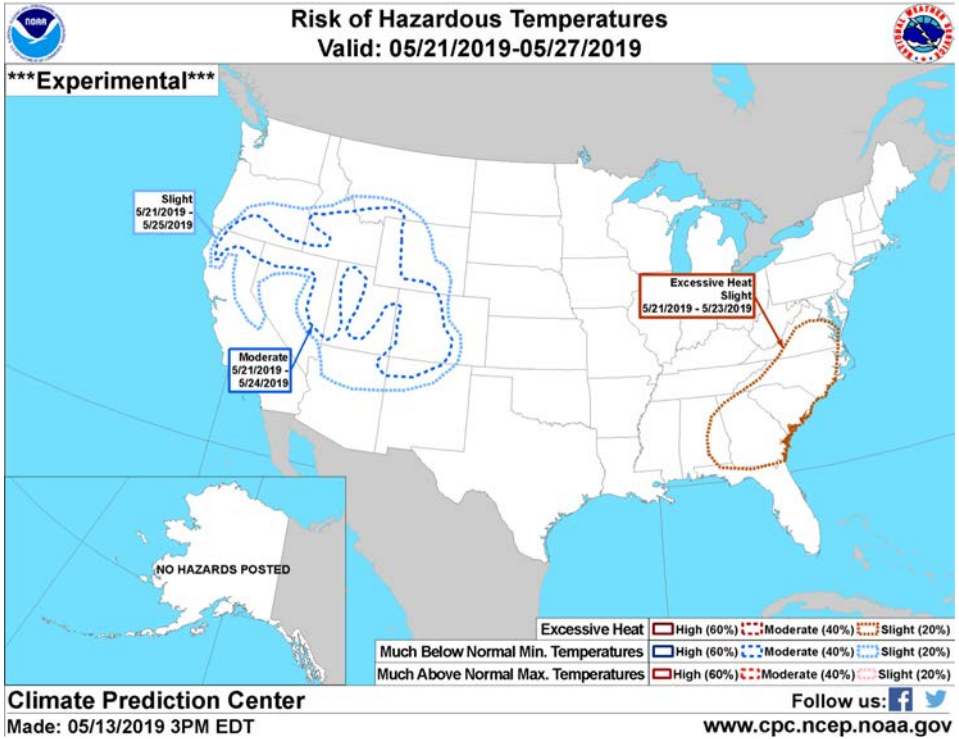
Issued daily on weekdays

CPC Week-2 U.S. Hazards Outlook - Composite



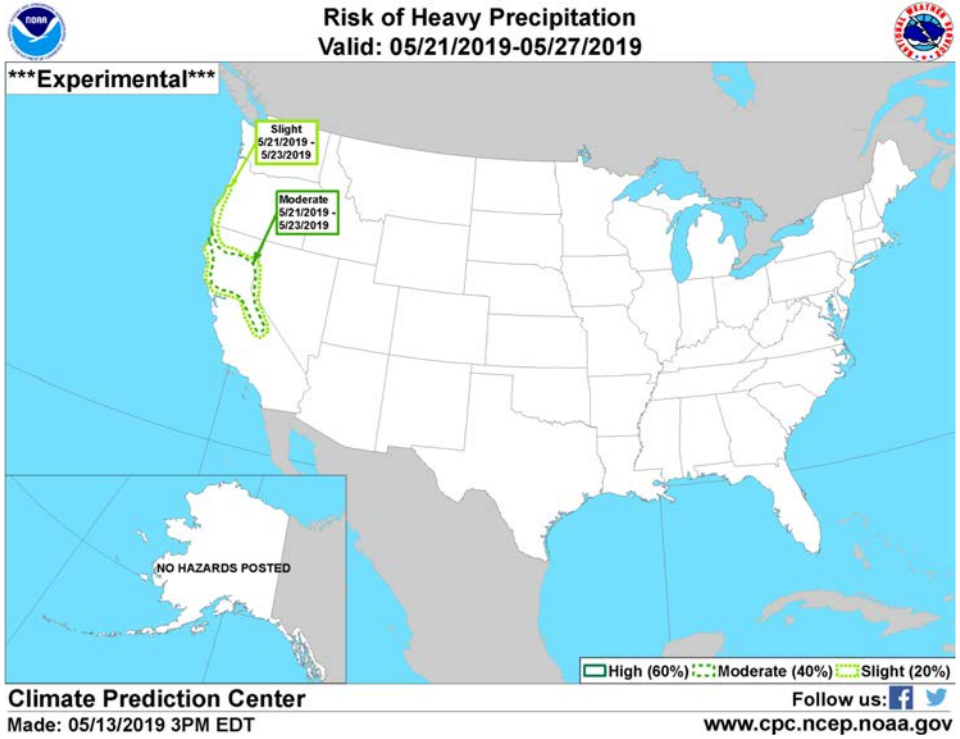
- Geared for DSS
- Includes moderate risk areas and variables that do not have an objective probabilistic tool yet (e.g. frozen precipitation, flood)
- Hawaii is covered in text
- In general forecasts are somewhat subjective but based on objective tools.

CPC Week-2 U.S. Hazards Outlook - Probabilistic



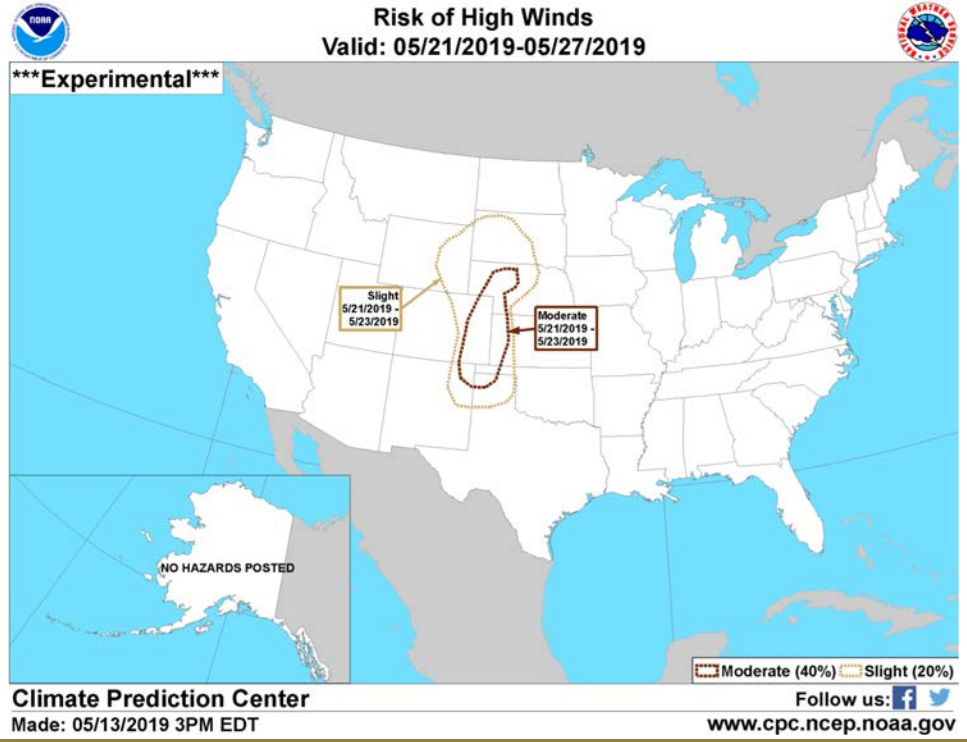
- Thresholds vary temporally, spatially, and situationally
- Much above normal temperatures, much below normal temperatures, excessive heat
- May-Sept: Excessive heat
- Oct-Apr: Much above normal temperatures
- Tmin < 15th ptile, Tmax/heat > 85th (consider actual values also)

CPC Week-2 U.S. Hazards Outlook - Probabilistic



- Heavy precipitation
- Liquid amounts > 85th percentile & > 1” (regional)

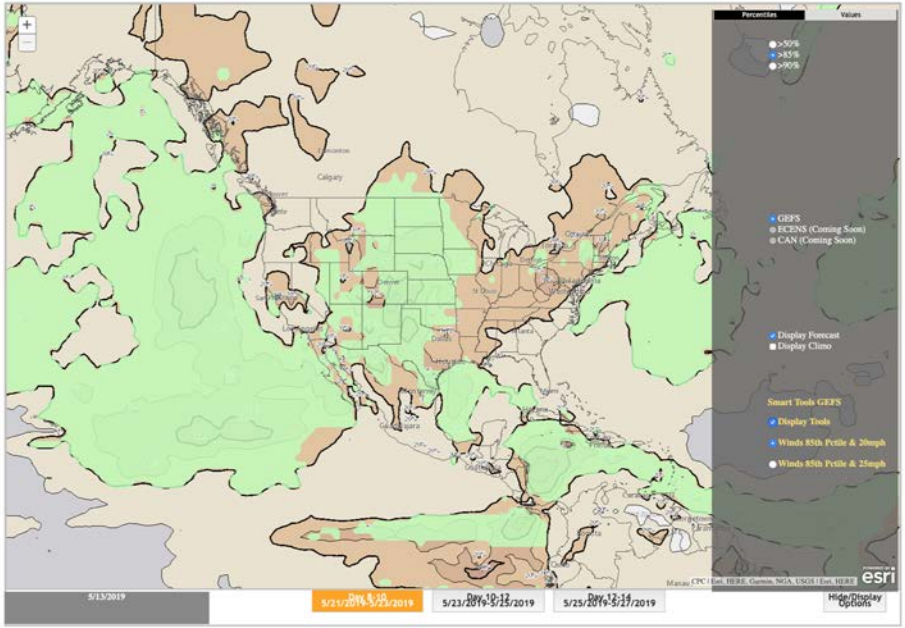
CPC Week-2 U.S. Hazards Outlook - Probabilistic



- Newest variable, issued since Aug 2018
- Wind speeds > 85th percentile & 20/25 mph
- No high risk issued: Forecast probabilities >= 60% less reliable and likely

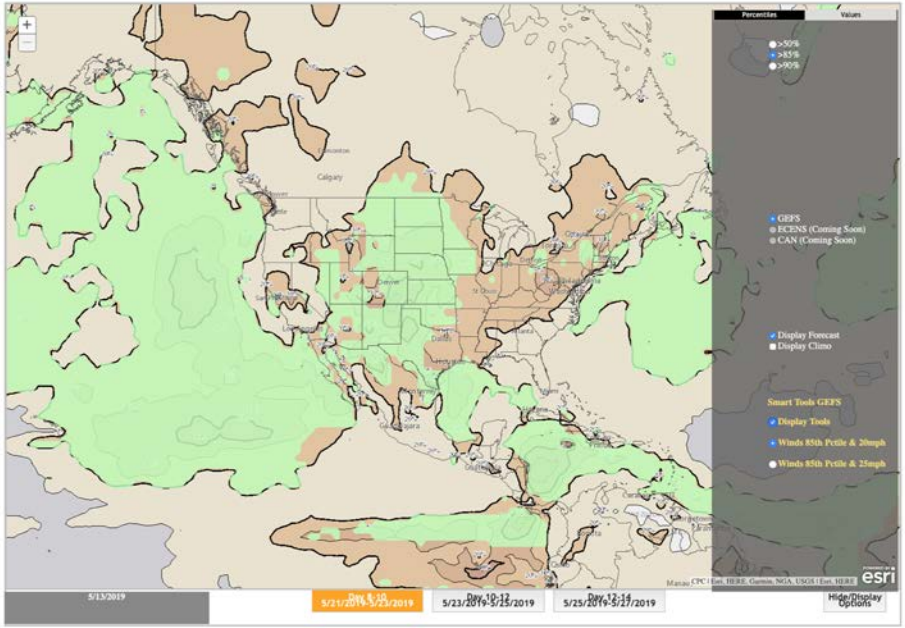
Wind Extremes Tool

Wind Extremes Tool - About



- Probabilistic format (contours are >= 20% chance)
- Multiple percentile and wind speed thresholds
- 10m wind speeds
- Lead time of days 8-10, 10-12, 12-14
- New “smart tools” feature - first guess for forecasters

Wind Extremes Tool - Methodology

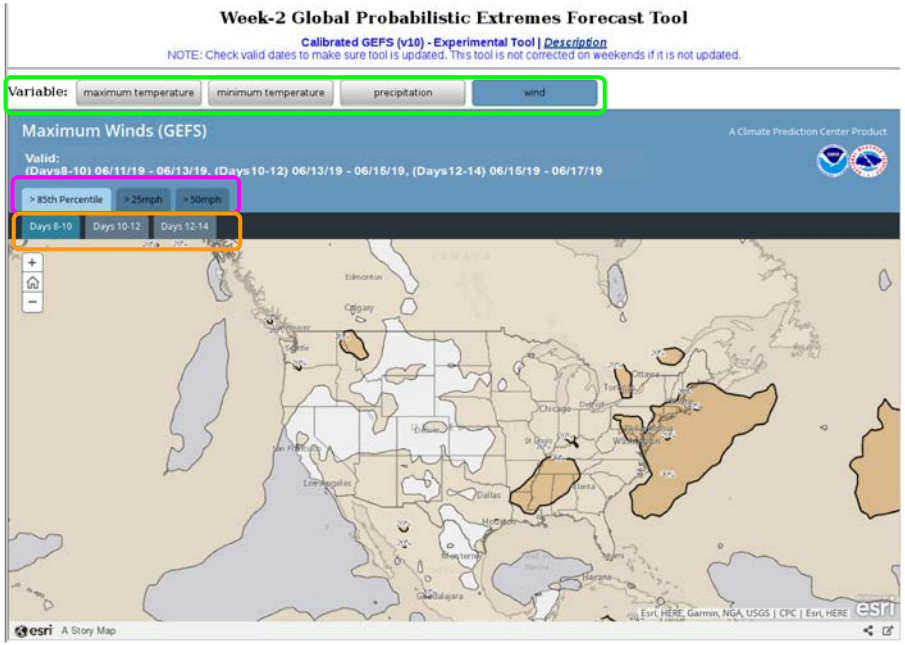


- Uses GEFSv10 (ECMWF soon internally)
- Statistically adjusted (bias corrected and calibrated (ens regression))
- Calibration uses 25 years worth of reforecasts
- 3-day periods * 4 model update cycles - Max instantaneous wind speed out of 13 data points

Public Extremes Tool

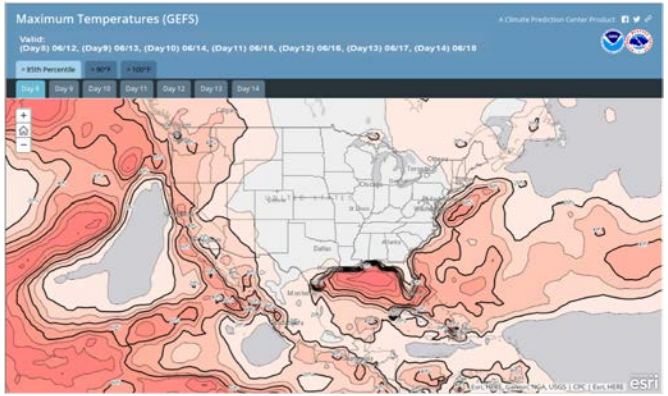
Available Daily Including Weekends

Public Extremes Tool - About



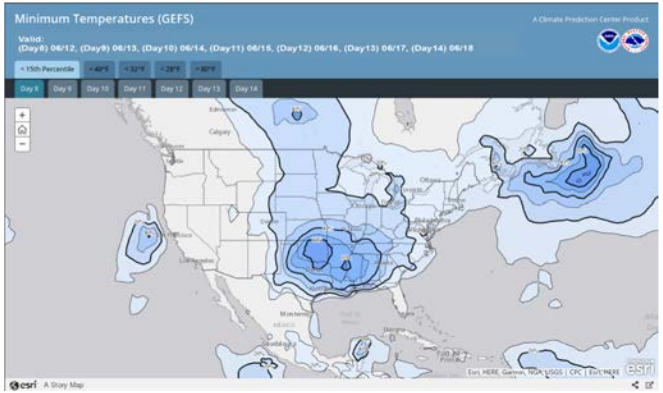
- Tool publicly available as of Sept 2018
- GEFSv10
- Link on left of CPC's hazards page
- Global - Drag map area
- 4 variables
- Subset of internal tool thresholds
- Various lead times

Public Extremes Tool - Feedback



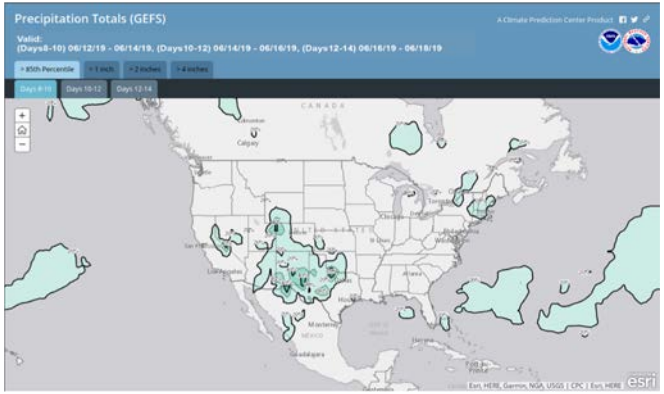
Thresholds

> 85th ptile
> 90 deg F
> 100 deg F

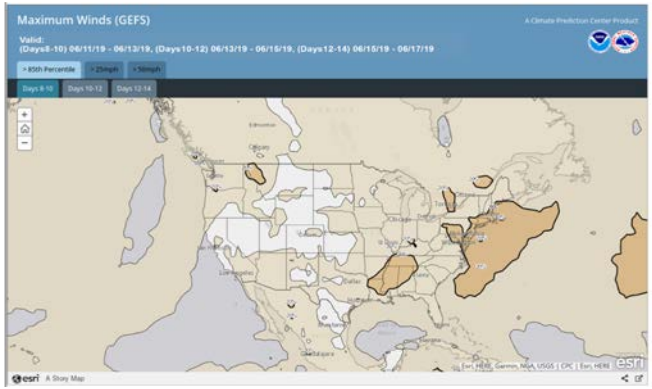


Thresholds

<15th ptile
< 40 deg F
< 32 deg F
< 28 deg F
> 80 deg F



> 85th ptile
> 1”
> 2”
> 4”

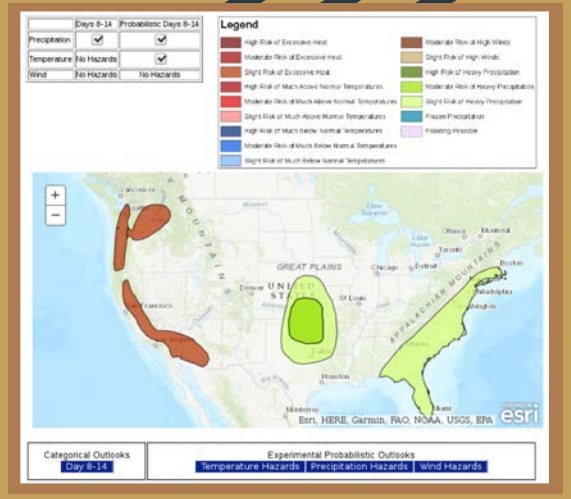


>85th ptile
> 25mph
> 20mph

Future Work

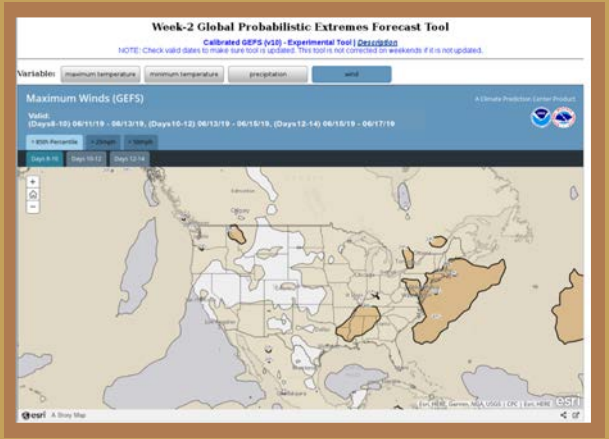
- Additional models for extremes tools (ECMWF for wind, Canadian)
- Consolidated tool using calibrated model inputs

Thank you!



CPC Official Week-2 U.S. Hazards Outlook

https://www.cpc.ncep.noaa.gov/products/predictions/threats/threats.php



Probabilistic Extremes Tool

https://www.cpc.ncep.noaa.gov/products/predictions/threats/extremesTool.php

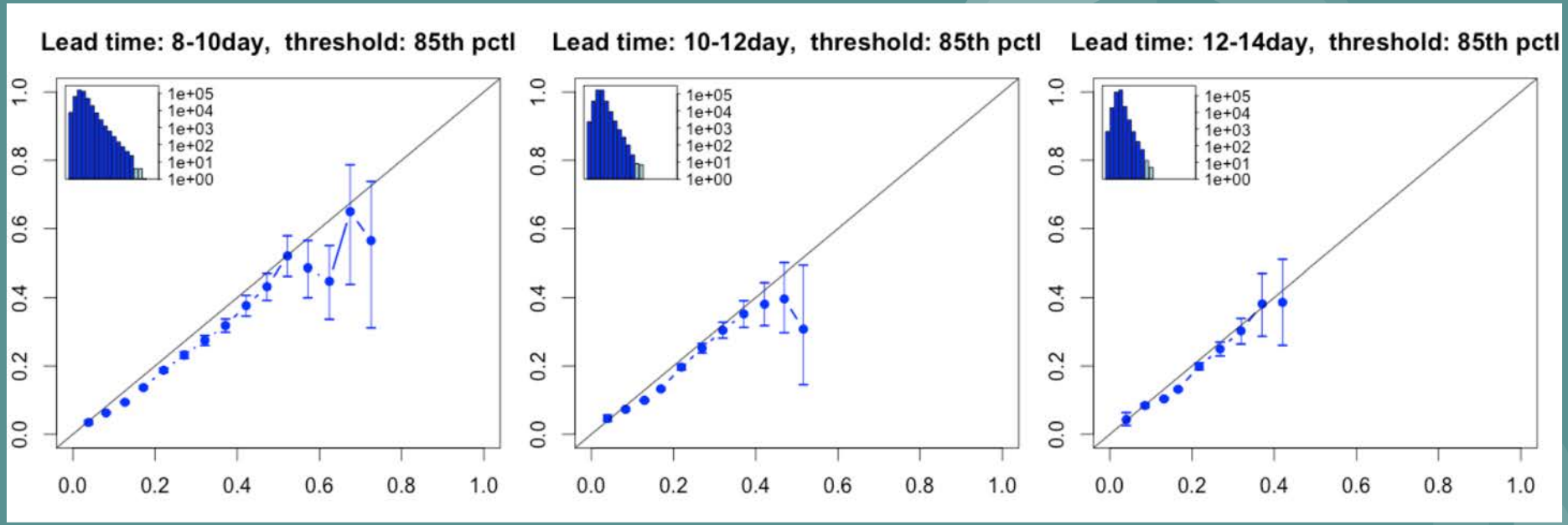
Contact:

melissa.ou@noaa.gov

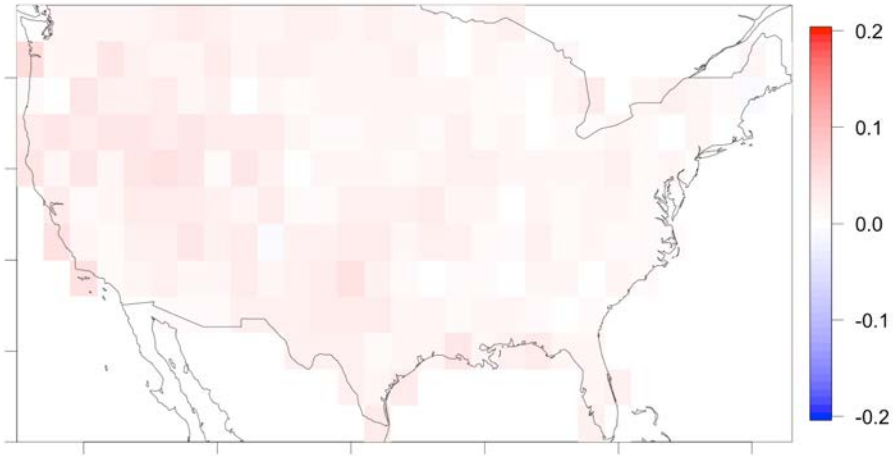
Verification

High winds
Forecasts Valid
1/1/2014 - 12/31/2017
Obs: CFSR Analyses

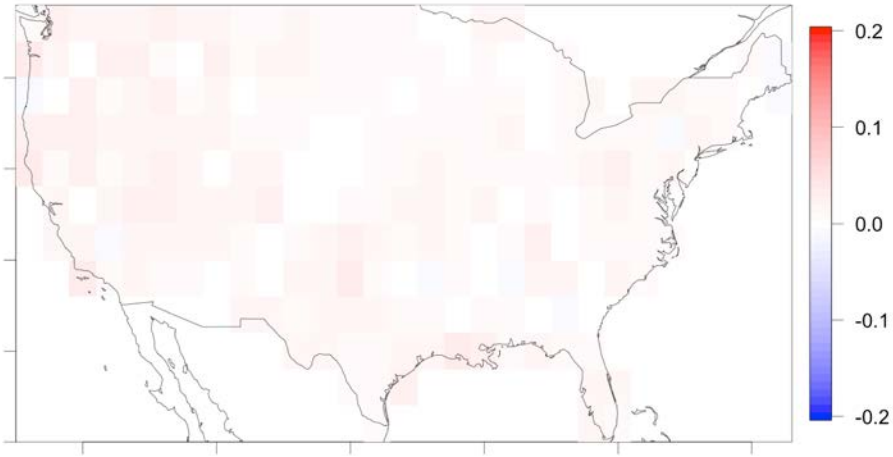
High Wind Reliability



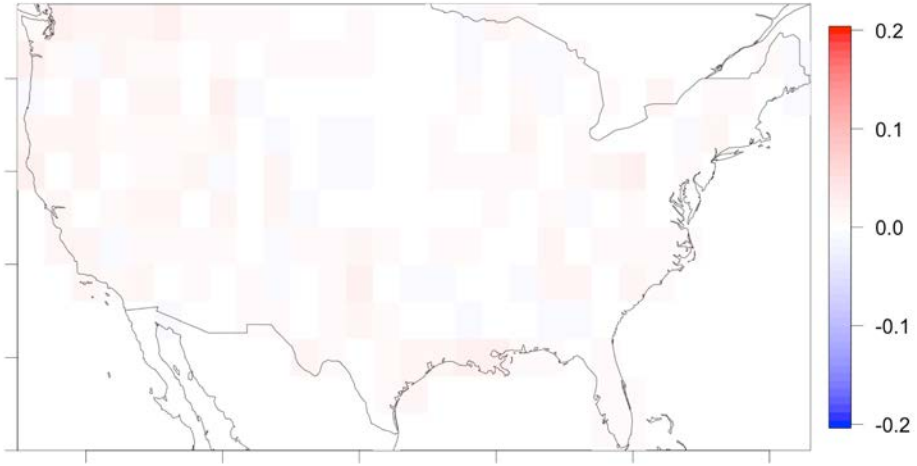
Map of ranked probability skill scores for wind, 8-10day

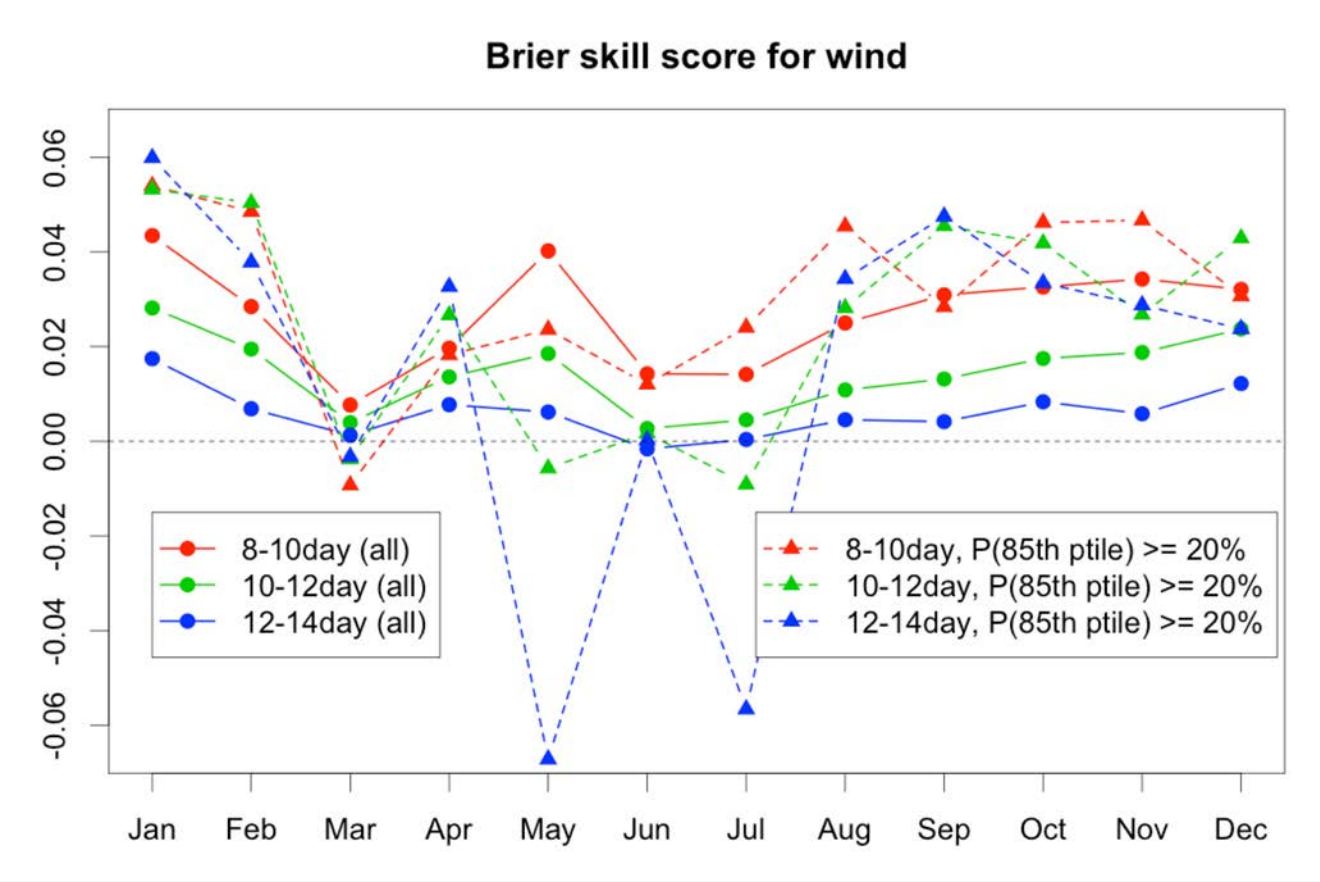


Map of ranked probability skill scores for wind, 10-12day



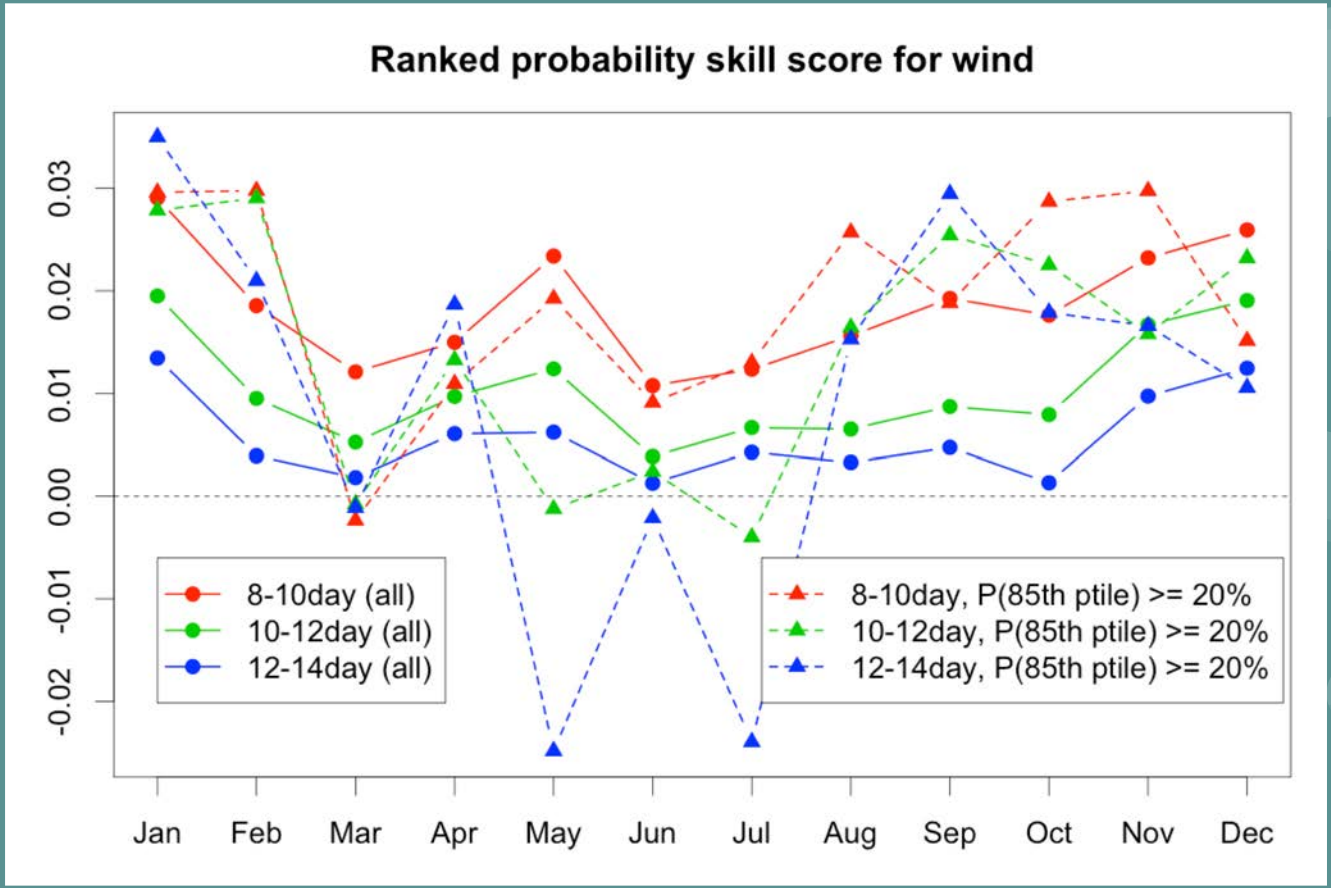
Map of ranked probability skill scores for wind, 12-14day





Mean BSS
All Seasons

	All Ptile	P@85th>20%
Day 8-10	0.02	0.03
Day 10-12	0.02	0.03
Day 12-14	0.00	0.01



Mean RPSS
All Seasons

	All Ptile	P@85th>20%
Day 8-10	0.02	0.02
Day 10-12	0.01	0.01
Day 12-14	0.01	0.01

Mean RPSS values:

1. Tmax for Apr-Sep:

day9	day11	day13	
0.102	0.075	0.050	all cases
0.151	0.113	0.085	P(85th ptile) >=20%

2. Tmin for Oct-Mar:

day9	day11	day13	
0.080	0.060	0.041	all cases
0.140	0.117	0.096	P(15th ptile) >= 20%

3. Wind for all months:

day8-10	day10-12	day12-14	
0.019	0.010	0.006	all cases
0.019	0.014	0.009	P(85th ptile) >= 20%

4. Precip for all months:

day8-10	day10-12	day12-14	
0.055	0.018	-0.008	all cases
0.060	0.021	-0.014	P(85th ptile) >= 20%

Mean BSS values:

1. Tmax for Apr-Sep:

day9	day11	day13	
0.089	0.061	0.041	all cases
0.151	0.112	0.084	P(85th ptile) >= 20%

2. Tmin for Oct-Mar:

day9	day11	day13	
0.111	0.078	0.048	all cases
0.200	0.166	0.138	P(15th ptile) >= 20%

3. Wind for all months:

day8-10	day10-12	day12-14	
0.027	0.015	0.006	all cases
0.031	0.025	0.014	P(85th ptile) >= 20%

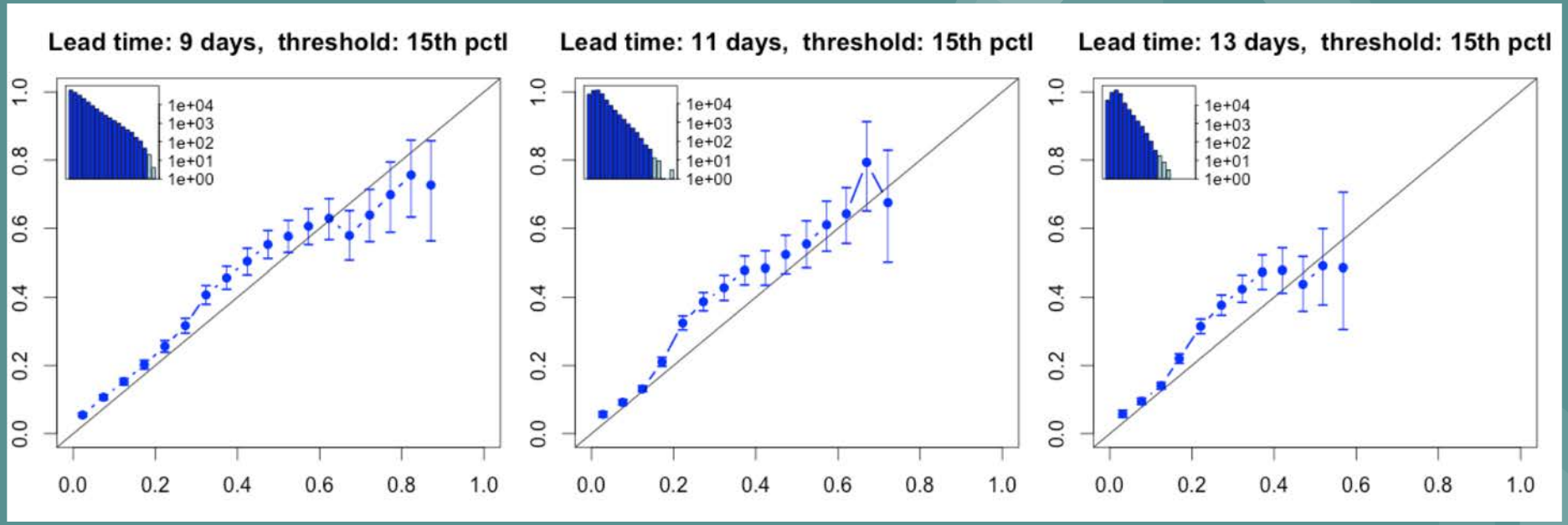
4. Precip for all months:

day8-10	day10-12	day12-14	
0.007	0.000	-0.004	all cases
-0.005	-0.016	-0.038	P(85th ptile) >= 20%

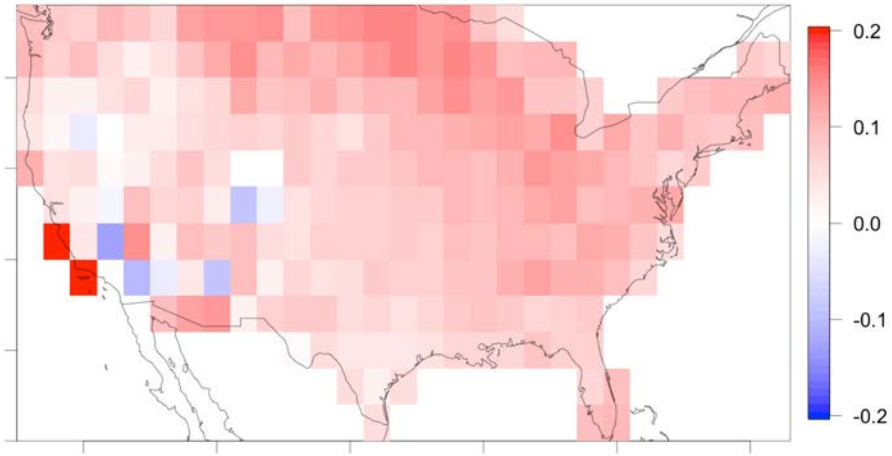
Companion meeting minute notes at
https://docs.google.com/document/d/1Qn05bylVD1Kh6uU6qg4tBw0VuTWANnwx3sBdyApiVFc/edit

Tmin
Forecasts Valid 1/1/2014 - 12/31/2017
Obs: Wei Shi’s gridded obs v2

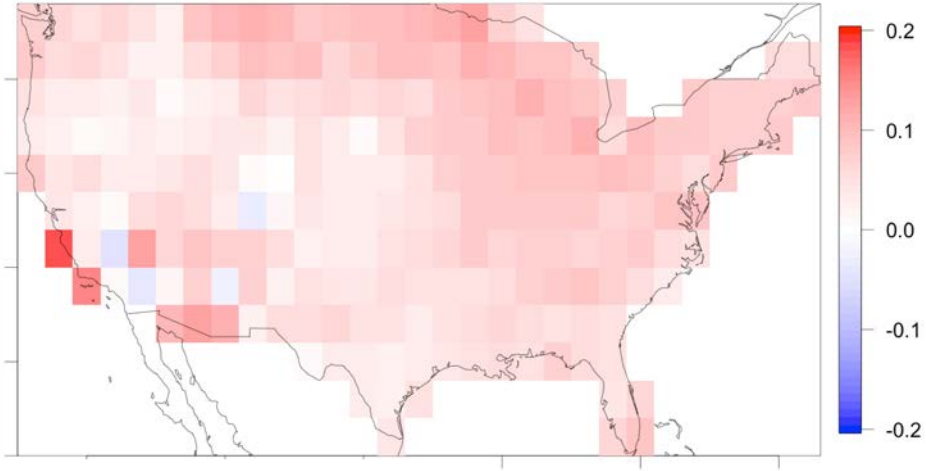
Tmin Reliability



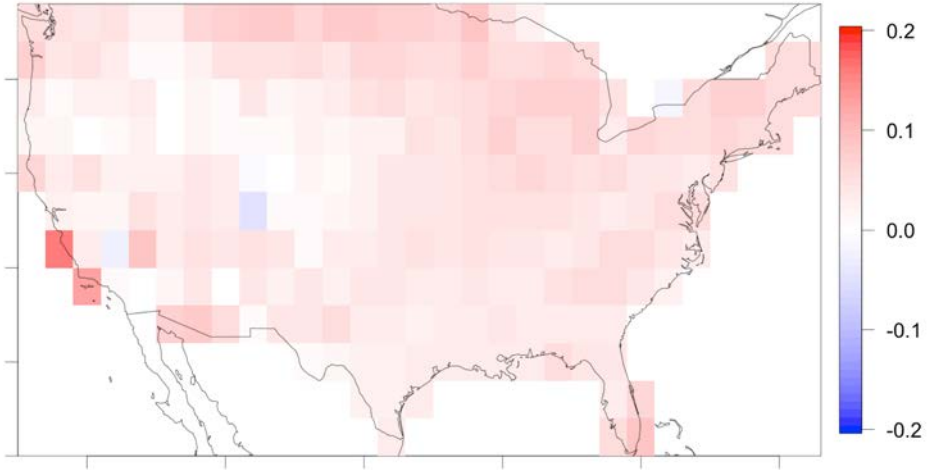
Map of ranked probability skill scores for Tmin (Oct-Mar), day9

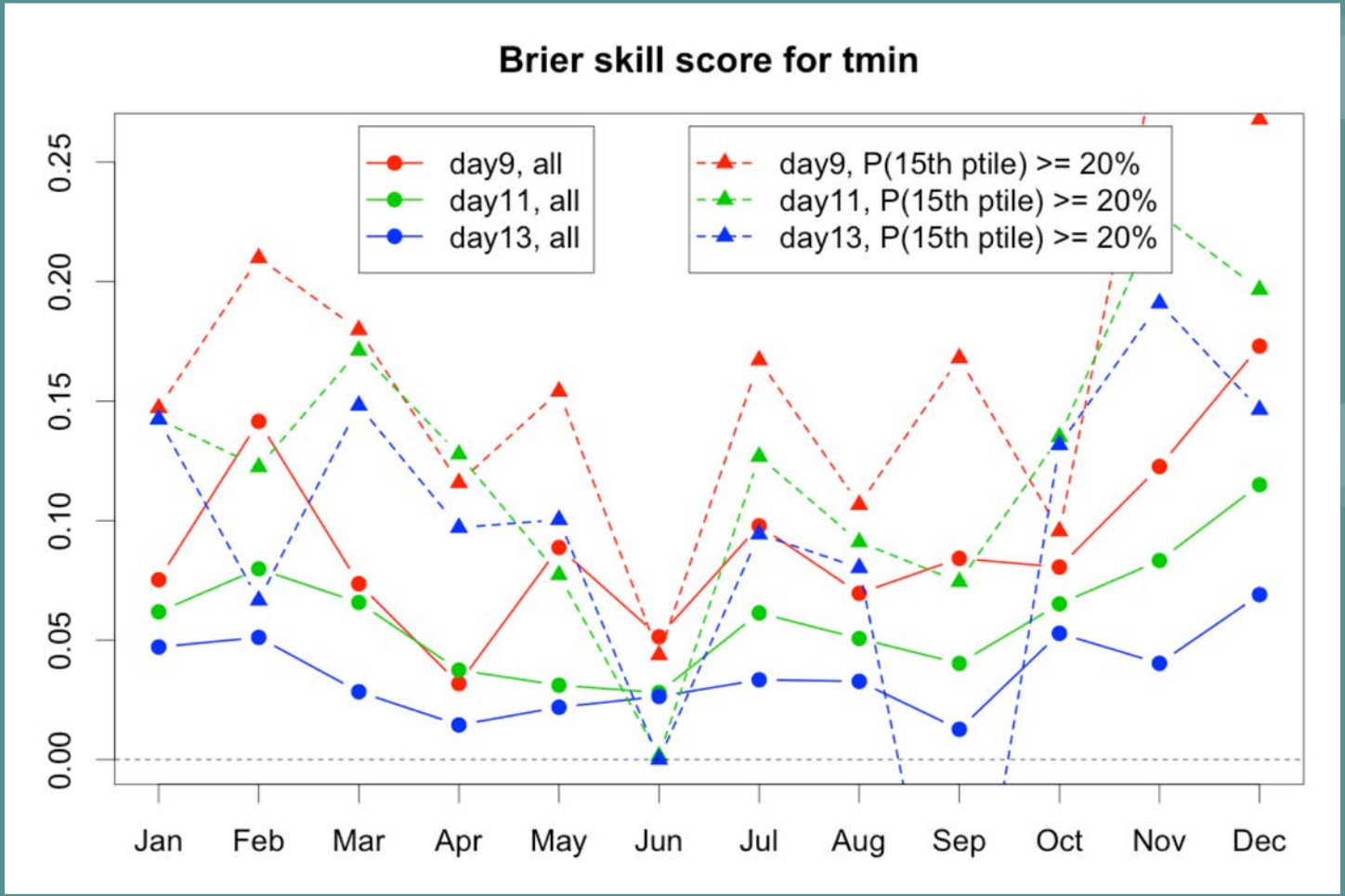


Map of ranked probability skill scores for Tmin (Oct-Mar), day11



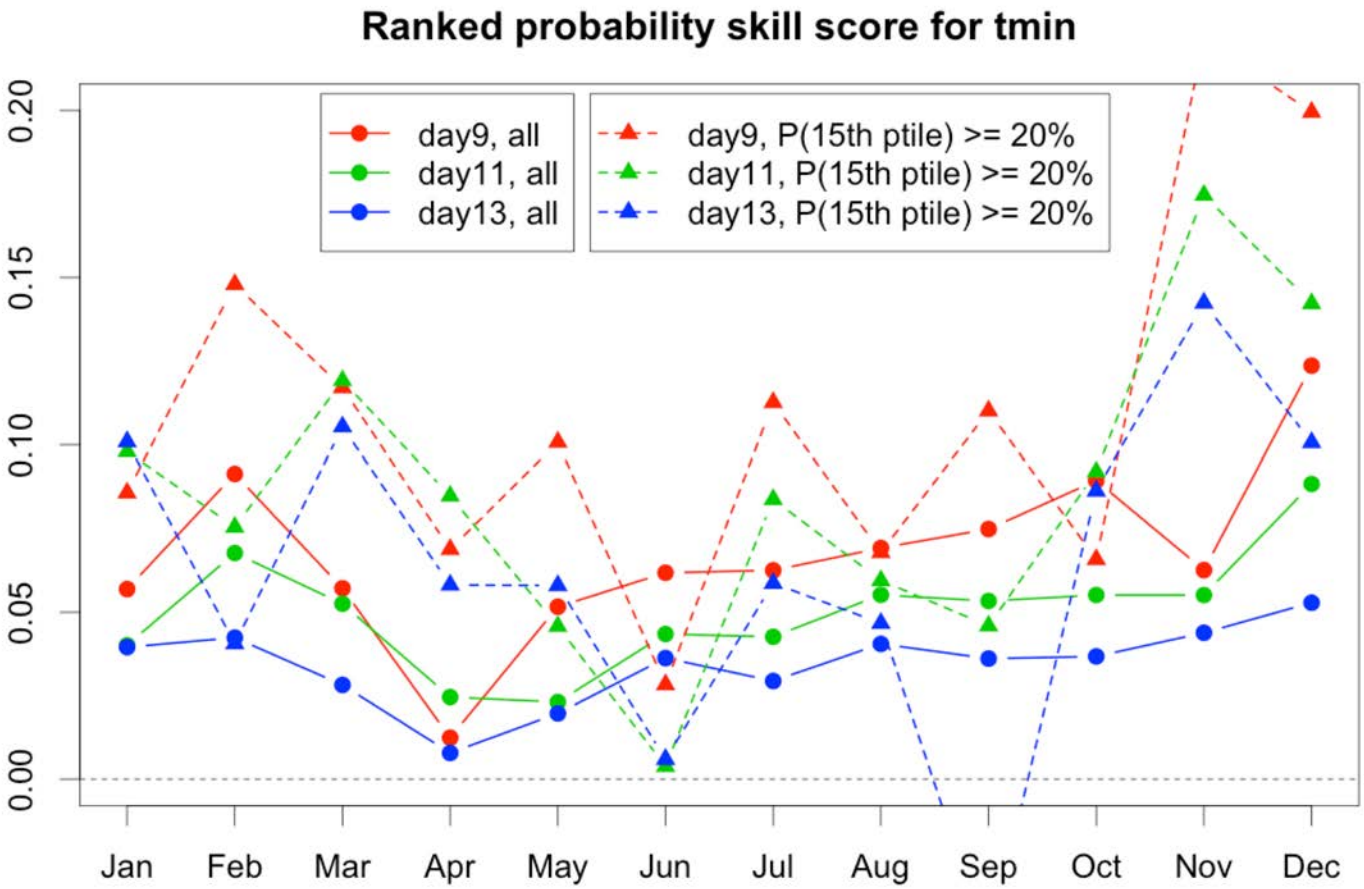
Map of ranked probability skill scores for Tmin (Oct-Mar), day13





Mean BSS
Cool Season (Oct-Mar)
All Ptile | P<15th
Day 9 0.11 | 0.2
Day 11 0.08 | 0.17
Day 13 0.05 | 0.14

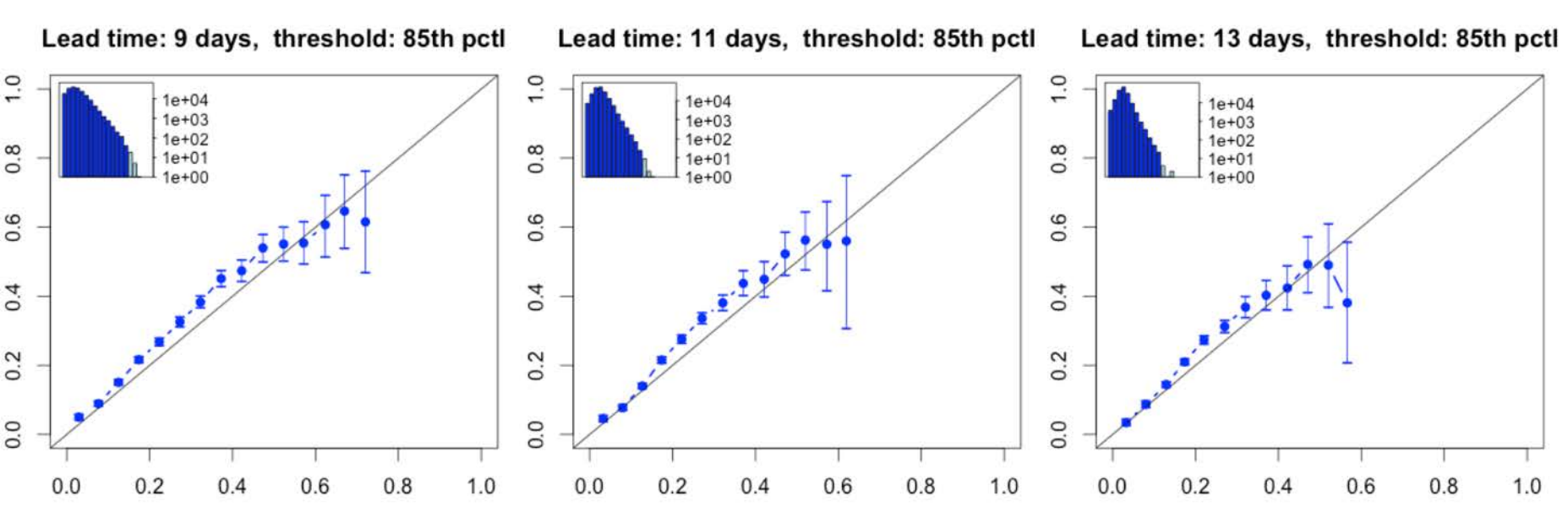
Note: Outlier values should be ignored since likely not reliable and potentially due to low sample size



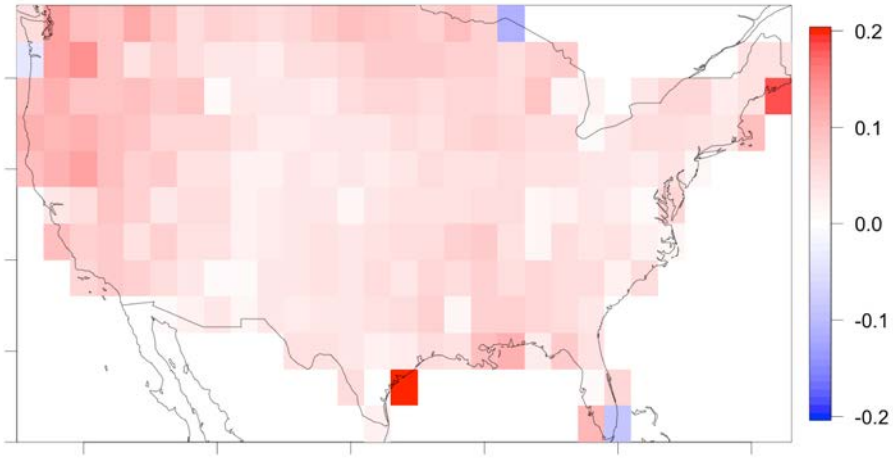
Mean RPSS
Cool Season (Oct-Mar)
All Ptile | P<15th
Day 9 0.08 | 0.14
Day 11 0.06 | 0.12
Day 13 0.04 | 0.09

Tmax
Forecasts Valid 1/1/2014 - 12/31/2017
Obs: Wei Shi’s gridded obs v2

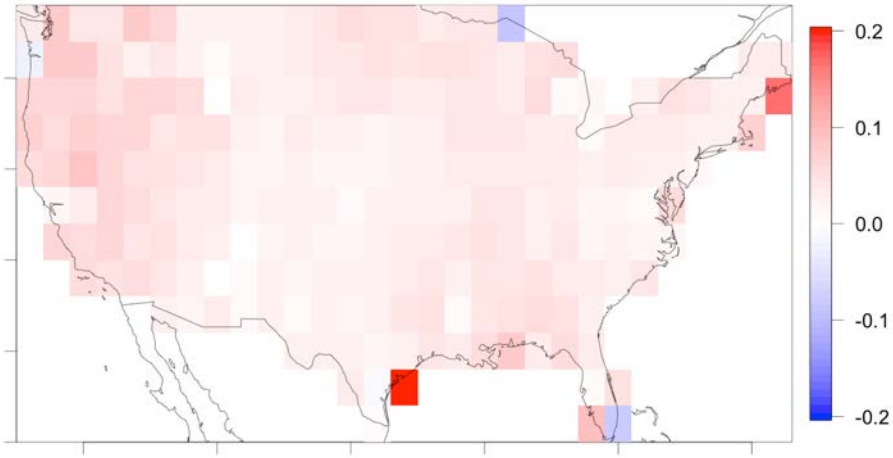
Tmax Reliability



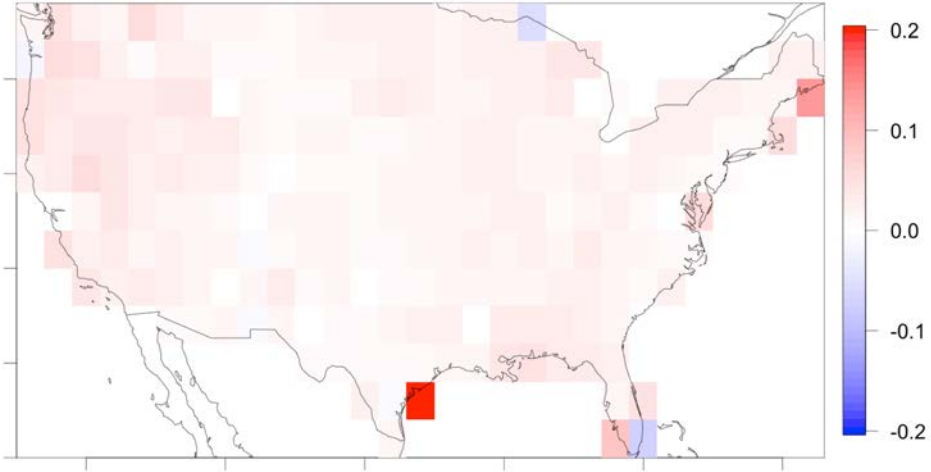
Map of ranked probability skill scores for Tmax (Apr-Sep), day9

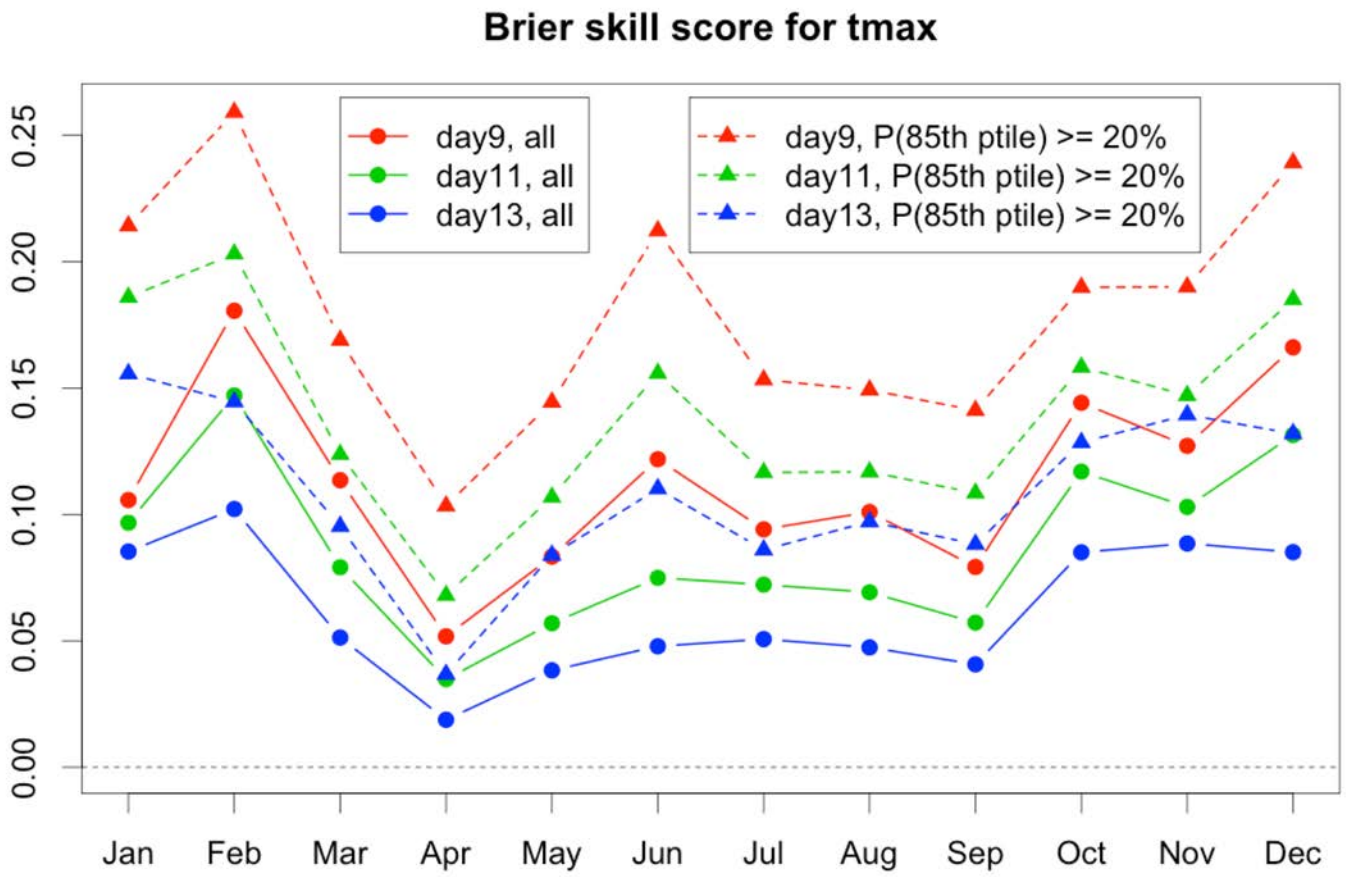


Map of ranked probability skill scores for Tmax (Apr-Sep), day11



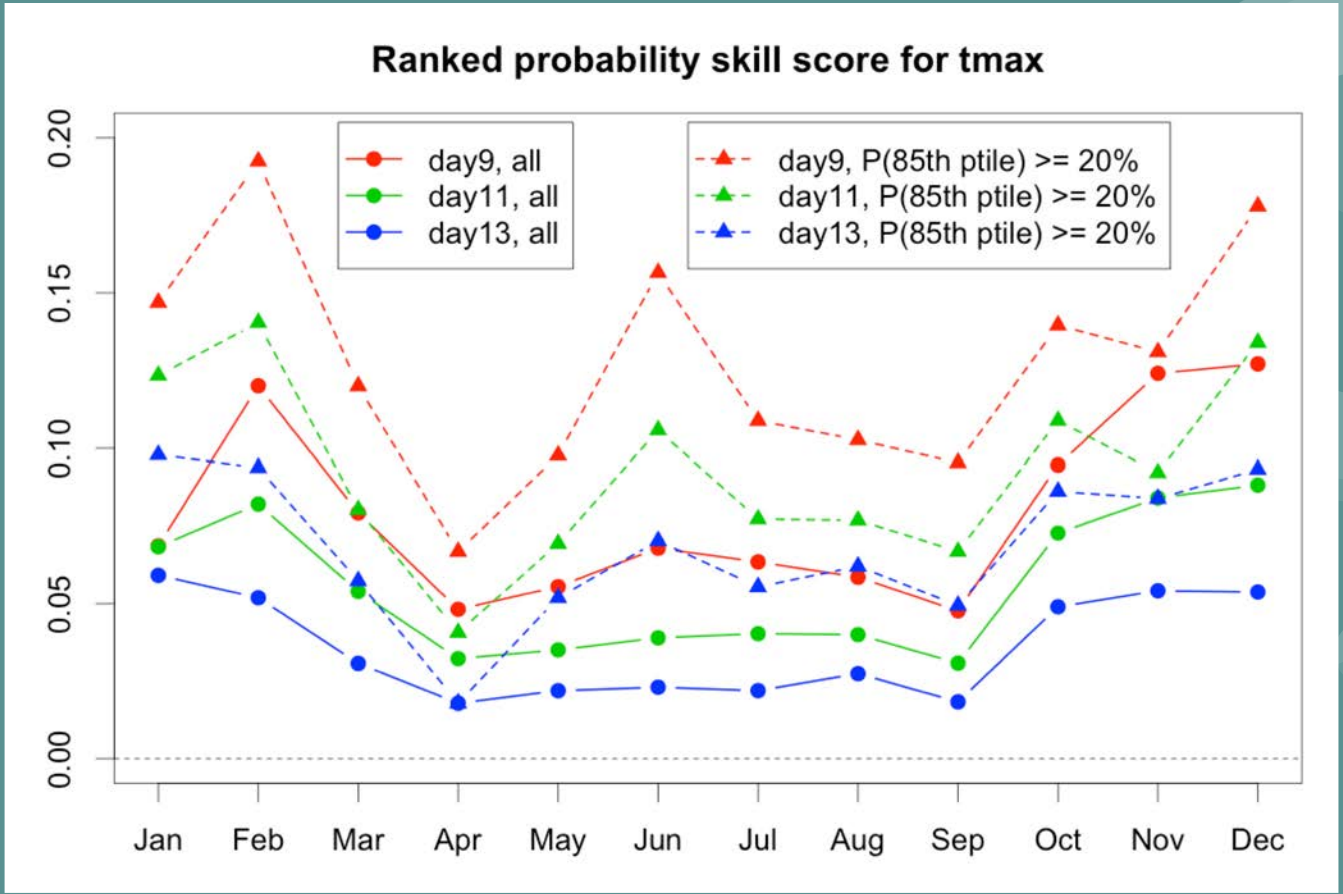
Map of ranked probability skill scores for Tmax (Apr-Sep), day13





Mean BSS
Warm Season (Apr-Sep)

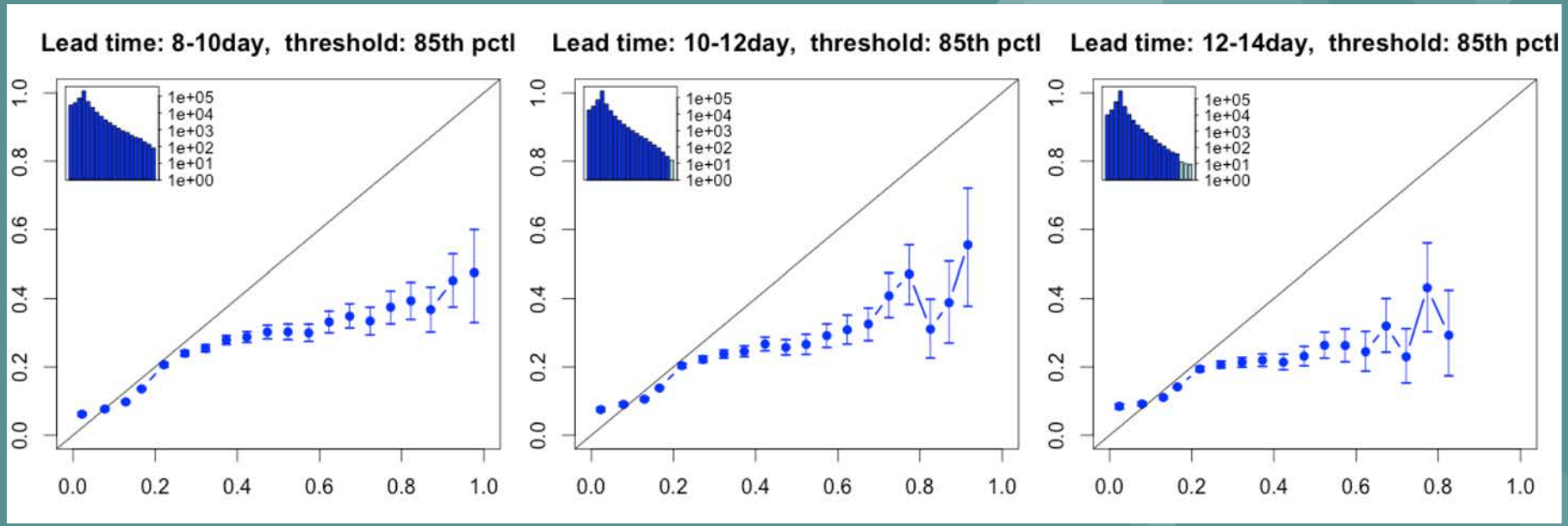
	All Ptile	P<15th
Day 9	0.09	0.15
Day 11	0.06	0.11
Day 13	0.04	0.08

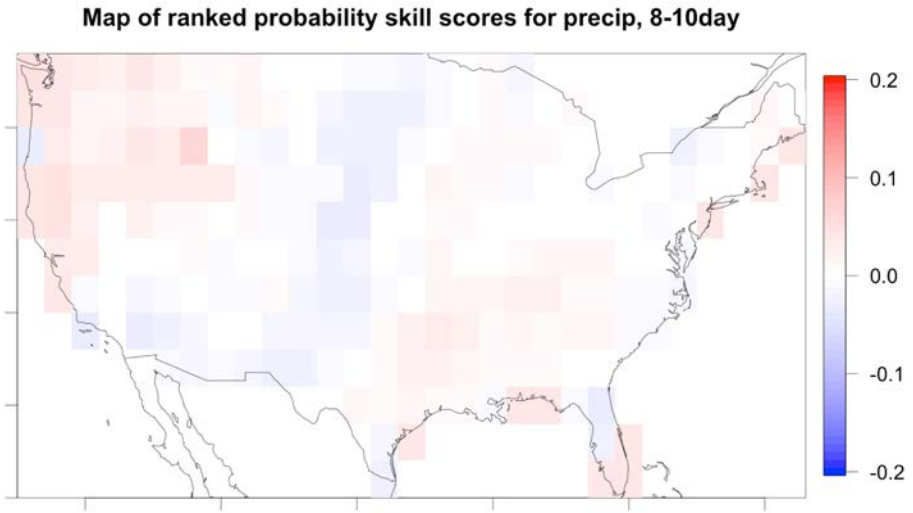


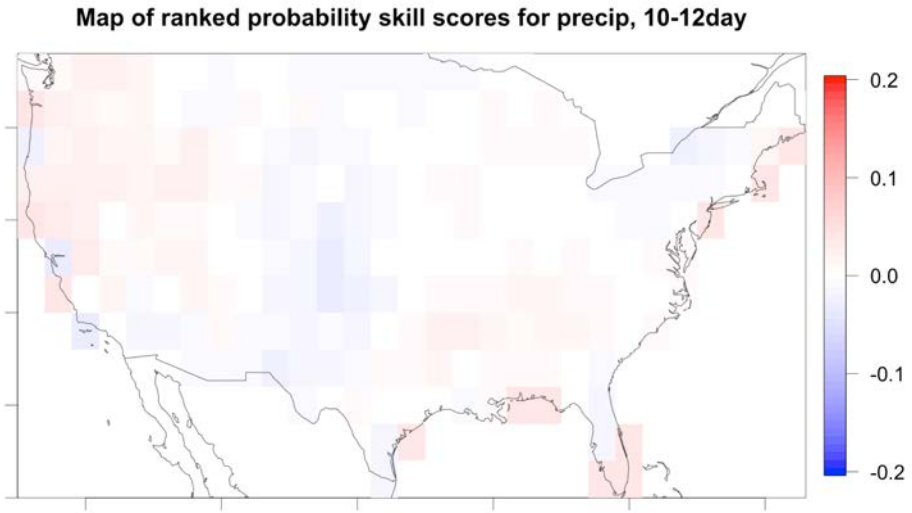
Mean RPSS
Warm Season(Apr-Sep)
All Ptile | P@85th>20%
Day 9 0.10 | 0.15
Day 11 0.08 | 0.11
Day 13 0.05 | 0.09

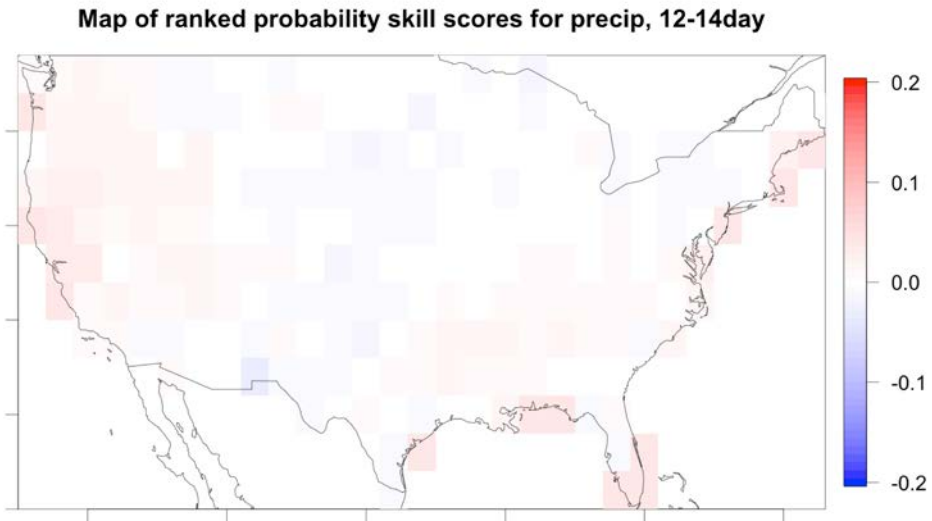
Heavy precipitation Forecasts Valid 1/1/2014 - 12/31/2017 Obs: CPC Gridded precip

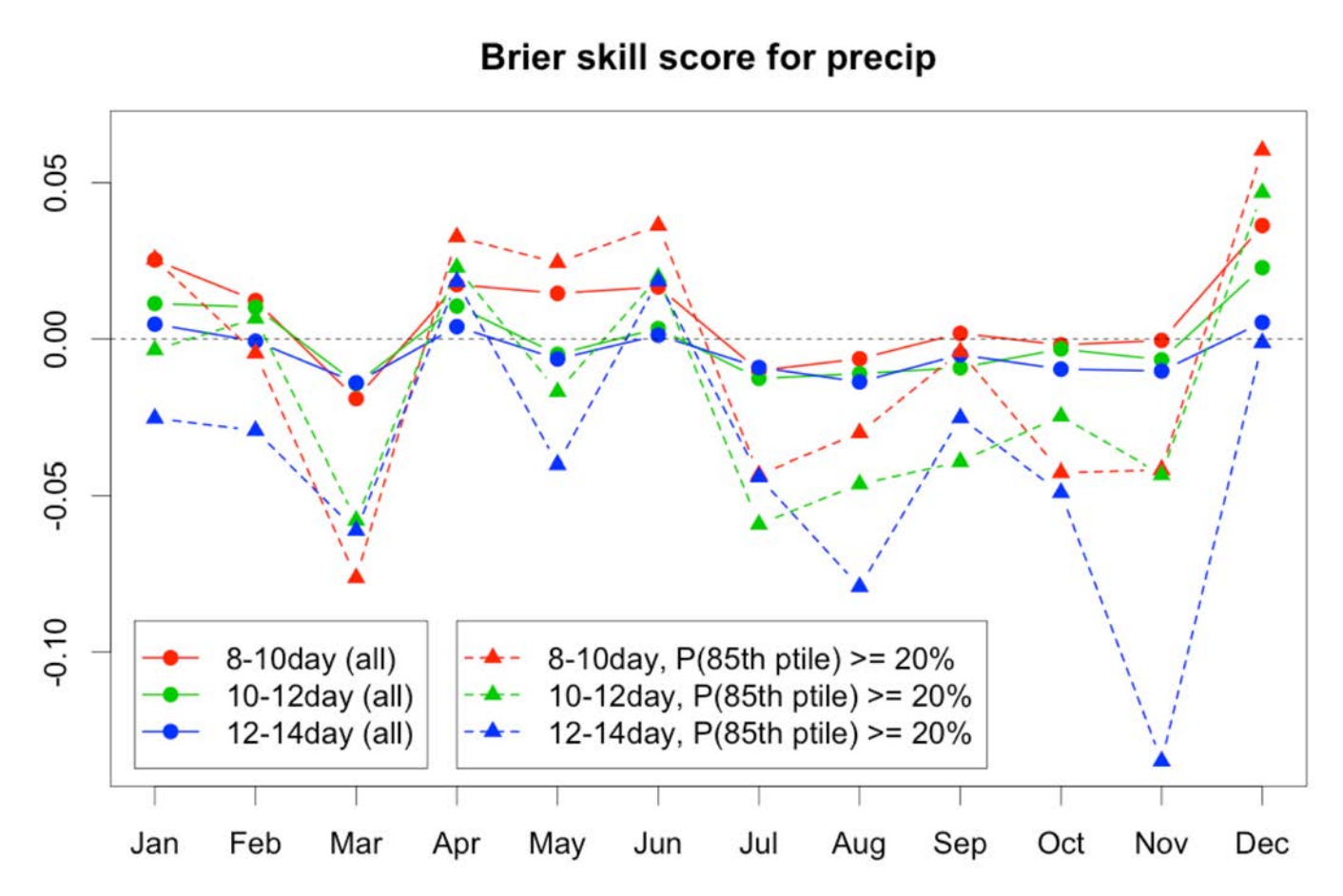
Heavy Precipitation Reliability




Map of ranked probability skill scores for precip, 8-10day
0.2
0.1
0.0
-0.1
-0.2

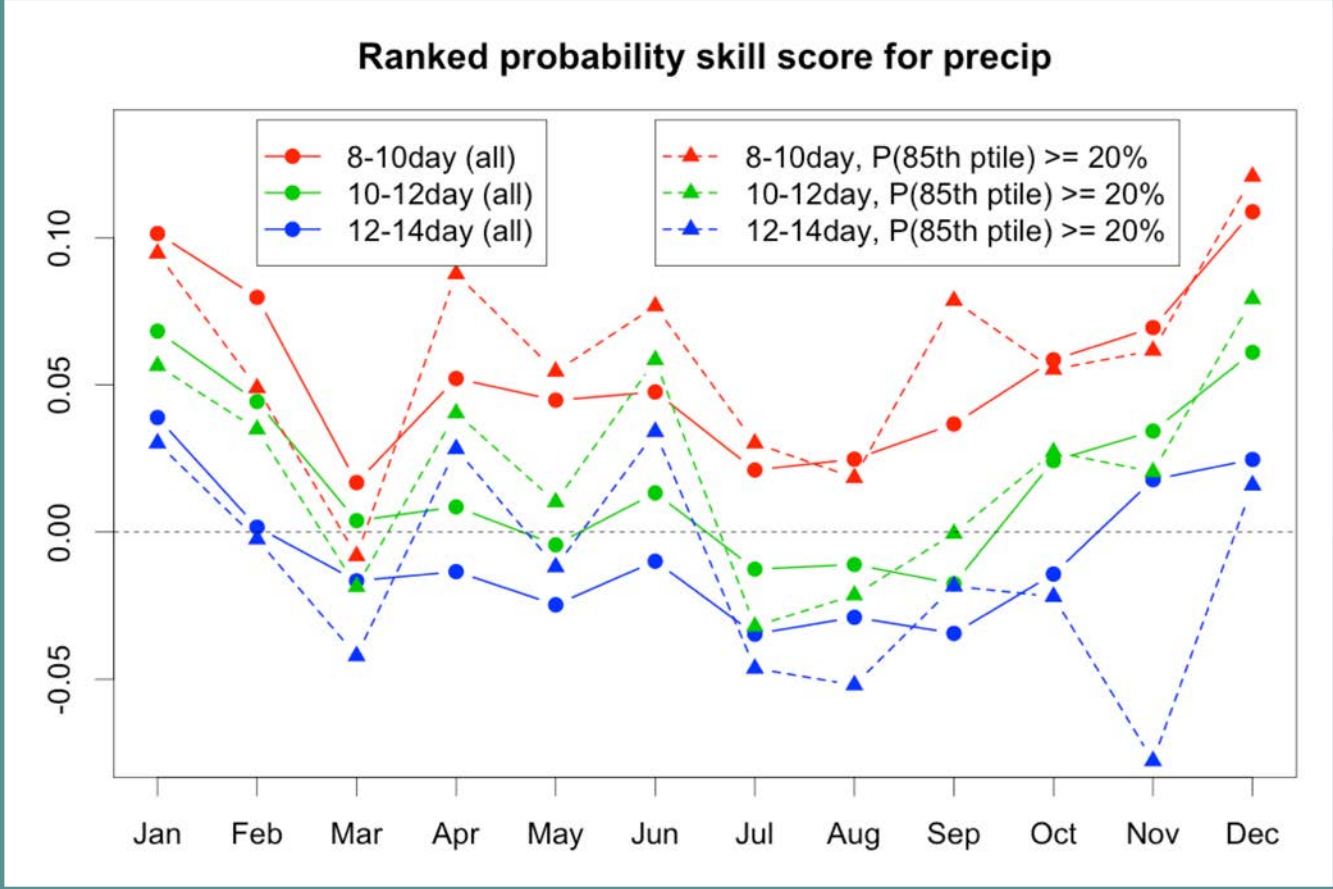

Map of ranked probability skill scores for precip, 10-12day
0.2
0.1
0.0
-0.1
-0.2


Map of ranked probability skill scores for precip, 12-14day
0.2
0.1
0.0
-0.1
-0.2

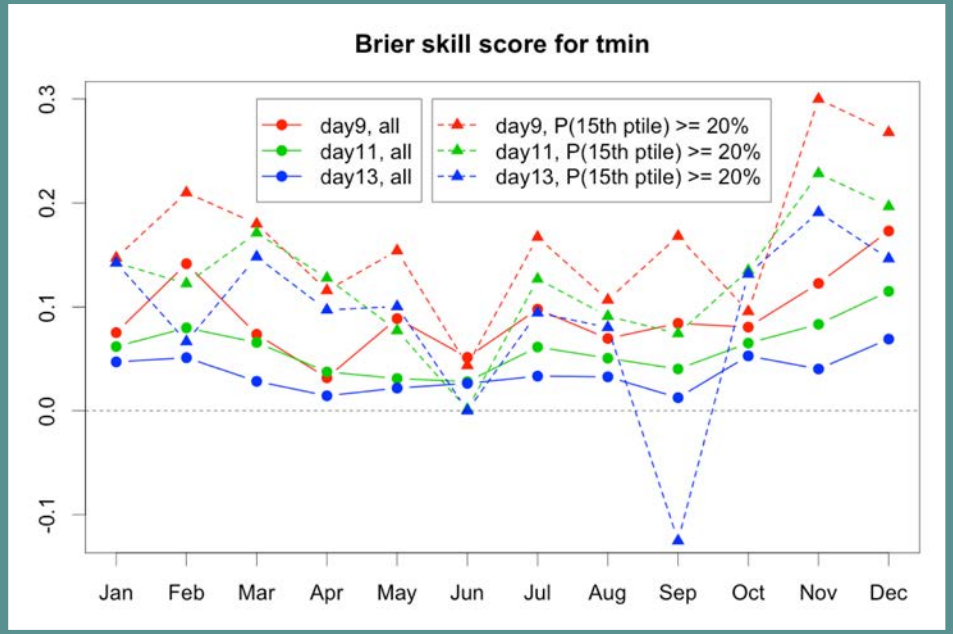
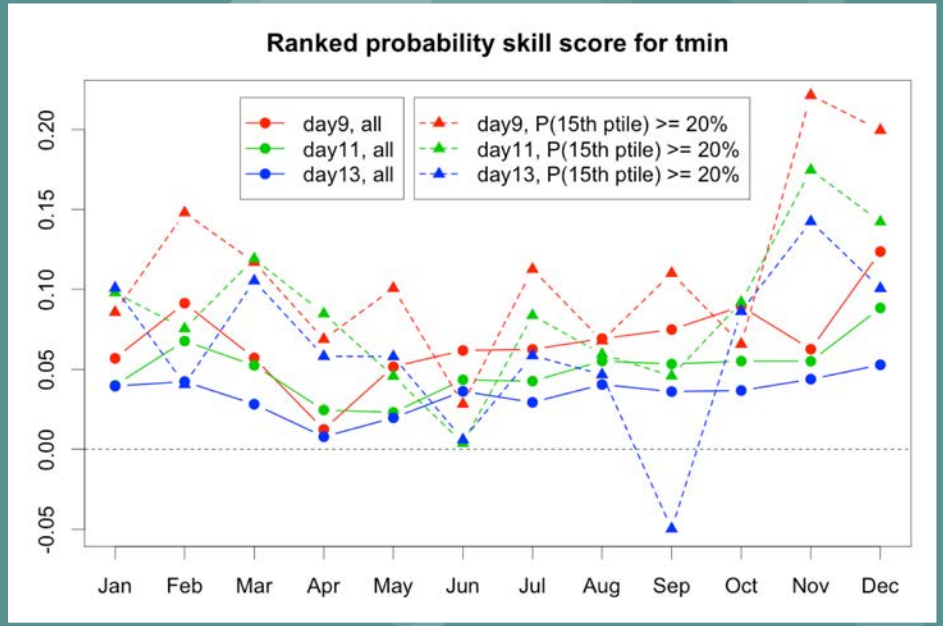


Mean BSS
All Seasons

	All Ptile	P<15th
Day 8-10	0.01	0.00
Day 10-12	0.00	-0.01
Day 12-14	0.00	-0.04



Mean RPSS
All Seasons

	All Ptile	P@85th>20%
Day 8-10	0.06	0.06
Day 10-12	0.02	0.02
Day 12-14	-0.01	-0.01

Extra Slides - with outlier values shown