MAPP
Modeling, Analysis, Predictions, and Projections

The Subseasonal Prediction Experiment (SubX)

Dan Barrie (NOAA Modeling, Analysis, Predictions, and Projections program)

Thursday, March 1, 2018

MAPP Team -- Annarita Mariotti, Ali Stevens, Emily Read

SubX - Basics

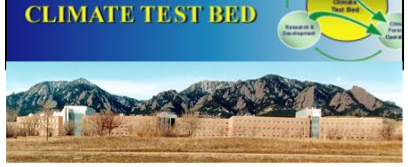
2016-2018 Climate Test Bed Experiment

Seven global models developed in North America running coordinated hindcast and real-time experiment, and evaluating system setup and performance.

Twenty-Five scientists from CPC, EMC, ESRL, U Miami, GMU, Columbia, FIU, EC, NASA GMAO, NRL, UCLA

Participants follow flexible protocol:

- Forecast providers determine system setup
- Real-time and retrospective systems identical
- Minimum reforecast: 1999-2017
- Minimum forecast lead: 32 days
- 3+ ensemble members
- Real-time forecasts sent to CPC via NCO by 5pm Wednesday, every week
- Data on uniform 1x1 grid



SubX - Model Descriptions

Model	Atmosphere	Ocean	Sea Ice	Land
NCEP/CFSv2	T126 L64 ICs CFSR	MOM4L40 0.25° EQ, 0.5° global, ICs CFSR	Same as Ocn	NOAH ICs GLDAS
NCEP/GEFS	T574 L64 for 0-8 day; T382 for 8-35 days; ICs: Atm DA	N/A	N/A	T574 ICs GDAS
ECCC GEM	0.45° 40L levels; ICs from ERA-interim	N/A	N/A	Offline SPS forced by ERA-Interim
NASA GEOS-5 AOGCM	GEOS5 0.5° 72L, ICs from MERRA2	MOM5 - 0.5° 40L; ICs: GMAO Ocn Analysis	CICE; ICs: GMAO Ocn Analysis	Catchment Land Sfc Model ICs MERRA-2
Navy Earth System Model	T0359 L50 ICs atmos DA	0.08°; 41L ICs: Ocn reanalysis	Same as ocn	T0359 ICs: AGRMET
NCAR/CCSM4	0.9°x1.25° L26	POPL60; 1°; 0.25 lat res in deep tropics	CICE4, Same as ocn	CLM4, Same as atmos
NOAA/ESRL FIM HYCOM	~60km 64L; ICs: CFSR	~60km, iHYCOM	Same as Ocn	NOAH land sfc model; ICs: CFSR

Data Availability

Data hosted at IRI/Columbia University

Priority 1 data (Operations-necessitated): Z500/200, U/V 850/200, T2m, P, Ts, TOA OLR

Priority 2 data (Research-necessitated): HUS850, W500, U/V 100/10m, T2m day max/min, Td2m, Sfc. SH/LH, Tau x/y, PSL, SWE, Net SR, Snow density/cover, SM, SIC, CAPE

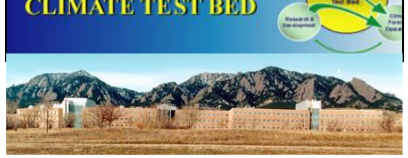
Current Data Holdings (Last updated: Feb 14, 2018)

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	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑

Forecasts

Model	Ens Members	Day of Week Init	P1	P2
ECCC-GEM	21	Thurs	☑	☑
EMC-GEFS	21	Wed	☑	☑
ESRL-FIM	4	Wed	☑	☑
GMAO-GEOS	4	Rotates	☑	
NRL-NESM	1	Sat,Sun,Mon,Tues	☑	☑
RSMAS-CCSM4	9	Sun	☑	



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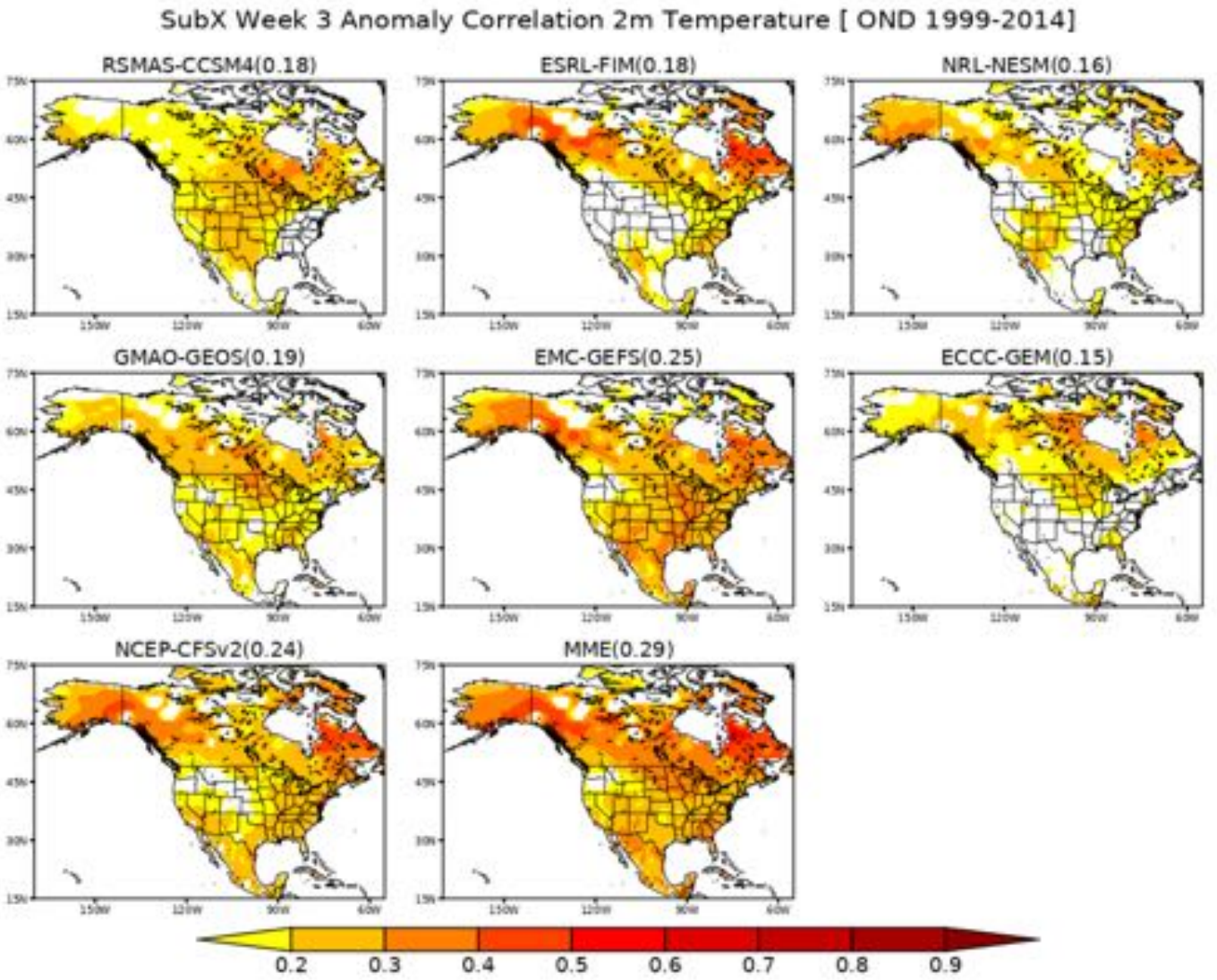
Preliminary Hindcast Evaluation



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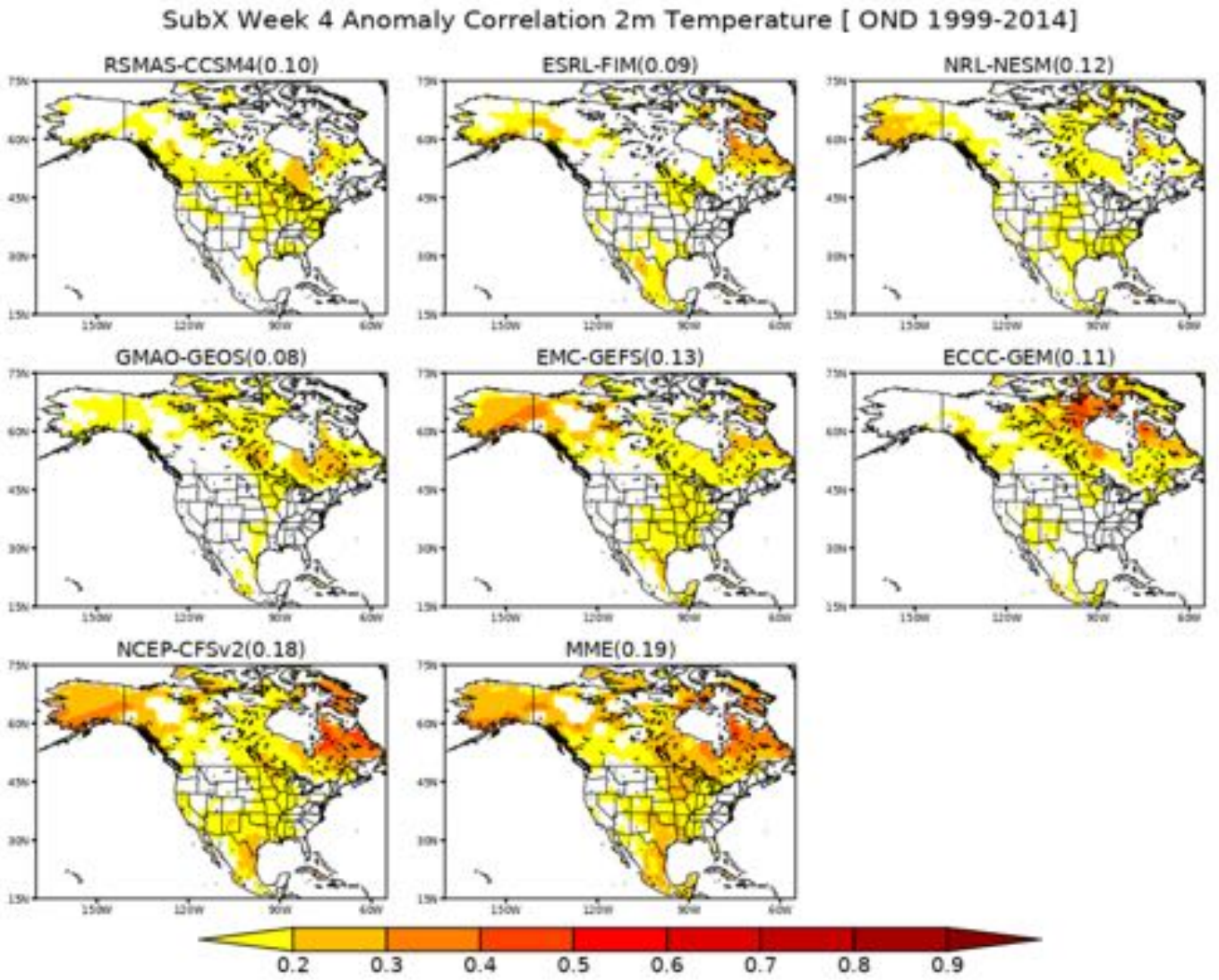

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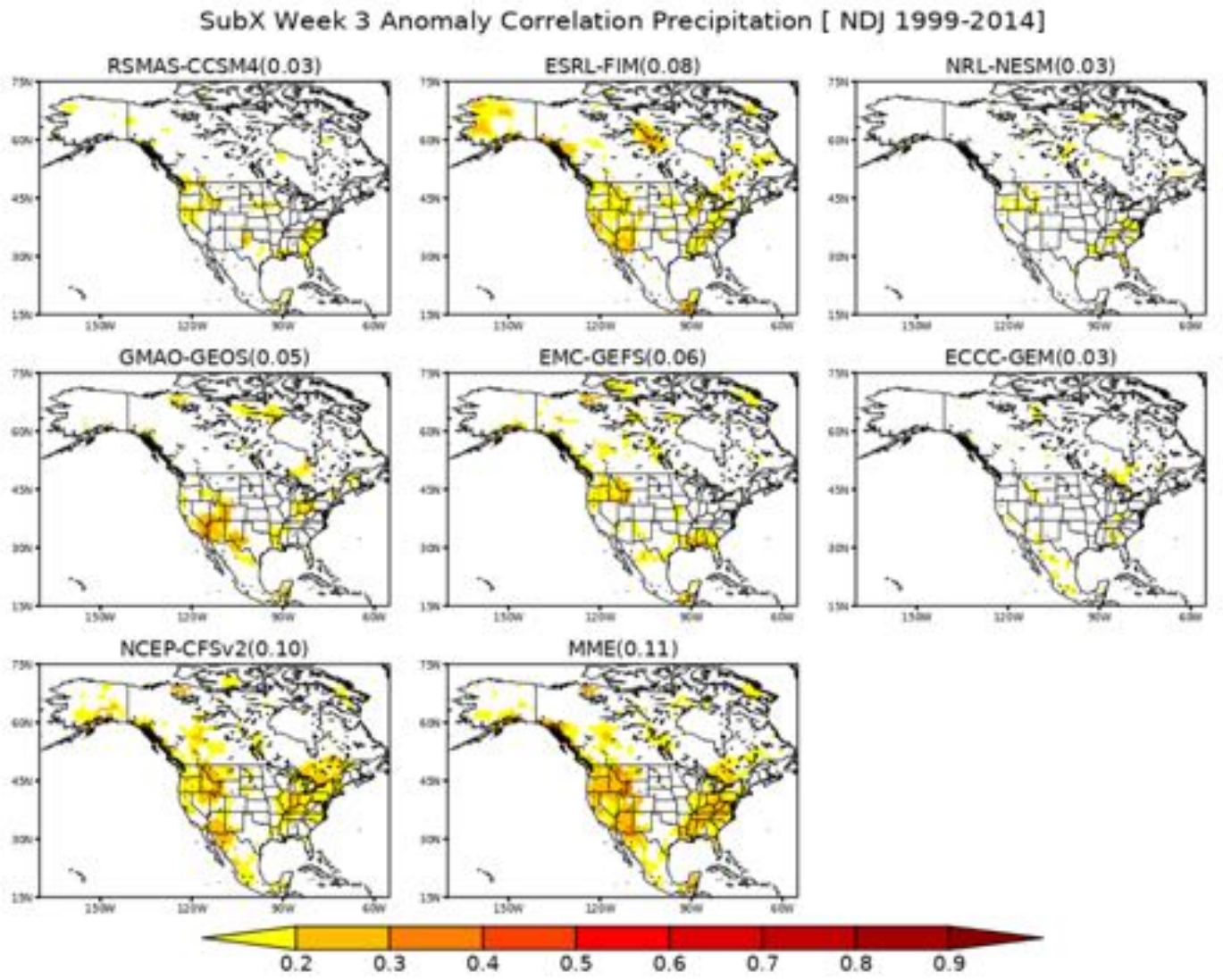

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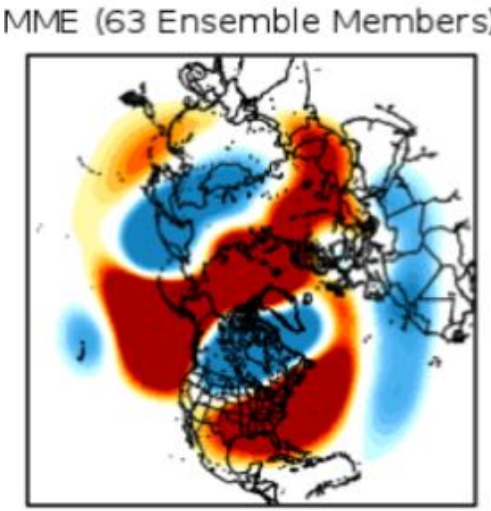
Week of 2/17 East Coast Ridge

SubX MME

1-week lead

init ~2/10-15

forecast 2/17-23

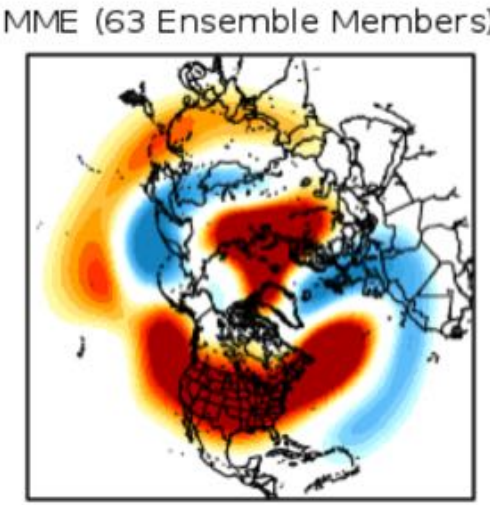


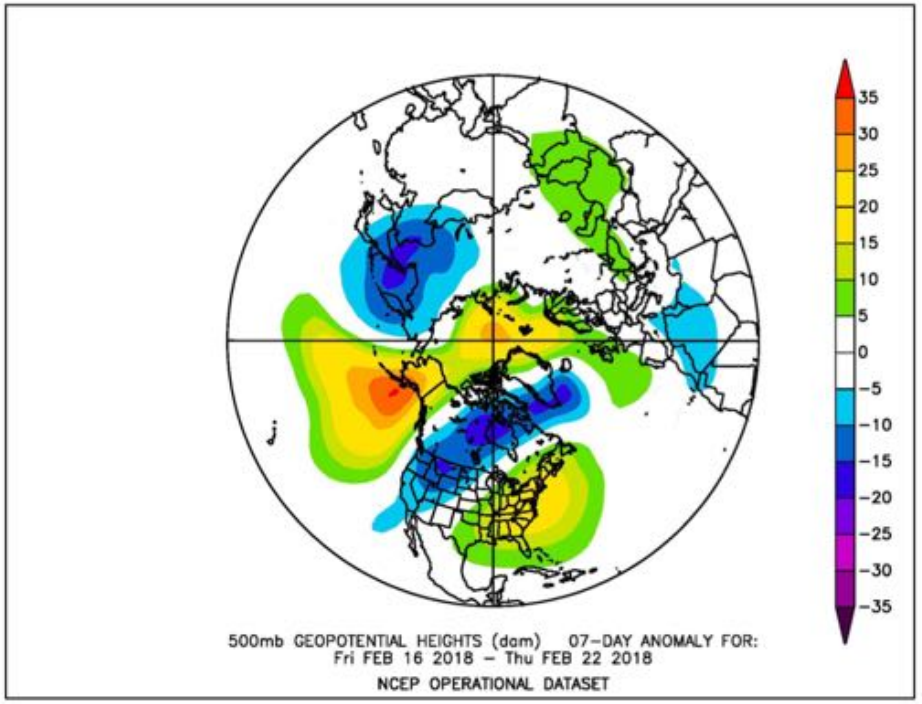
SubX MME

2-week lead

init ~2/3-8

forecast 2/17-23





NCEP Analysis

2/16-2/22

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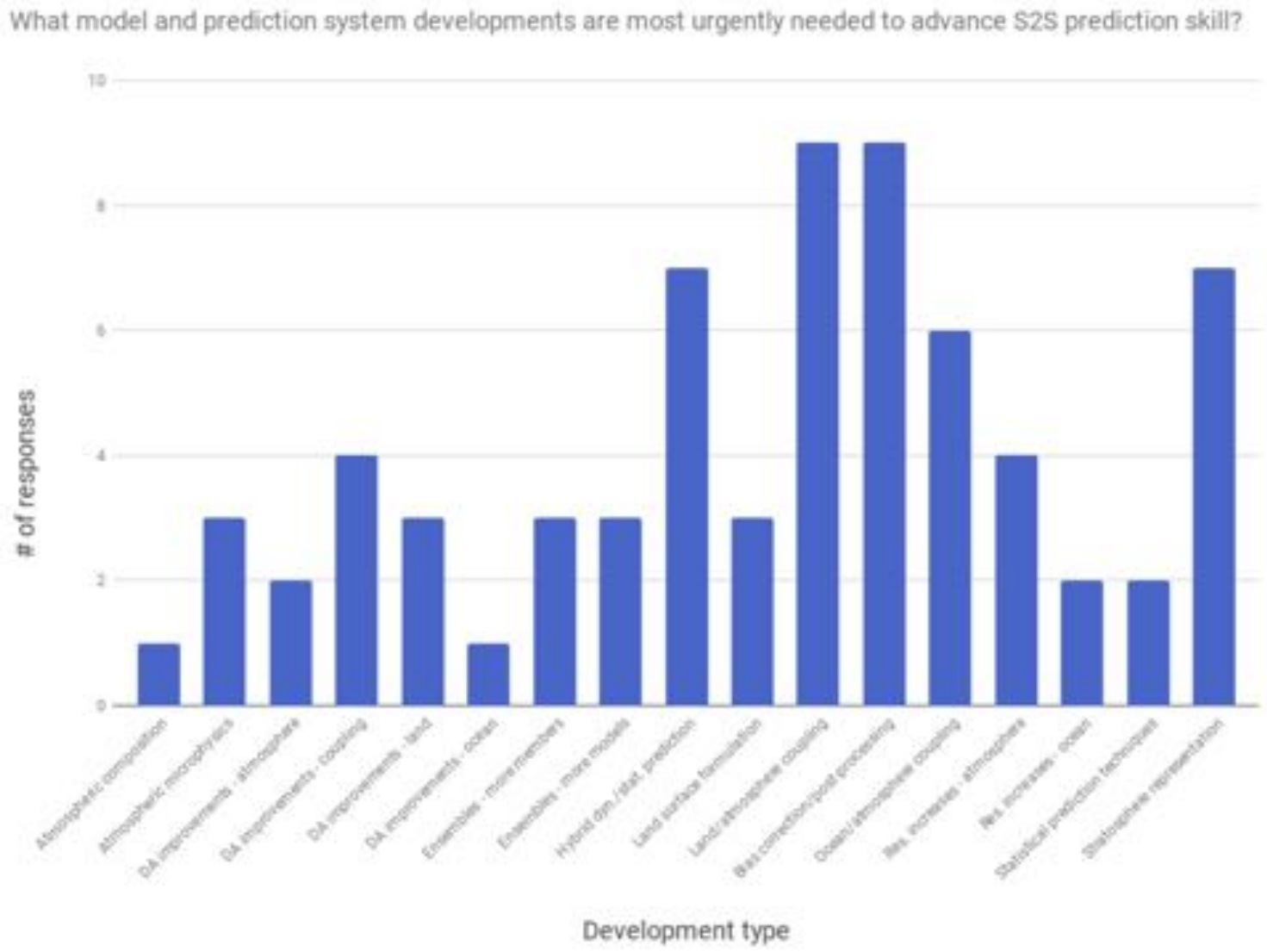
cpo.noaa.gov/mapp/webinar



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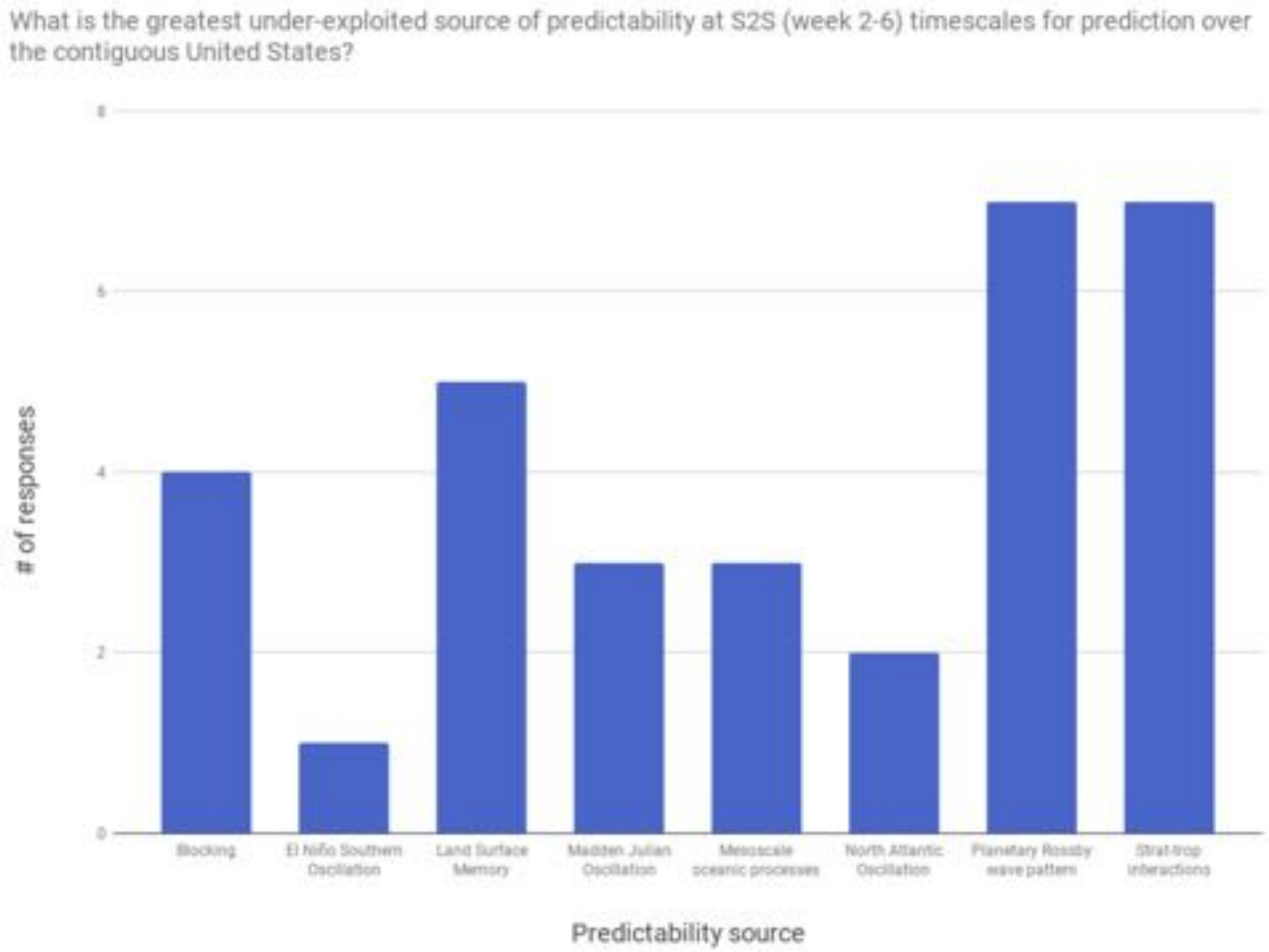


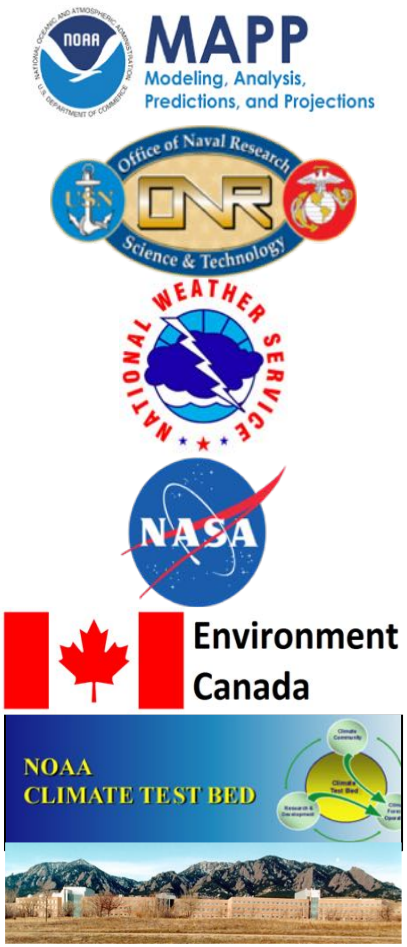
Coordinates and Acknowledgements

Project website:
http://cola.gmu.edu/kpegion/subx/

More details on system configurations, model output, and data access

Acknowledgements: Kathy Pegion and Ben Kirtman

SubX Team: Ben Kirtman, Kathy Pegion, Tim DelSole, Michael Tippett, Andy Robertson, Michael Bell, Robert Burgman, Hai Lin, Dan Collins, Wei Li, Eric Sinsky, Hong Guan, Yuejian Zhu, Emerson Lajoie, Kyle MacRitchie, Emily Becker, Dughong Min, Rong Fu, Deepthi Achuthavarier, Randy Koster, Lena Marshak, Bertrand Denis, Neil Barton, E. Joseph Metzger, Shan Sun, Stan Benjamin, Ben Green



Extra slides

Motivation

Growing need for information and products at subseasonal to seasonal timescales.

"One week I was on vacation and didn't put the [subseasonal] forecast out. I had about 50 emails saying where is the subseasonal forecast, we are dependent on that. We have a growing body of subscribers to that product."

Agricultural applications

Water management

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Germination of Subseasonal EXperiment (SubX)

Synchronicity

2014-15: MAPP FY2016 Climate Test Bed competition -- experiment to test S2S MME prediction system.

March 2015: Sub-Seasonal Forecast System Exploratory Workshop (MAPP-organized)

2016: National Academy of Sciences publishes report on "Next Generation Earth System Prediction: Strategies for Subseasonal to Seasonal Forecasts"

L: ***Accelerate efforts to carefully design and create robust operational multi-model ensemble S2S forecast systems.***

Use test beds and interagency and international collaborations where feasible to systematically explore the impact of various S2S forecast system design elements on S2S forecast skill, in particular the question how many unique models in a multi-model ensemble are required to predict operationally useful S2S parameters (see also Recommendation K).

Assess realistically the available operational resources and centers that are able to contribute operationally rigorous prediction systems.

Explore systematically how many unique models in a multi-model ensemble are required to predict useful S2S parameters, and whether those models require unique data assimilation, physical parameterizations, or atmosphere, ocean, land, and ice components (see also Recommendation L).

Develop a strategy to transition very high resolution (eddy/cloud-resolving) atmosphere-ocean-land-sea ice coupled models to operations, including strategies for new parameterization schemes, data assimilation procedures, and multi-model ensembles (MME).