SubX Multi-Model Predictability and Prediction Experiment
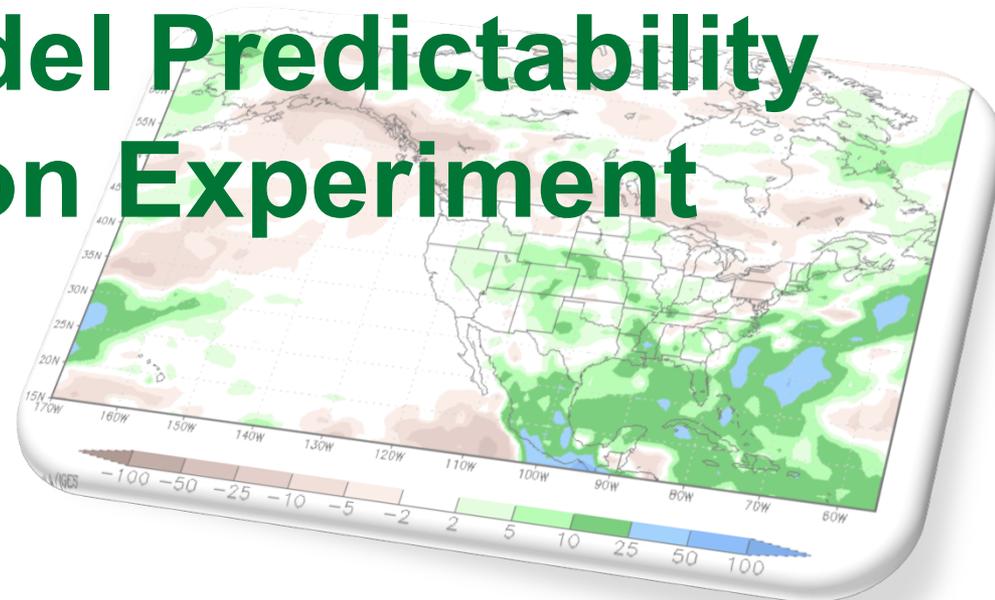
Who is the SubX Team?

CORE TEAM

Ben Kirtman
Kathy Pegion
Tim DelSole
Michael Tippett
Andy Robertson
Michael Bell
Robert Burgman
Jon Gottschalck
Dan Collins
Emerson LaJoie
Hai Lin

NCEP-CFSv2
Dan Collins
Jon Gottschalck
Emerson Lajoie
Emily Becker

NCEP-GEFS
Yuejian Zhu
Wei LI

NASA-GEOS5
Deepthi Achuthavarier
Randy Koster
Len Marshak

ECCC-GEM
Hai Lin
Bertrand Denis

Navy-ESM
Neil Barton
Joe Metzger

NCAR-CCSM4
Ben Kirtman
Duguong Min
Kathy Pegion
Rong Fu

ESRL-FIM
Shan Sun
Stan Benjamin
Ben Green

SubX≠NMME

- **NMME Sub-Seasonal Experiment**
  - **High Frequency NMME Output**
- **NMME Sub-Seasonal Forecast System Exploratory Workshop**
  - **Recommendations/Experimental Protocol**
- **SubX Protocol – Real-Time July 7, 2017**
  - **Re-Forecast and Forecast Data Available Mid-August 2017**
  - **Re-Forecast Deterministic Assessment**

SubX Protocol

- **Prediction System Details up to Provider**
- **Real-time and Retrospective Systems Identical**
  - **Ensemble Generation Issues**
- **Reforecast Forecast Period: 1999-2017**
- **At Least 3 Ensemble Members**
- **Minimum Length 32 Days**
- **Real-time Forecast Made Available to CPC Through NCO Every Wednesday by 5pm of Every week**
- **Data on Uniform 1x1 Grid**

Current Data Holdings (Last updated: Feb 14, 2018)

Re-Forecasts

Model	Ens Members	Init Interval	P1	P2	Climo	Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ECCC-GEM	4	7-days	☑	☑		1995-2014	☑							☑	☑	☑	☑	☑
EMC-GEFS	11	7-days	☑	☑		1999-2016	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
ESRL-FIM	4	7-days	☑	☑		1999-2016	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
GMAO-GEOS	4	5-days	☑			1999-2015	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
NRL-NESM	1	4 inits every 7-days	☑	☑		1999-2016	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
RSMAS-CCSM4	3	7-days	☑			1999-2016	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
NCEP-CFSv2	4	1-days	tas,pr			1999-2016	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑

- ECCC-GEM produces re-forecasts "on the fly"
- Some groups have provided both P1 & P2 data, others only P1
- Database constantly updated as new data comes available

SubX Week 3 Anomaly Correlation 2m Temperature [ASO 1999-2014]
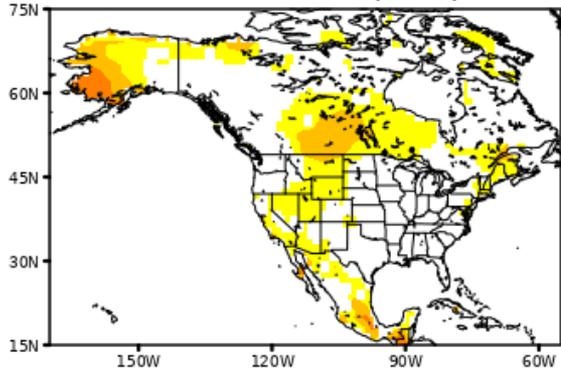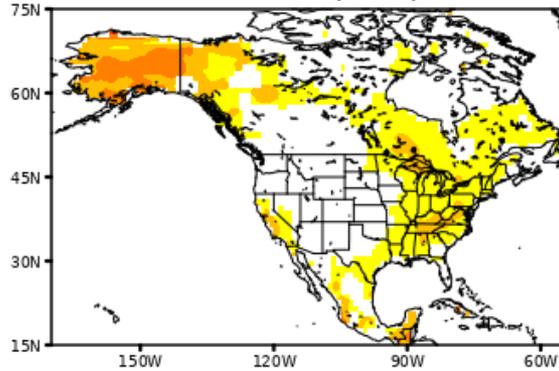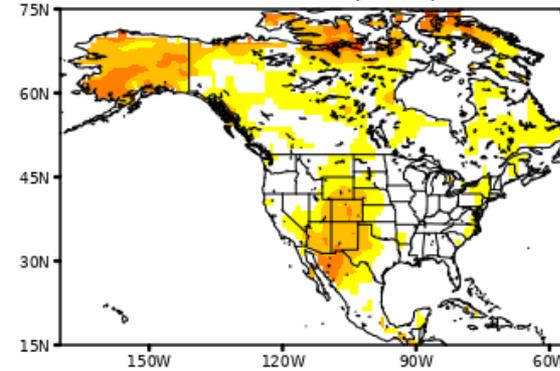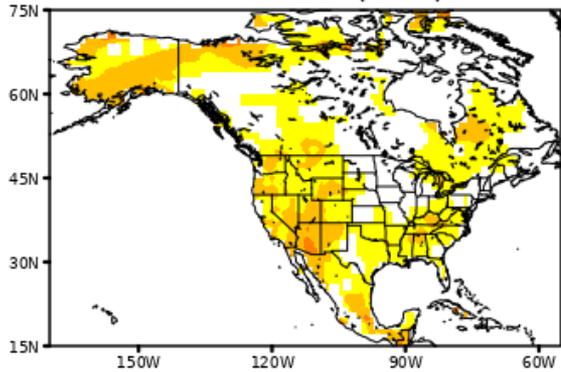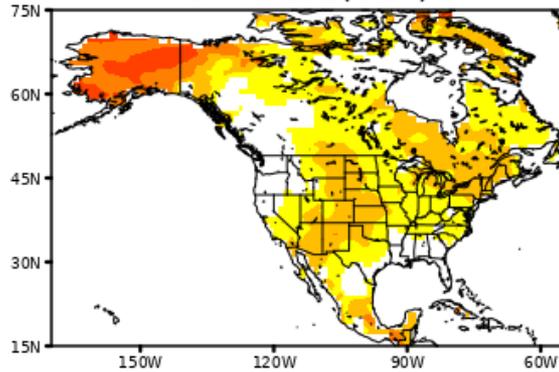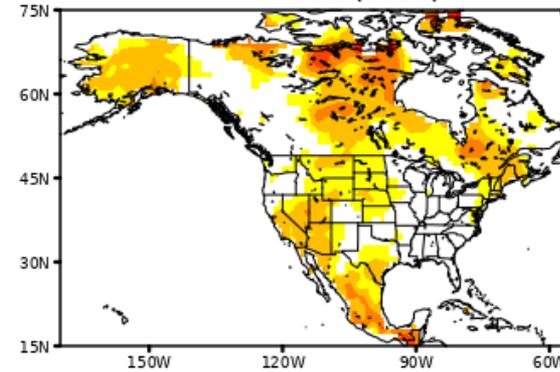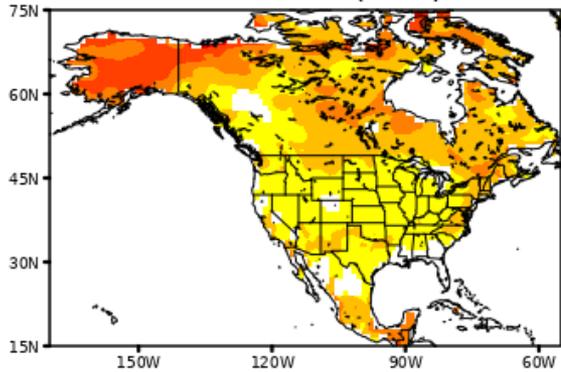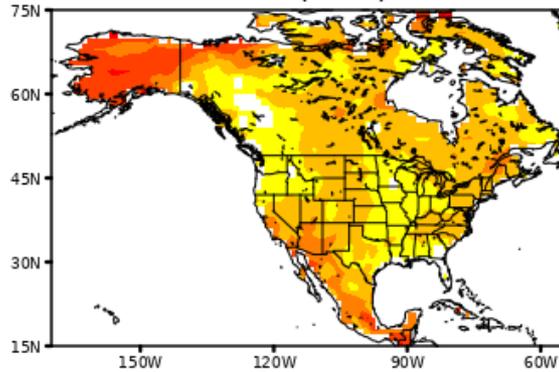
SubX Week 3 Anomaly Correlation 2m Temperature [SON 1999-2014]
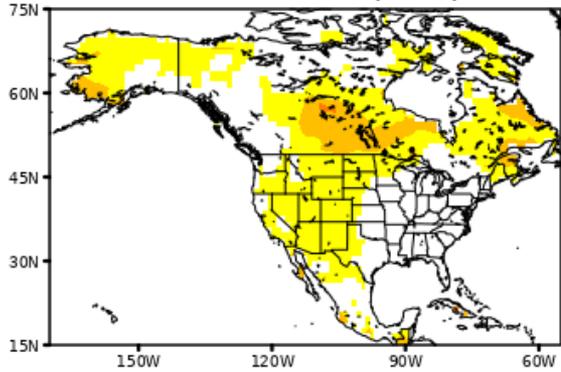
RSMAS-CCSM4(0.11) ESRL-FIM(0.15) NRL-NESM(0.14)
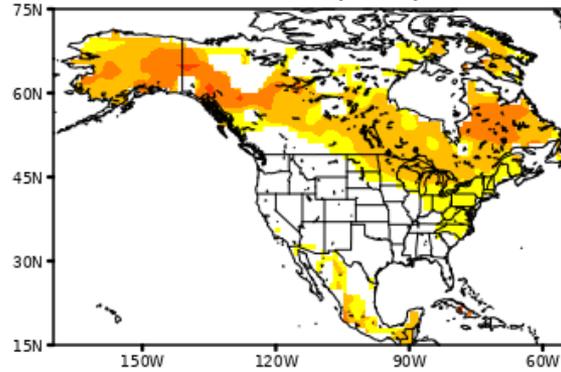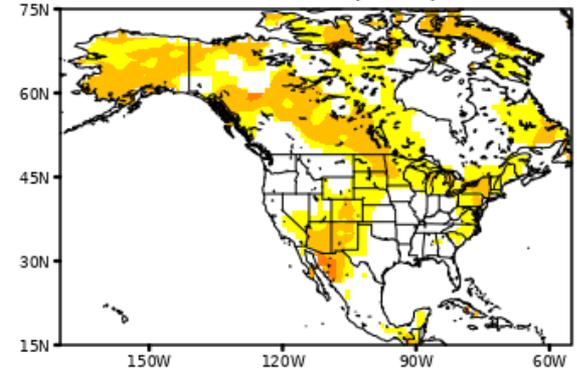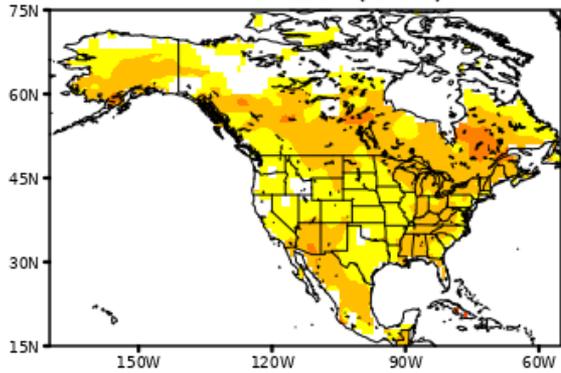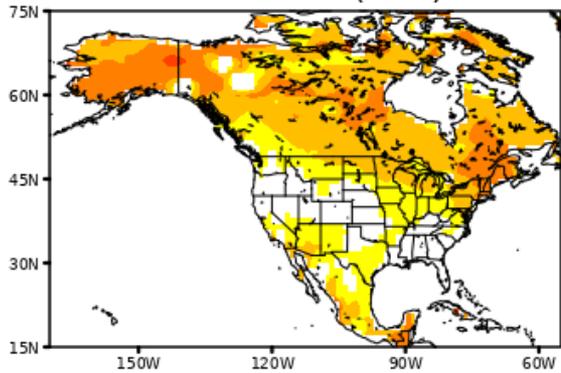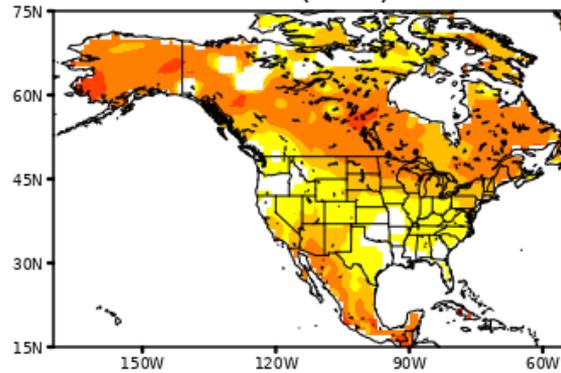
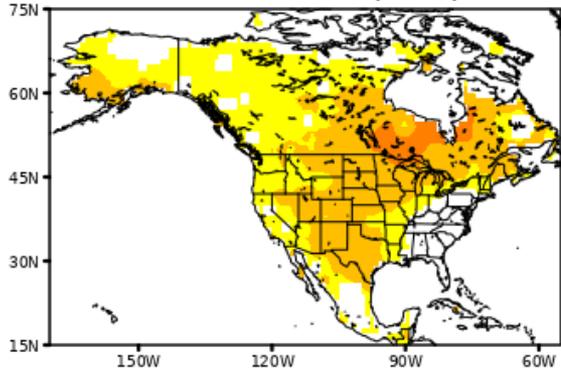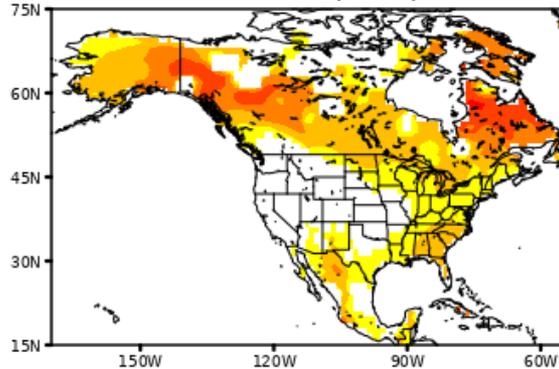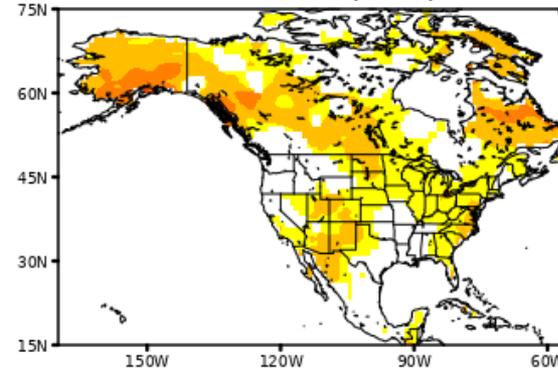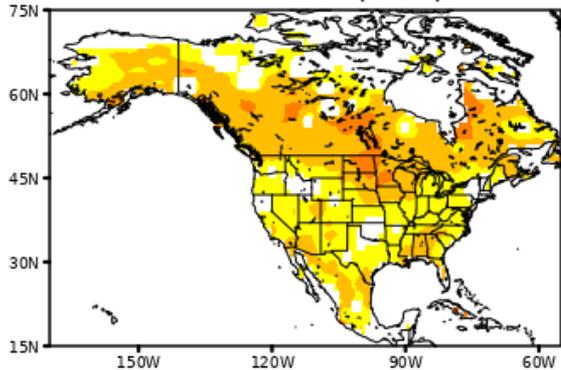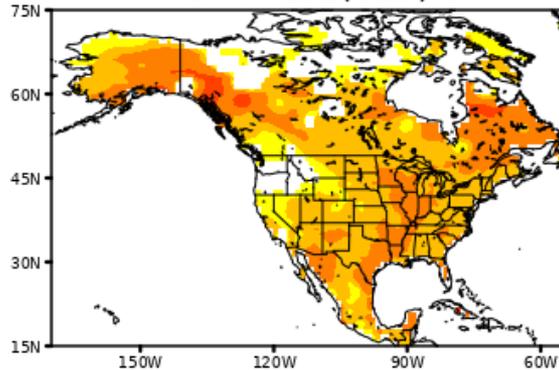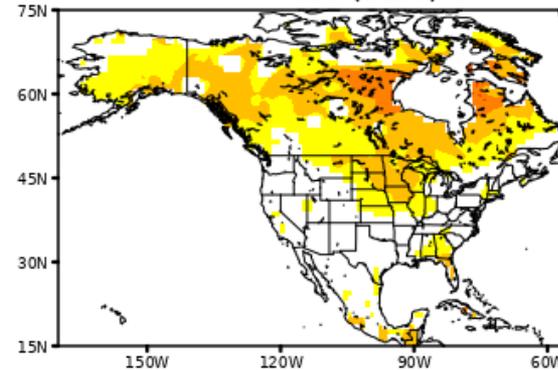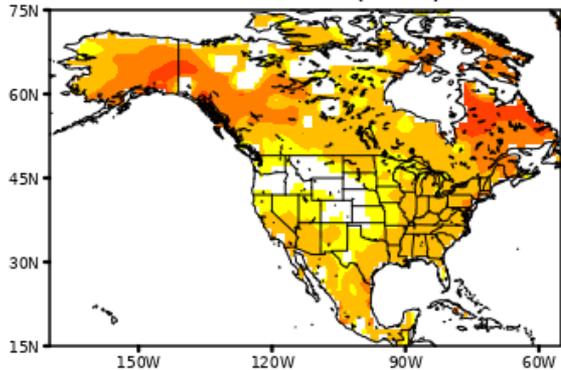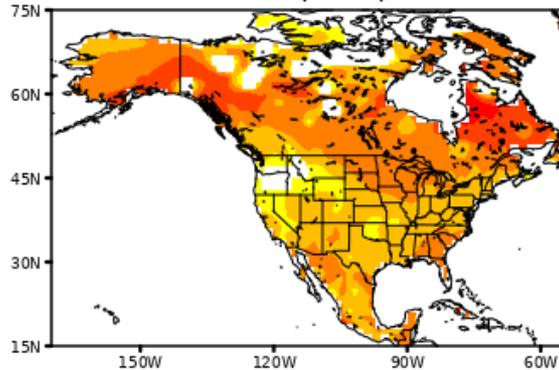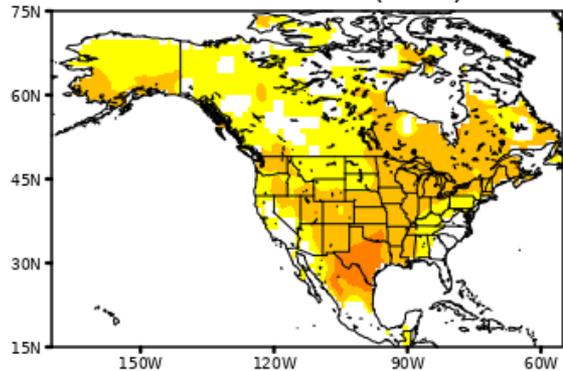GMAO-GEOS(0.19) EMC-GEFS(0.21) ECCC-GEM(0.14)
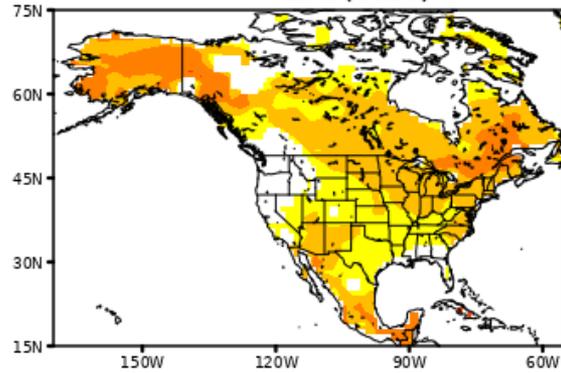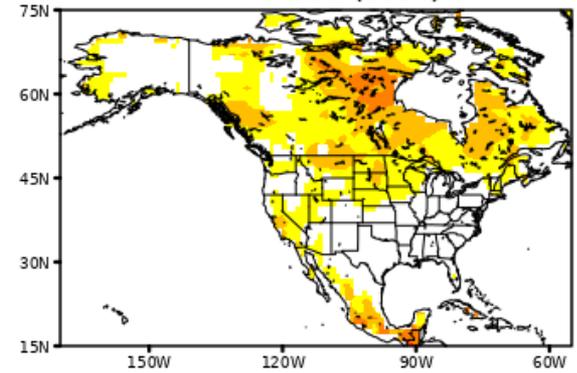
NCEP-CFSv2(0.21) MME(0.26)

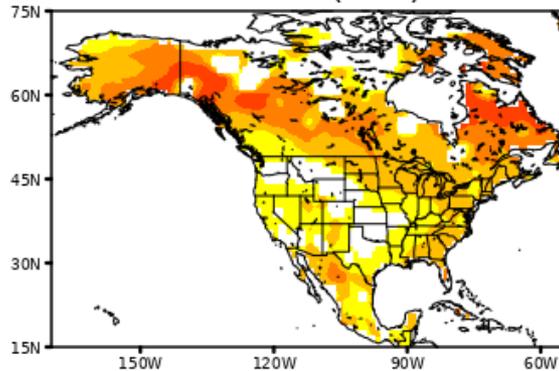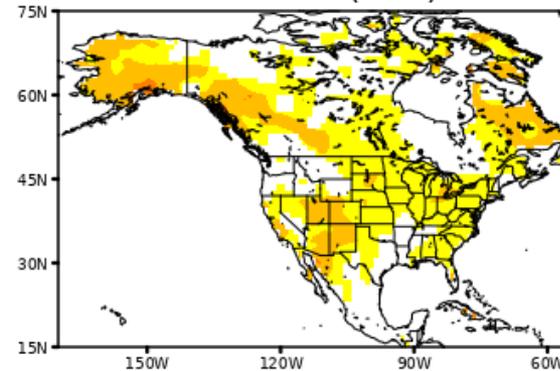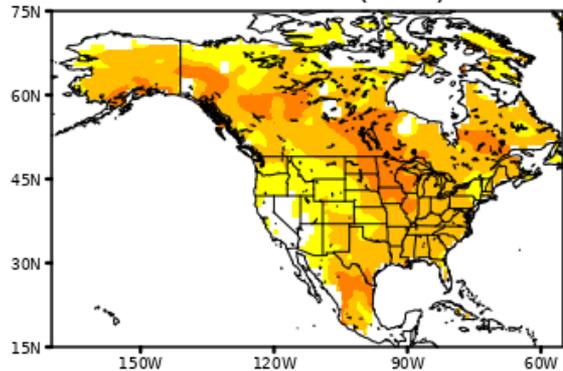SubX Week 3 Anomaly Correlation 2m Temperature [OND 1999-2014]

SubX Week 3 Anomaly Correlation 2m Temperature [NDJ 1999-2014]
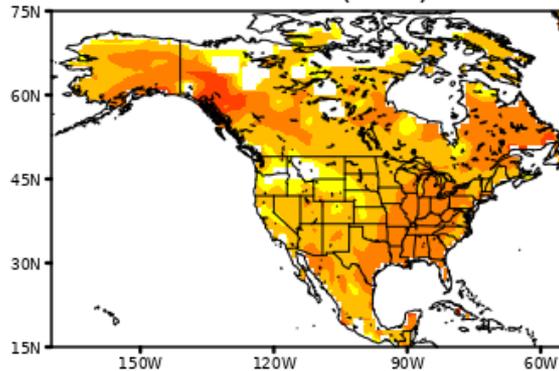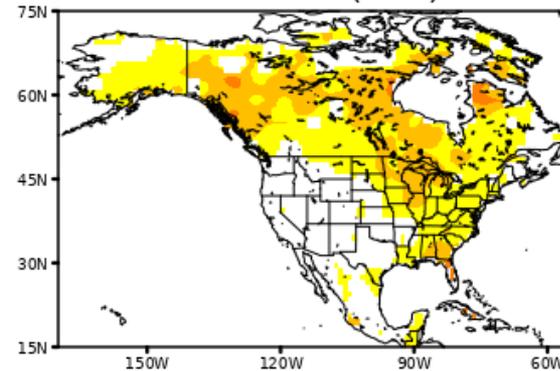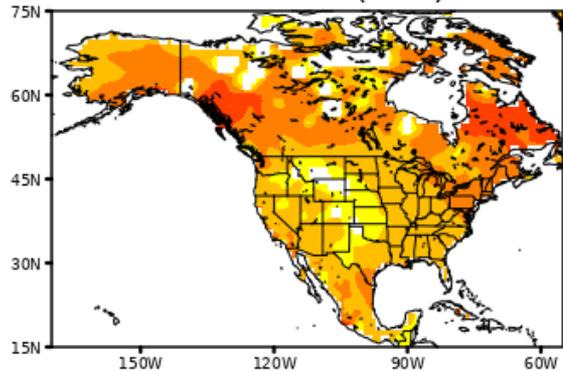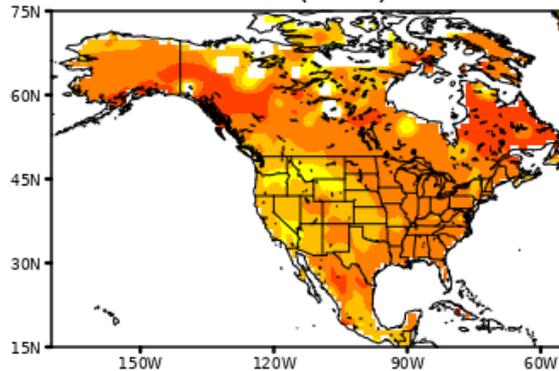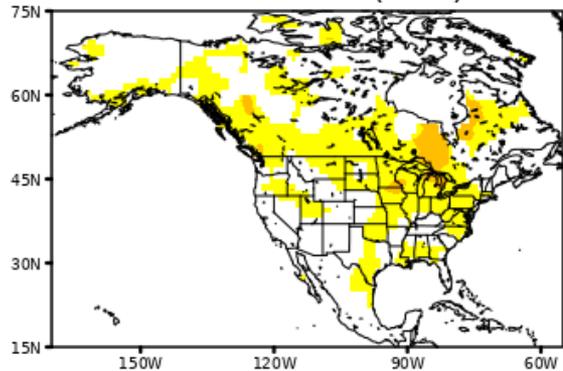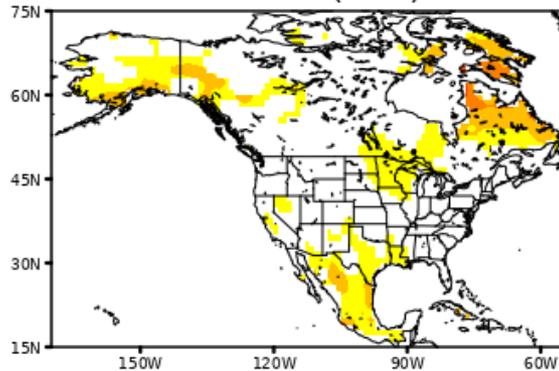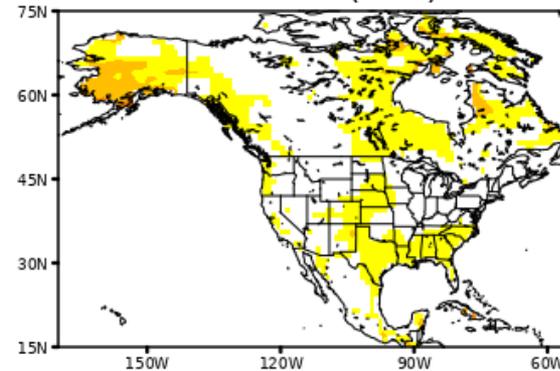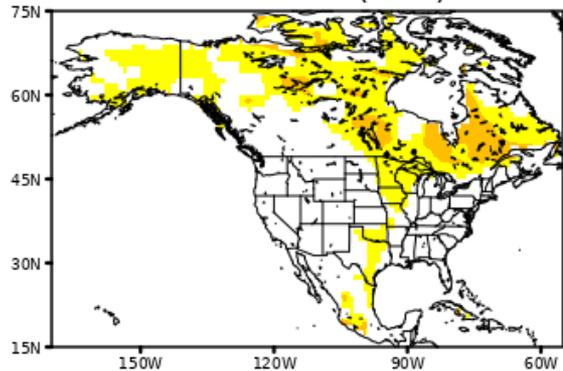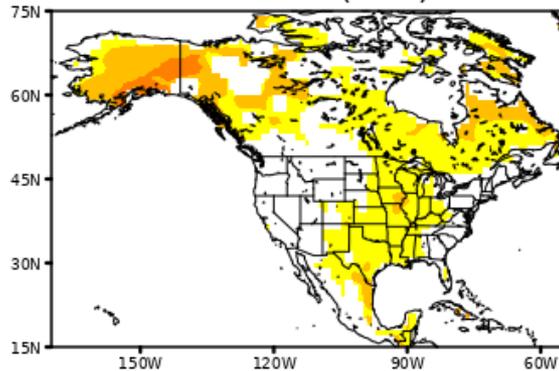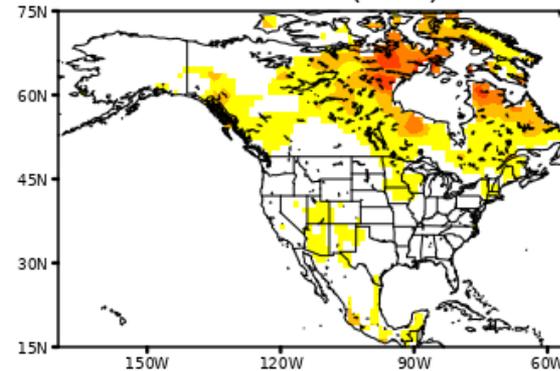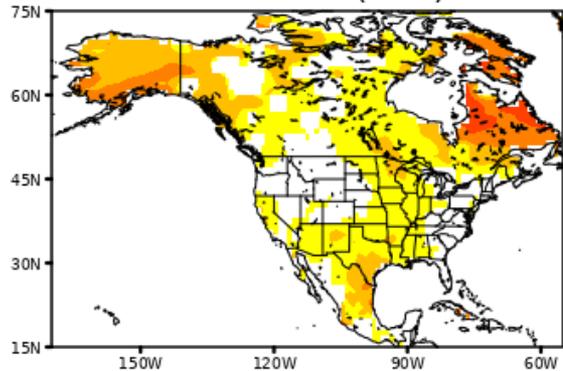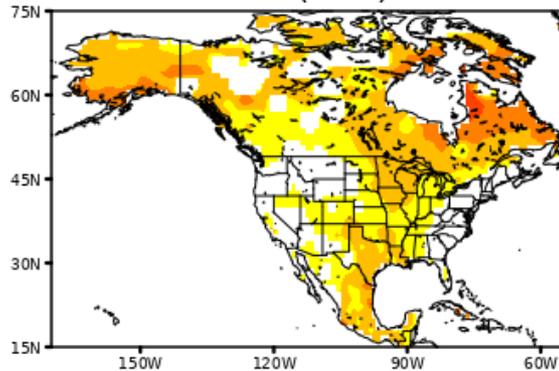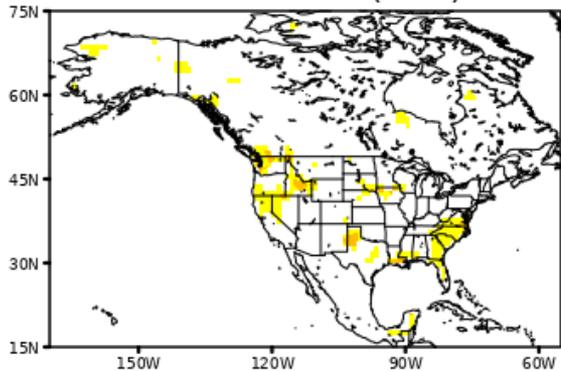

RSMAS-CCSM4(0.18)   ESRL-FIM(0.22)   NRL-NESM(0.15)

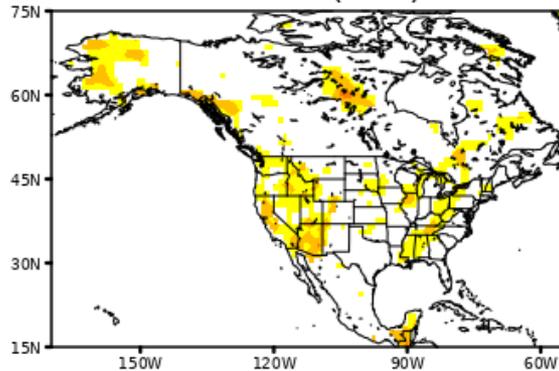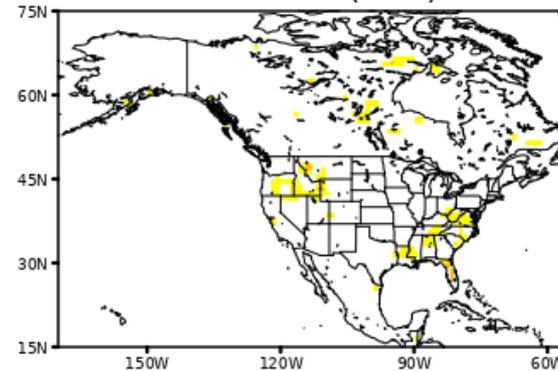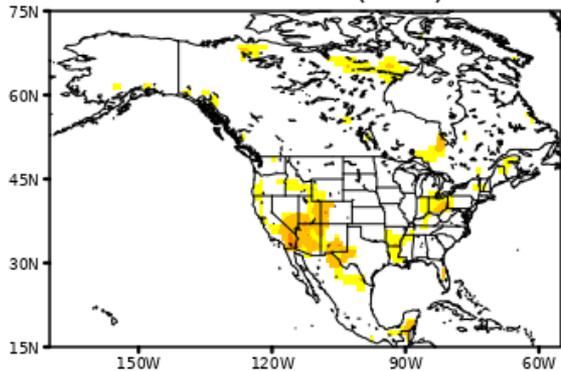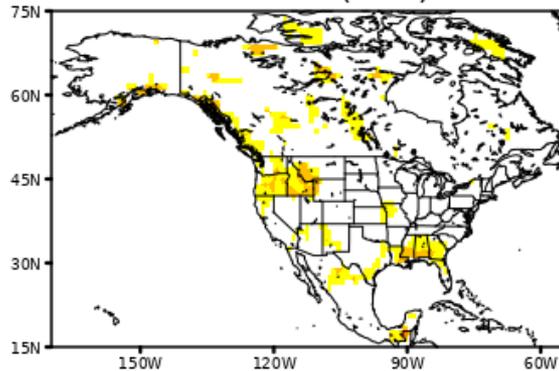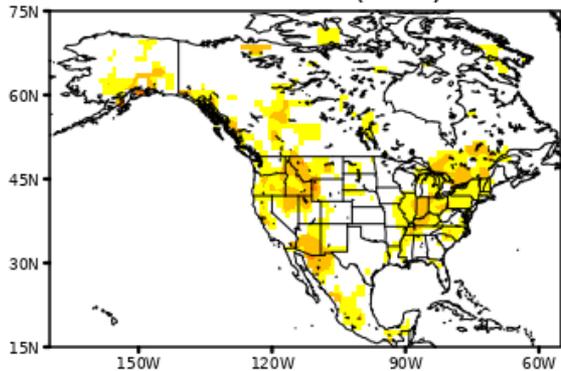GMAO-GEOS(0.22)   EMC-GEFS(0.27)   ECCC-GEM(0.15)

NCEP-CFSv2(0.27)   MME(0.31)

SubX Week 4 Anomaly Correlation 2m Temperature [OND 1999-2014]

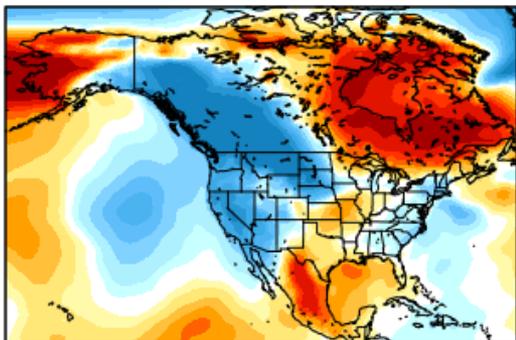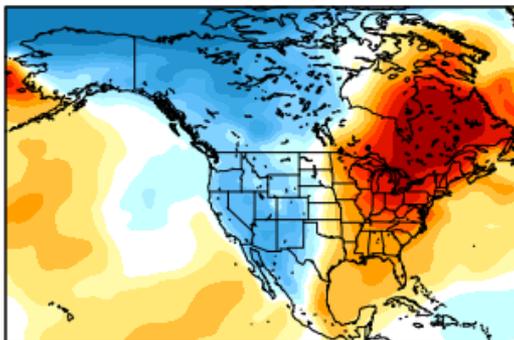# SubX Week 3 Anomaly Correlation Precipitation [NDJ 1999-2014]
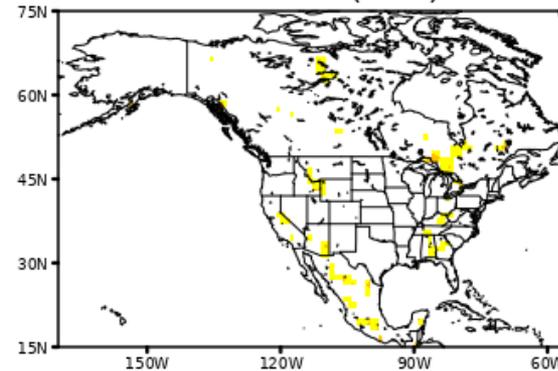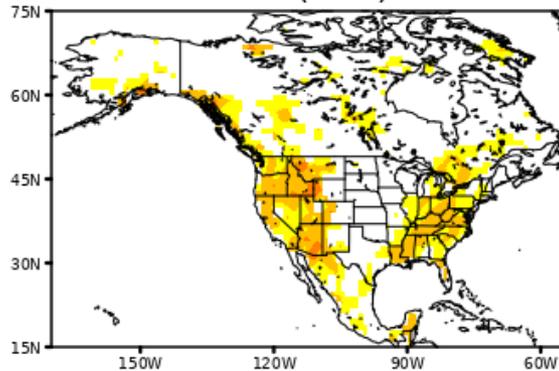
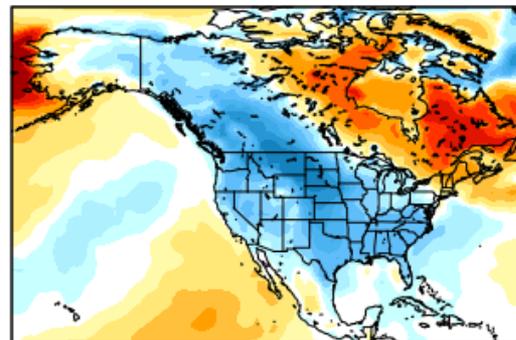# SubX Week 3-4 2m Temperature Anomalies (°C): Valid 2 weeks ending MAR 16

ESRL-FIMr1p1 (IC: 02/14 ; 4 Ens)
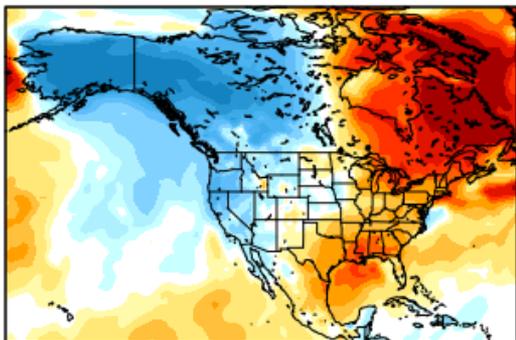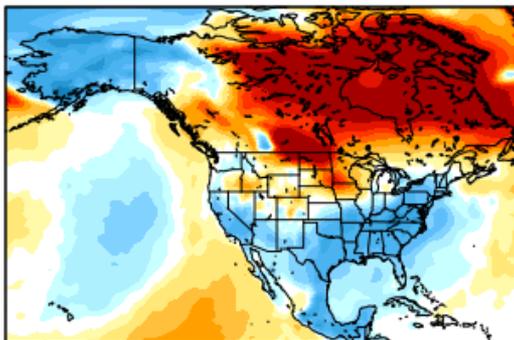RSMAS-CCSM4 (IC: 02/11 ; 9 Ens)
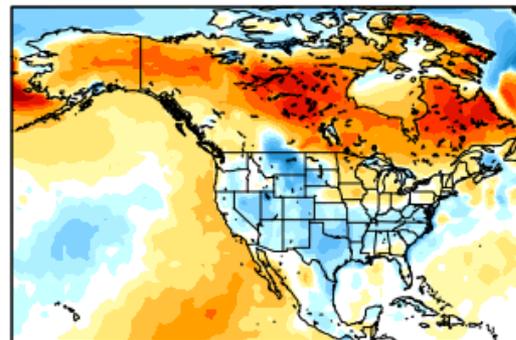EMC-GEFS (IC: 02/14 ; 21 Ens)
GMAO-GEOS_V2p1 (IC: 02/10 ; 4 Ens)
NRL-NESM (IC: 02/10-02/13 ; 4 Ens)
ECCC-GEM (IC: 02/15 ; 21 Ens)
MME (63 Ensemble Members)

SubX Week 3-4 Total Precipitation Anomalies (mm): Valid 2 weeks ending MAR 16

ESRL-FIMr1p1 (IC: 02/14 ; 4 Ens)

RSMAS-CCSM4 (IC: 02/11 ; 9 Ens)

EMC-GEFS (IC: 02/14 ; 21 Ens)
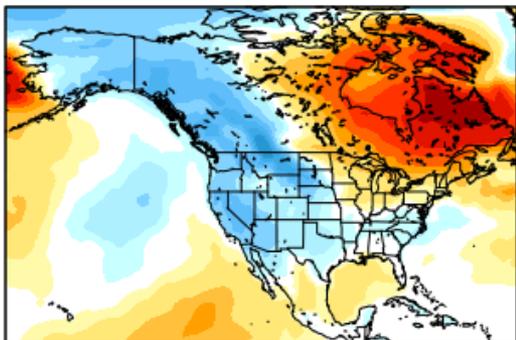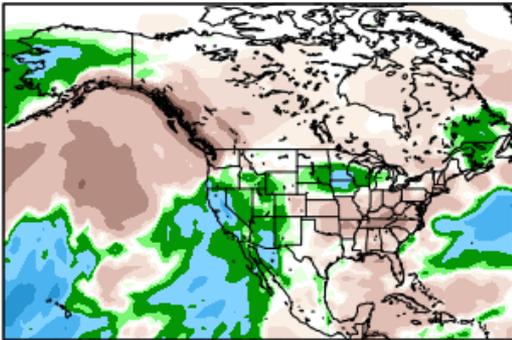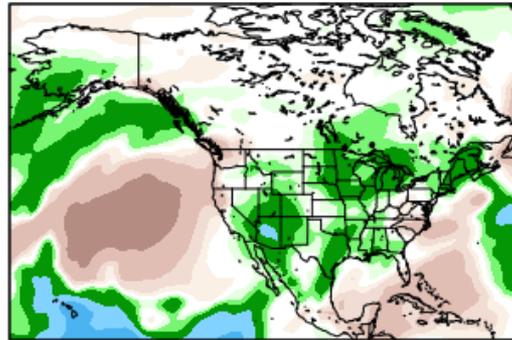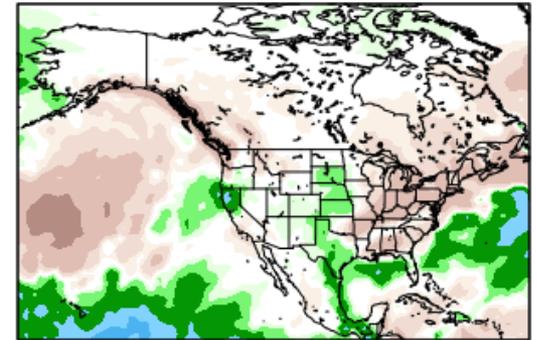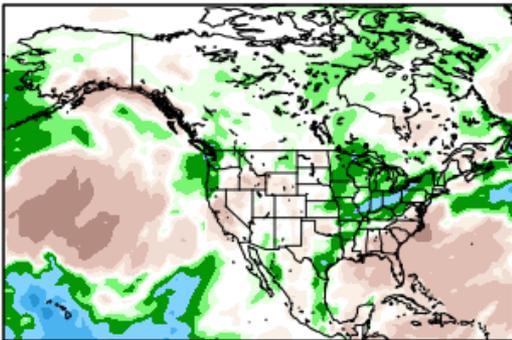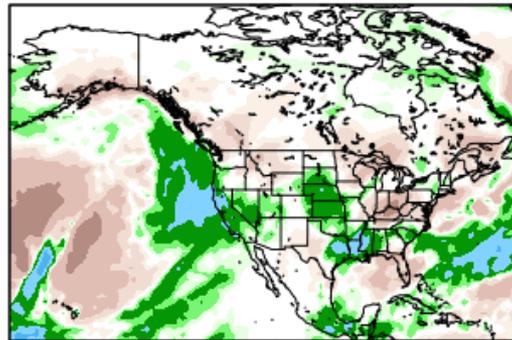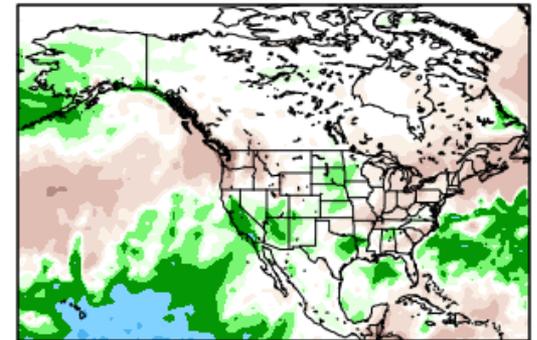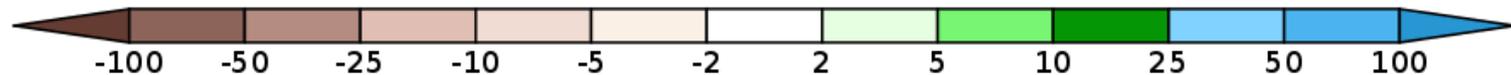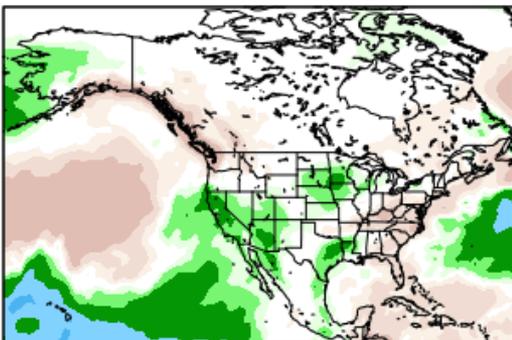
GMAO-GEOS_V2p1 (IC: 02/10 ; 4 Ens)

NRL-NESM (IC: 02/10-02/13 ; 4 Ens)

ECCC-GEM (IC: 02/15 ; 21 Ens)

MME (63 Ensemble Members)

-100 -50 -25 -10 -5 -2 2 5 10 25 50 100
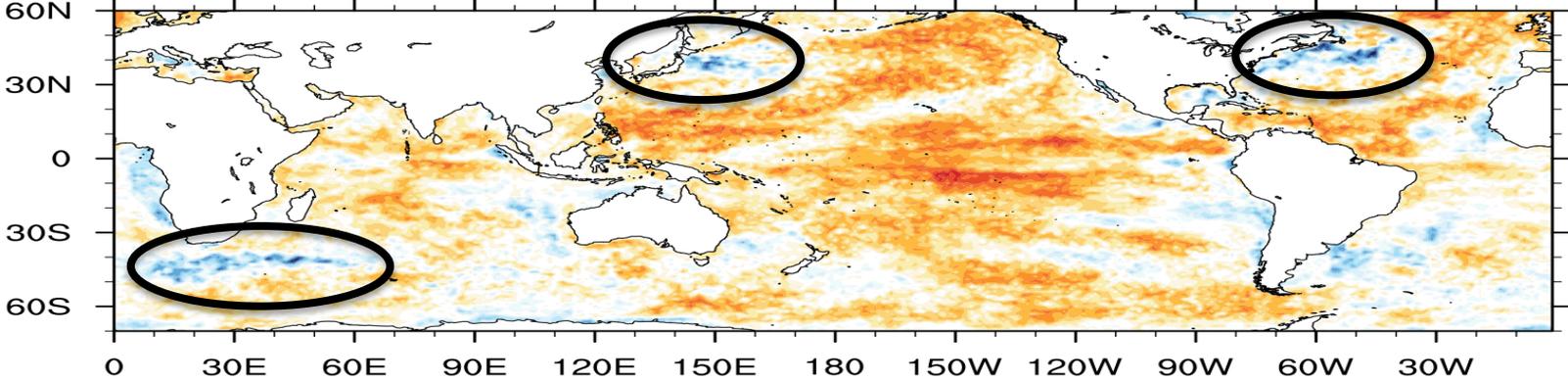
SubX BY THE NUMBERS

7 Global Models

1 Year of *Real-time* Forecasts
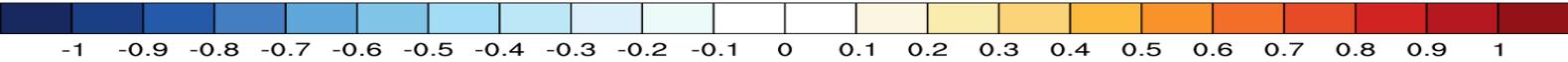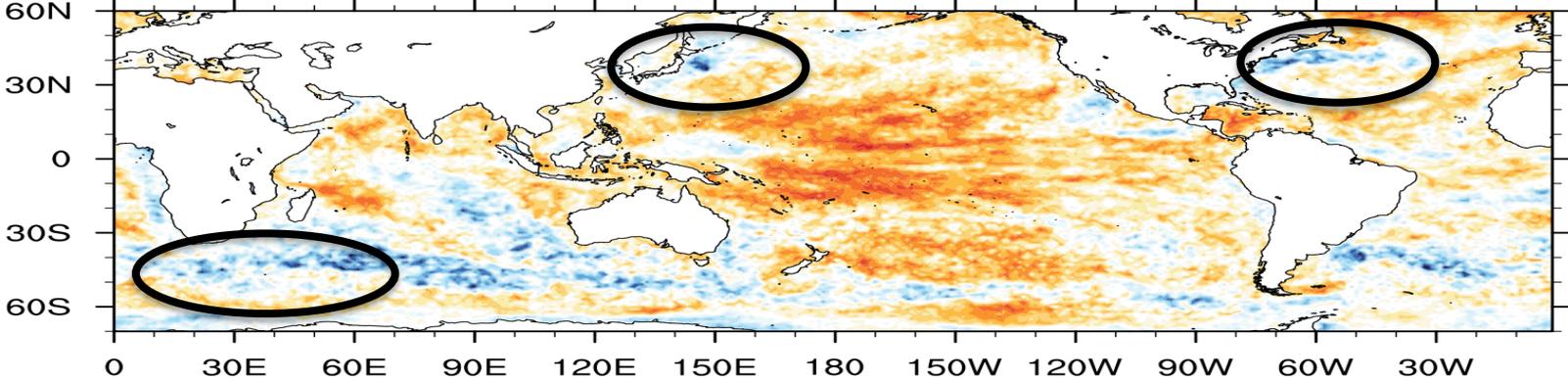
17 Years of *Retrospective* Forecasts

3-4 week guidance for Climate Prediction Center Outlooks

Can Resolved Ocean Eddies Improve Forecast Skill?
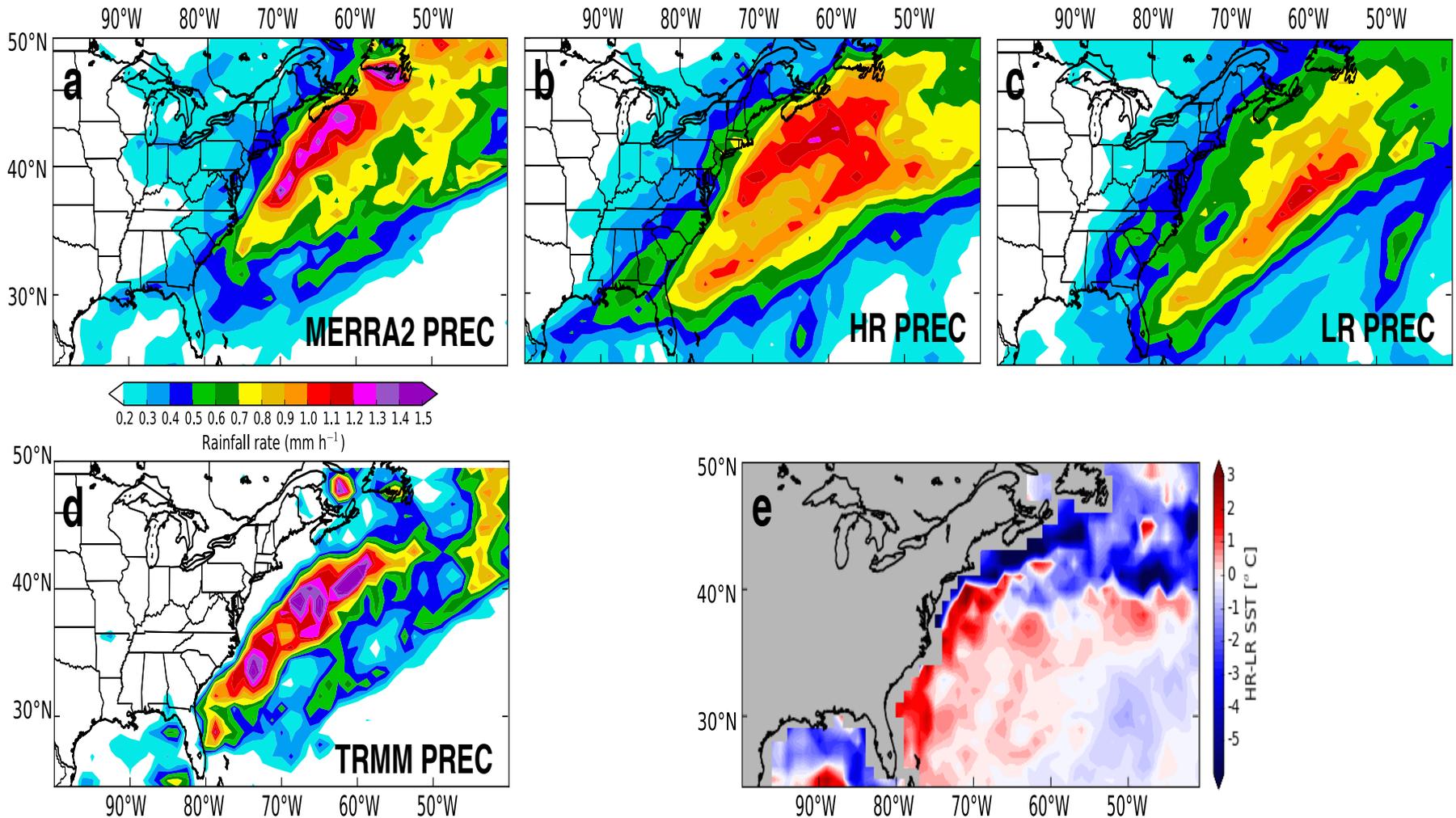

(a) RPSS – JanIC JFM CCSM4

(b) RPSS – JunIC JJA CCSM4

Improving the Week 3-4 Forecast
High Spatial Resolution (0.5x0.5 Atmos, 0.1x0.1 Ocean) Forecasts
Jan 15-31 2014 Forecast and Observational Estimates

Improving S2S Forecasts