
S2S Community Activities

(WCRP/WWRP S2S Project, SubX, IWRCC)

Duane Waliser, JPL/NASA

Winter Outlook Workshop
Nov 1, 2018
Scripps Institution of Oceanography

WWRP/WCRP

S2S Project

Frédéric Vitart and Andrew Robertson



WMO OMM

World Meteorological Organization
Organisation météorologique mondiale

Mission Statement

- **“To improve forecast skill and understanding on the sub-seasonal to seasonal timescale with special emphasis on high-impact weather events”**
- **“To promote the initiative’s uptake by operational centres and exploitation by the applications community”**
- **“To capitalize on the expertise of the weather and climate research communities to address issues of importance to the Global Framework for Climate Services”**

One of 3 Post-THORPEX Projects: S2S, HiW, PPP

S2S Project Website

WCRP-WWRP S2S Project

The screenshot displays the S2S Project Website interface. At the top, there is a navigation bar with the S2S Prediction Project logo and menu items: About S2S, News, Documents, Sub-projects, Database, Products, Meetings, People, Links, and Site Map. The main content area is divided into several sections:

- THE SUBSEASONAL TO SEASONAL (S2S) PREDICTION PROJECT DATABASE**: A central banner with a list of project members including F. Vitart, C. Ardiouze, A. Bonet, A. Brookshaw, M. Chen, C. Codorean, M. Deque, L. Ferranti, E. Fucile, M. Fuentes, H. Hendon, J. Hodgson, H.-S. Kang, A. Kumar, H. Lin, G. Liu, X. Liu, P. Malguzzi, I. Mallas, M. Manoussakis, D. Mastrangelo, C. MacLachlan, P. McLean, A. Minami, R. Mladek, T. Nakazawa, S. Najm, Y. Nie, M. Rixen, A. W. Robertson, P. Ruti, C. Sun, Y. Takaya, M. Tolstykh, F. Venuti, D. Waliser, S. Woolnough, T. Wu, D.-J. Won, H. Xiao, R. Zaripov, and L. Zhang. Below the list, it states: "A database containing subseasonal to seasonal forecasts from 11 operational centers is available to the research community and will help advance our understanding of predictability at the subseasonal to seasonal time range."
- Sub-projects' Wiki**: A list of wiki pages for various sub-projects, each with a contact name: Teleconnections (Hai Lin), Madden-Julian Oscillation (MJO) (Duane Waliser), Monsoons (Harry Hendon), Africa (Richard Graham), Extremes (Frederic Vitart), and Verification and Products (Caio Coelho).
- S2S News**: A section with tabs for S2S News, Upcoming Events, News Letter, and FAQs. The main article is titled "Regional S2S Activity: A New Spanish-language web portal 'Portal Experimental MONITOREO Y PRONOSTICO DEL CLIMA'". It describes a Spanish-language web portal developed in collaboration with CLIMAR and CLIMAX at CIMA, providing weekly CFSv2 sub-seasonal forecasts and circulation diagnostics for southern South America. The purpose is to accelerate knowledge among meteorological personnel and agencies in southern South America.
- S2S Database**: A section with tabs for ECMWF and CMA. It lists recent updates: "The result of 'S2S User Survey 2017'" (2017-05-25), "Charts of S2S Products/Indices are now available" (2016-09-22), "S2S Database Paper will come soon on BAMS" (2016-08-28), and "Now 9 centres S2S data available!" (2016-01-13).
- Mission**: A section with a flag icon. It states: "The main goal of the proposed WWRP/THORPEX/ WCRP joint research project is to improve forecast skill and understanding on the subseasonal to seasonal timescale, and promote its uptake by operational centres and exploitation by the applications community. Specific attention will be paid to the risk of extreme weather, including tropical cyclones, droughts, floods, heat waves and the waxing and waning of monsoon precipitation. Work will be guided by a steering group that will work in conjunction with appropriate WMO bodies and other relevant structures."
- Reports & Publications**: A section with a document icon. It lists several reports and publications, including a Spanish version of the S2S project overview, applications of S2S forecasts for disaster early warning, a report on subseasonal MME in LC-LRFMME, an early release of the S2S Project Database, a WMO publication on seamless prediction of the Earth system, and a paper by Andrew W. Robertson, Arun Kumar, Malaquias Pena, and Frederic Vitart on improving and promoting subseasonal to seasonal prediction.

At the bottom of the page, the website address **S2Sprediction.net** is displayed in a large blue font.

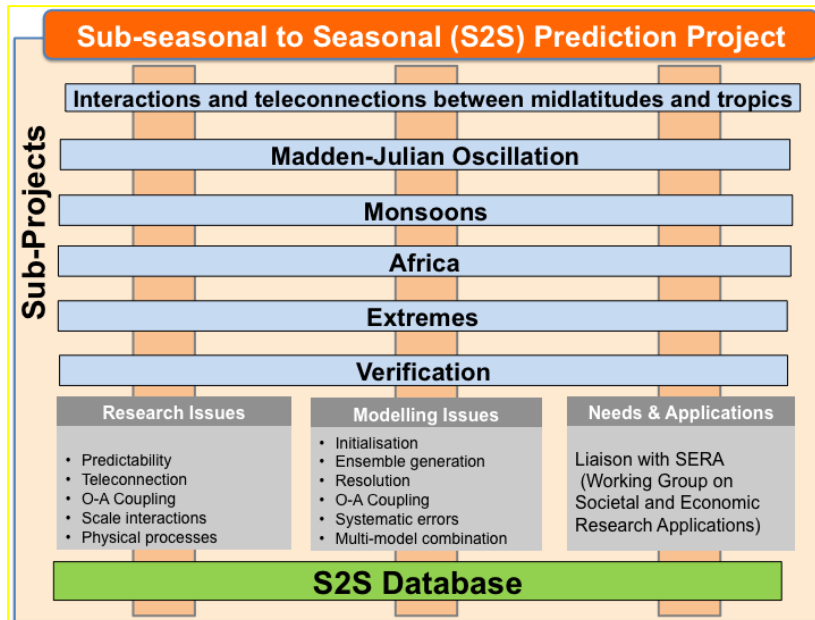
Subseasonal Forecast Database

WCRP-WWRP S2S Project

S2sprediction.net



International Program for S2S Research



S2S Database

	Time-range	Resol.	Ens. Size	Freq.	Hcsts	Hcst length	Hcst Freq	Hcst Size
ECMWF	D 0-46	T639/319L91	51	2/week	On the fly	Past 20y	2/weekly	11
UKMO	D 0-60	N216L85	4	daily	On the fly	1996-2009	4/month	3
NCEP	D 0-44	N126L64	4	4/daily	Fix	1999-2010	4/daily	1
EC	D 0-32	0.6x0.6L40	21	weekly	On the fly	1995-2014	weekly	4
CAWCR	D 0-60	T47L17	33	weekly	Fix	1981-2013	6/month	33
JMA	D 0-34	T319L60	25	2/weekly	Fix	1981-2010	3/month	5
KMA	D 0-60	N216L85	4	daily	On the fly	1996-2009	4/month	3
CMA	D 0-45	T106L40	4	daily	Fix	1886-2014	daily	4
CNRM	D 0-32	T255L91	51	Weekly	Fix	1993-2014	2/monthly	15
CNR-ISAC	D 0-32	0.75x0.56 L54	40	weekly	Fix	1981-2010	6/month	1
HMCRC	D 0-63	1.1x1.4 L28	20	weekly	Fix	1981-2010	weekly	10



Origin

- ECMWF
- JMA
- NCEP

Statistical process

- Instantaneous and accumulated
- Daily averaged

Type of level

- Potential temperature
- Pressure levels
- Surface

Type

- Control forecast
- Perturbed forecast

About

- Conditions of use
- Documentation

Navigation

- Datasets
- Job list
- Batch access

See also...

- FAQ
- Accessing forecasts
- GRIB decoder

Subseasonal to Seasonal Instantaneous and Accumulated

Select date

Select a date in the interval 2015-01-01 to 2015-03-09

Start date: End date:

[Reset](#)

Select a list of months

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																					

[Select All](#) or [Clear](#)

Select step

<input type="checkbox"/> 0	<input type="checkbox"/> 6	<input type="checkbox"/> 12	<input type="checkbox"/> 18	<input type="checkbox"/> 24	<input type="checkbox"/> 30	<input type="checkbox"/> 36	<input type="checkbox"/> 42	<input type="checkbox"/> 48
<input type="checkbox"/> 90	<input type="checkbox"/> 96	<input type="checkbox"/> 102	<input type="checkbox"/> 108	<input type="checkbox"/> 114	<input type="checkbox"/> 120	<input type="checkbox"/> 126	<input type="checkbox"/> 132	<input type="checkbox"/> 138
<input type="checkbox"/> 180	<input type="checkbox"/> 186	<input type="checkbox"/> 192	<input type="checkbox"/> 198	<input type="checkbox"/> 204	<input type="checkbox"/> 210	<input type="checkbox"/> 216	<input type="checkbox"/> 222	<input type="checkbox"/> 228
<input type="checkbox"/> 270	<input type="checkbox"/> 276	<input type="checkbox"/> 282	<input type="checkbox"/> 288	<input type="checkbox"/> 294	<input type="checkbox"/> 300	<input type="checkbox"/> 306	<input type="checkbox"/> 312	<input type="checkbox"/> 318
<input type="checkbox"/> 360	<input type="checkbox"/> 366	<input type="checkbox"/> 372	<input type="checkbox"/> 378	<input type="checkbox"/> 384	<input type="checkbox"/> 390	<input type="checkbox"/> 396	<input type="checkbox"/> 402	<input type="checkbox"/> 408
<input type="checkbox"/> 460	<input type="checkbox"/> 466	<input type="checkbox"/> 482	<input type="checkbox"/> 488	<input type="checkbox"/> 474	<input type="checkbox"/> 480	<input type="checkbox"/> 486	<input type="checkbox"/> 492	<input type="checkbox"/> 498
<input type="checkbox"/> 540	<input type="checkbox"/> 546	<input type="checkbox"/> 552	<input type="checkbox"/> 558	<input type="checkbox"/> 564	<input type="checkbox"/> 570	<input type="checkbox"/> 576	<input type="checkbox"/> 582	<input type="checkbox"/> 588
<input type="checkbox"/> 630	<input type="checkbox"/> 636	<input type="checkbox"/> 642	<input type="checkbox"/> 648	<input type="checkbox"/> 654	<input type="checkbox"/> 660	<input type="checkbox"/> 666	<input type="checkbox"/> 672	<input type="checkbox"/> 678
<input type="checkbox"/> 720	<input type="checkbox"/> 726	<input type="checkbox"/> 732	<input type="checkbox"/> 738	<input type="checkbox"/> 744	<input type="checkbox"/> 750	<input type="checkbox"/> 756	<input type="checkbox"/> 762	<input type="checkbox"/> 768

[Select All](#) or [Clear](#)

Select parameter

<input type="checkbox"/> 10 metre U wind component	<input type="checkbox"/> 10 metre V wind component
<input type="checkbox"/> Convective precipitation	<input type="checkbox"/> Eastward turbulent surface stress
<input type="checkbox"/> Land-sea mask	<input type="checkbox"/> Maximum temperature at 2 metres in the last 6 hours
<input type="checkbox"/> Mean sea level pressure	<input type="checkbox"/> Minimum temperature at 2 metres in the last 6 hours
<input type="checkbox"/> Northward turbulent surface stress	<input type="checkbox"/> Orography
<input type="checkbox"/> Snow Fall water equivalent	<input type="checkbox"/> Soil type
<input type="checkbox"/> Surface latent heat flux	<input type="checkbox"/> Surface net solar radiation
<input type="checkbox"/> Surface net thermal radiation	<input type="checkbox"/> Surface pressure
<input type="checkbox"/> Surface runoff	<input type="checkbox"/> Surface sensible heat flux

- Daily real-time forecasts + re-forecasts
- 3 weeks behind real-time
- Common grid (1.5x1.5 degree)
- Variables archived: about 80 variables including stratospheric levels, soil moisture & temperature
- Ocean variables available soon.

REPLICATED @ CMA
 Subset at IRI

Value Added Products

Sub-seasonal to seasonal forecast

*Considering to Add
AR Detections*

56 matching items

No filters applied

Filters

Product

- Anomaly (21)
- EFI (7)
- Hovmoller (21)
- Madden-Julian Oscillation(MJO) (...)

Parameters

- 2m Temperature (7)
- CEOF (6)
- Geopotential at 500 hPa (7)
- Outgoing Long Wave radiation (7)
- Precipitations (7)
- Zonal Wind Anomaly at 200 hPa...
- Zonal Wind Anomaly at 850 hPa...

Centre

- BoM (8)
- CMA (8)
- ECMWF (8)
- JMA (8)
- Meteo France (8)
- NCEP (8)
- UKMO (8)

 BoM 2m Temperature	 BoM CEOF Madden-Julian	 BoM EFI	 BoM Geopotential at 500 hPa Anomaly	 BoM Outgoing Long Wave radiation	 BoM Precipitations Anomaly	 BoM Zonal Wind Anomaly at 200 hPa
 BoM Zonal Wind Anomaly at 850 hPa	 CMA 2m Temperature	 CMA CEOF Madden-Julian	 CMA EFI	 CMA Geopotential at 500 hPa Anomaly	 CMA Outgoing Long Wave radiation	 CMA Precipitations Anomaly
 CMA Zonal Wind Anomaly at 200 hPa	 CMA Zonal Wind Anomaly at 850 hPa	 ECMWF 2m Temperature	 ECMWF CEOF Madden-Julian	 ECMWF EFI	 ECMWF Geopotential at 500	 ECMWF Outgoing Long Wave radiation
 ECMWF Precipitations	 ECMWF Zonal Wind Anomaly at 200 hPa	 ECMWF Zonal Wind Anomaly at 850 hPa	 JMA 2m Temperature	 JMA CEOF Madden-Julian	 JMA EFI	 JMA Geopotential at 500 hPa Anomaly
 JMA Outgoing Long Wave radiation	 JMA Precipitations Anomaly	 JMA Zonal Wind Anomaly at 200 hPa	 JMA Zonal Wind Anomaly at 850 hPa	 Meteo France 2m Temperature	 Meteo France CEOF Madden-Julian	 Meteo France EFI

Sub-seasonal to Seasonal (S2S) Prediction Project – phase 1

Sub-Projects

Teleconnections

Madden-Julian Oscillation

Monsoons

Africa

Extremes

Verification

Research Issues

- Predictability
- Teleconnection
- O-A Coupling
- Scale interactions
- Physical processes

Modelling Issues

- Initialisation
- Ensemble generation
- Resolution
- O-A Coupling
- Systematic errors
- Multi-model combination

Needs & Applications

Liaison with SERA
(Working Group on Societal
and Economic Research
Applications)

S2S Database

Sub-seasonal to Seasonal (S2S) Prediction Project – Phase 2

Sub-Projects

MJO and Teleconnections

Ocean Initialization and Processes

Land Initialization and processes

Aerosols

Ensemble generation

Stratosphere

Predictability Issues

- Monsoons
- Extremes
- Verification
- Africa

Modelling Issues

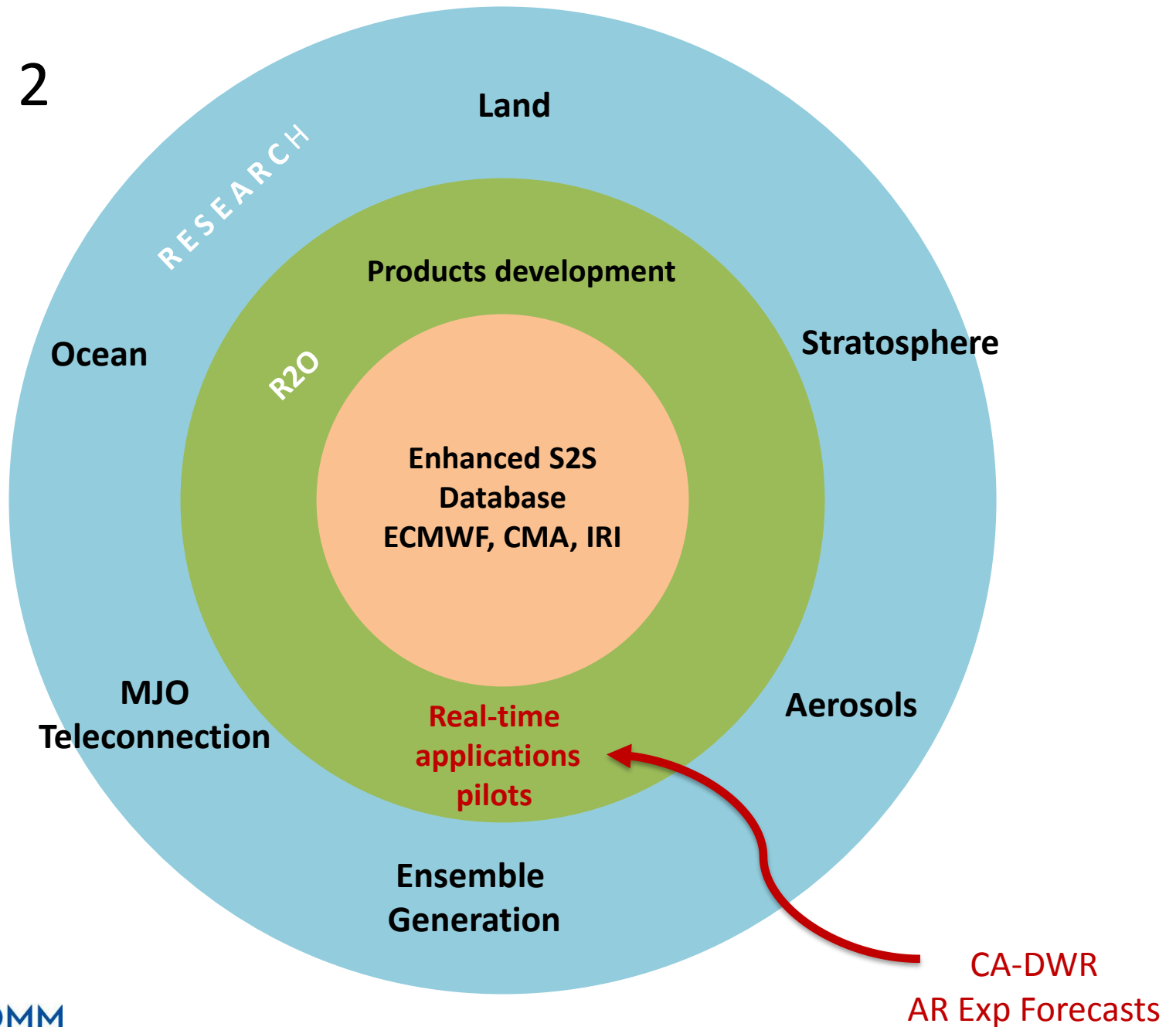
- Resolution
- Systematic errors
- Multi-model combination

Needs & Applications

- Real-Time Pilot (S2S_SERA)
- R2O project

S2S Database

Phase 2

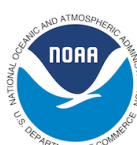


The Subseasonal Experiment (SubX)

Kathy Pegion

George Mason University, Dept of Atmospheric, Oceanic, and Earth Sciences
Center for Ocean-Land-Atmposphere Studies

Pegion, K. and Co-authors, 2018: The Subseasonal Experiment (SubX): A multi-model subseasonal prediction experiment, to be submitted to BAMS





- Multi-model
- Monthly
- Re-forecasts & Forecasts
- Research & Predictions (R2O)



- Collection of NOAA MAPP PIs
- Collaboration to understand S2S predictability & prediction
- Uses data from other S2S Projects



- Multi-model
- Subseasonal (weekly)
- Re-forecasts & Forecasts
- Research & Predictions (R2O)



- International project
- Operational models
- Re-forecasts & Forecasts (delayed)
- Research

What is Unique about SubX?

**Forecasts available in
real-time**



Supports potential
use in real-time
applications

**Research models
included**



Facilitates model
development &
improvements



SubX BY THE NUMBERS

7 Global Models

1+ Years of *Real-time*
Forecasts

17 Years of
Retrospective Forecasts

3-4 week guidance
for Climate Prediction
Center Outlooks

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
Kyle MacRitchie

NCEP-GEFS

Yuejian Zhu
Wei Li
Eric Sinsky
Hong Guan

NASA-GEOS5

Deepthi Achuthavarier
Randy Koster
Lena Marshak

ECCC-GEM

Hai Lin
Bertrand Denis
Normand Gagnon

Navy-ESM

Neil Barton
Joe Metzger

NCAR-CCSM4

Ben Kirtman
Dughong Min
Kathy Pegion
Ray Bell

ESRL-FIM

Shan Sun
Stan Benjamin
Ben Green

SubX Protocol

- Prediction System Details up to Provider
- Real-time and Retrospective Systems Identical
- Reforecast Period: 1999-2015
- At Least 3 Ensemble Members
- Minimum Length: 32 Days
- Real-time Forecast Made Available to CPC
Every Thurs by 6am of *Every week*
- Data on Uniform 1x1 Grid

SubX Models

Model	Components	Ensemble Members	Length (Days)
NCEP-CFSv2	A,O,I,L	4	45
EMC-GEFS	A,L	11 [21]	35
ECCC-GEM	A,L	4 [21]	32
GMAO-GEOS5	A,O,I,L	4	45
NRL-NESM	A,O,I,L	4	45
RSMAS-CCSM4	A,O,I,L	3 [9]	45
ESRL-FIM	A,O,I,L	4	32

Priority 1 Variables – Required to Support Operations

On 500 and 200 hPa levels

Variable	CF Standard Name	Abbrev	Unit	Frequency
Geopotential Height	geopotential_height	zg	m	Average of Instantaneous values at 0,6,12,18Z

On 850 and 200 hPa levels

Variable	CF Standard Name	Abbrev	Unit	Frequency
Zonal Velocity	eastward_wind	ua	ms-1	Average of Instantaneous values at 0,6,12,18Z
Meridional Velocity	northward_wind	va	ms-1	Average of Instantaneous values at 0,6,12,18Z

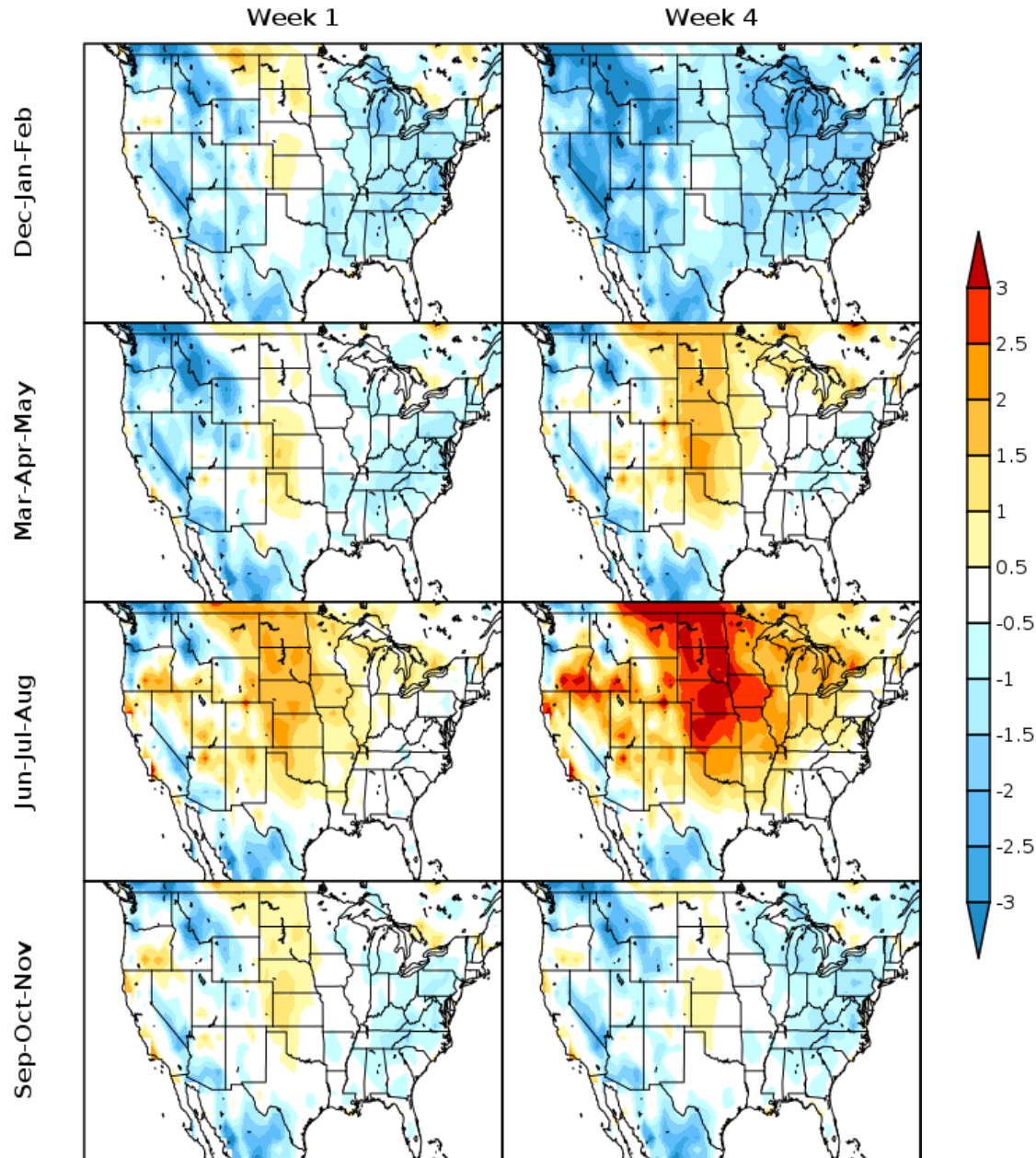
On a single level

Variable	CF Standard Name	Abbrev	Unit	Frequency
2m Temperature	air_temperature	tas	K	Daily Average
Precipitation	precipitation_flux	pr	kgm-2s-1	Accumulated every 24hrs
Surface Temperature (SST+Land)	surface_temperature	ts	K	Daily Average
Outgoing Longwave Radiation at top of Atm	toa_outgoing_longwave_flux	rlut	Wm-2	Accumulated every 24hrs

SubX Current Status & On-going Activities

- ✓ Re-forecast & real-time forecast database
- ✓ Real-time forecast maps
- ✓ Real-time forecast data to NCEP/CPC
- ✓ Re-forecast Evaluation: probabilistic and deterministic skill, bias
- ✓ Sources of predictability/phenomena: MJO, NAO

SubX Multi-model Biases 2m Temperature

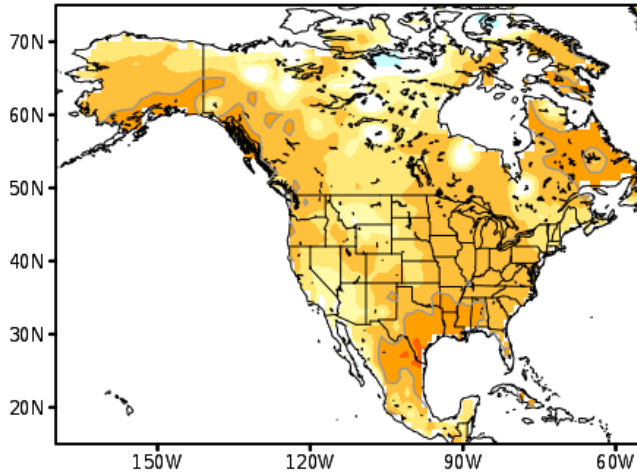


- Bias patterns established in week 1, grow into week 4
- Summer warm/dry bias
- MME bias is smaller than individual models

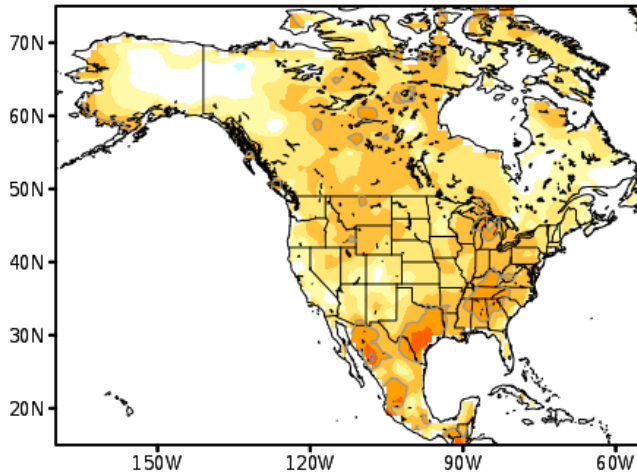
SubX Multi-model Anomaly Correlation Week 3-4

2m Temperature

a) 2m Temperature Dec-Jan-Feb

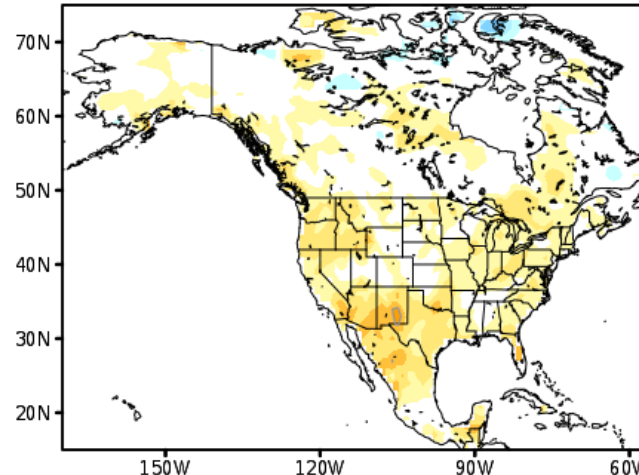


c) 2m Temperature Jun-Jul-Aug

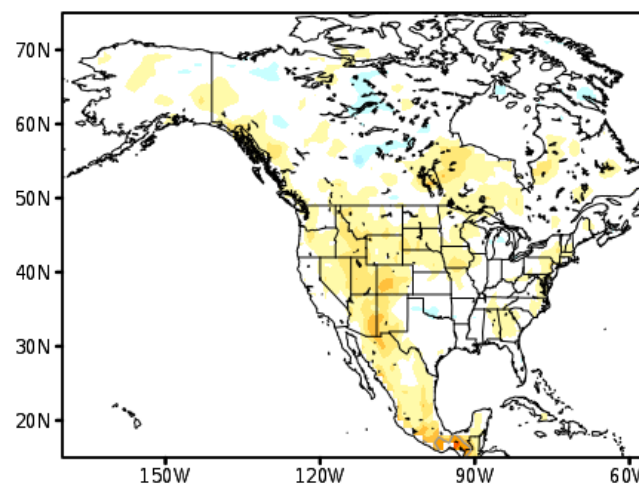


Precipitation

a) Precipitation Dec-Jan-Feb



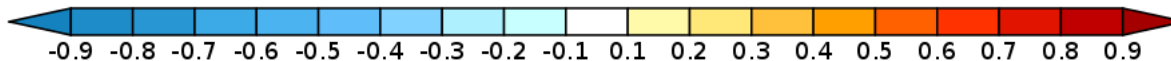
c) Precipitation Jun-Jul-Aug



Winter

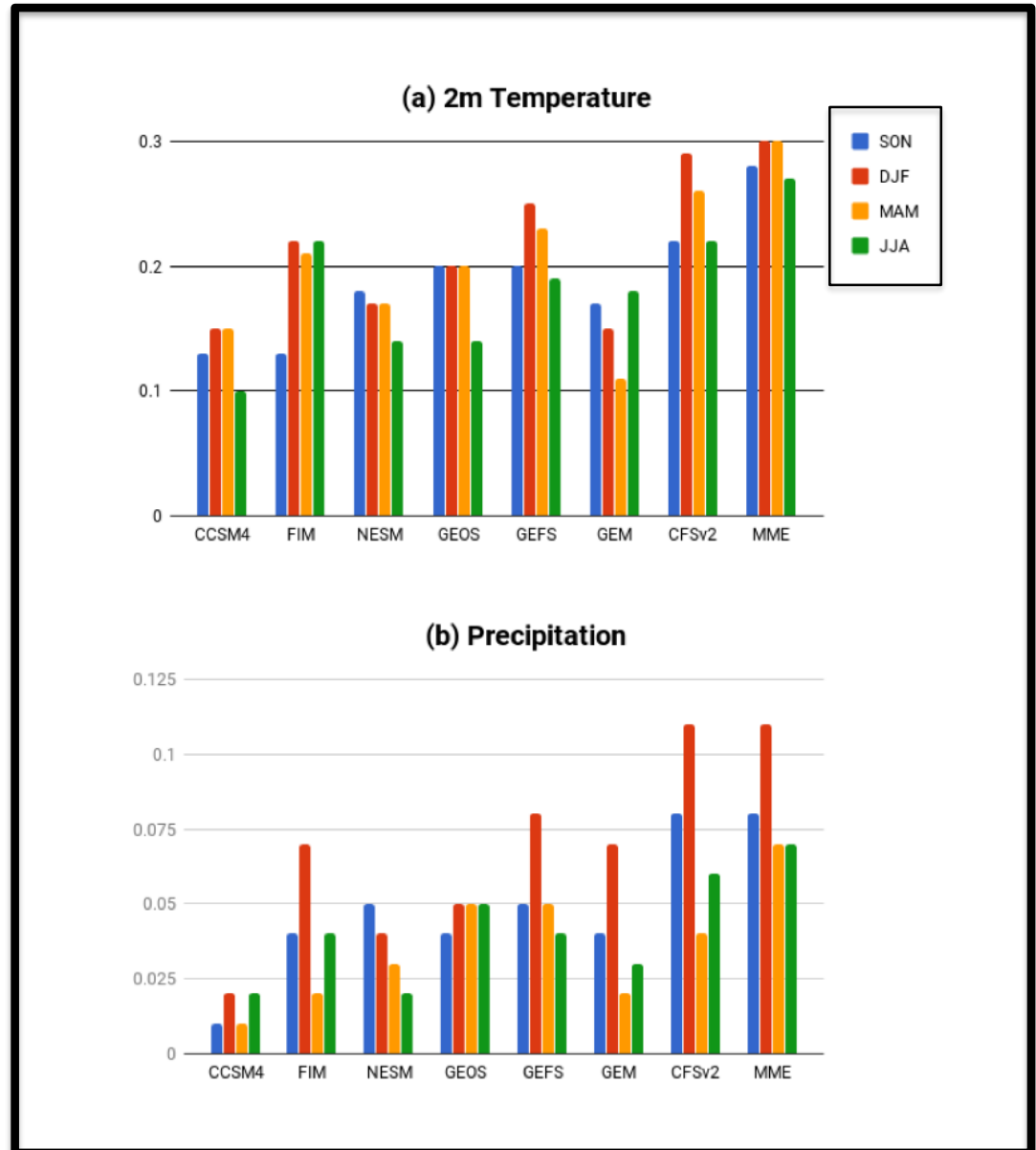
Summer

- Skill is positive
- There is "useful" skill for some regions and seasons



SubX Average Anomaly Correlation North America Week 3-4

- MME more skillful than individual models in all seasons
- No stratification of skill by model configuration



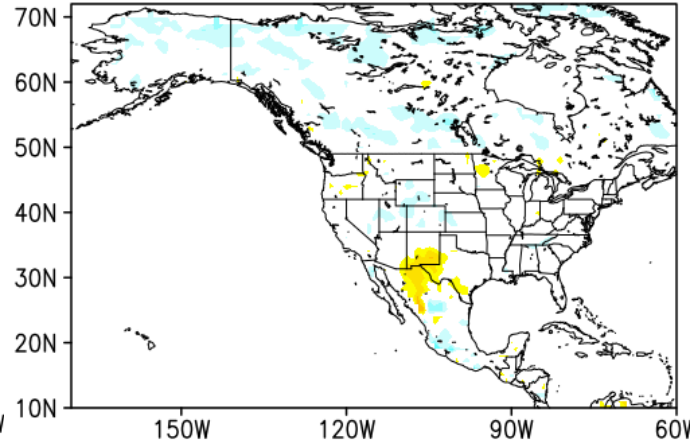
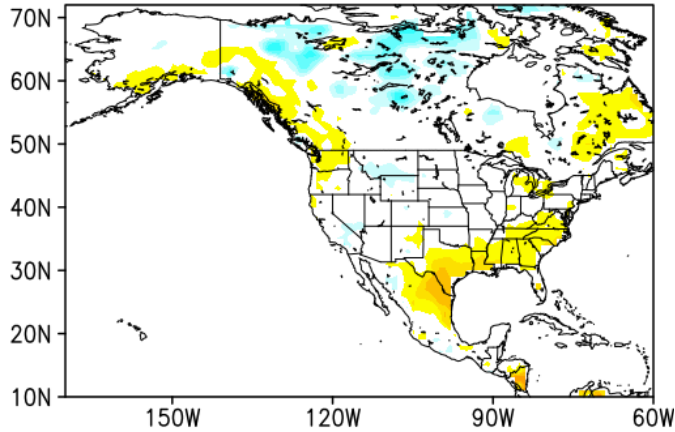
SubX Multi-model RPSS Week 3-4

2m Temperature

Precipitation

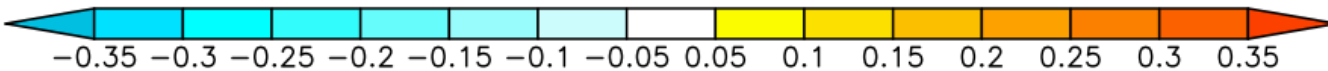
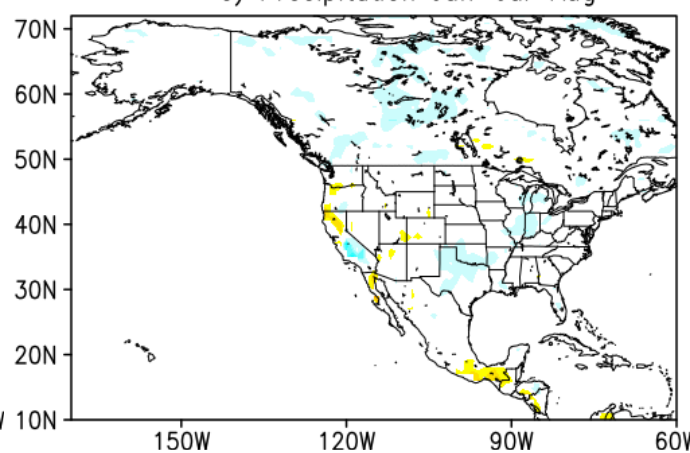
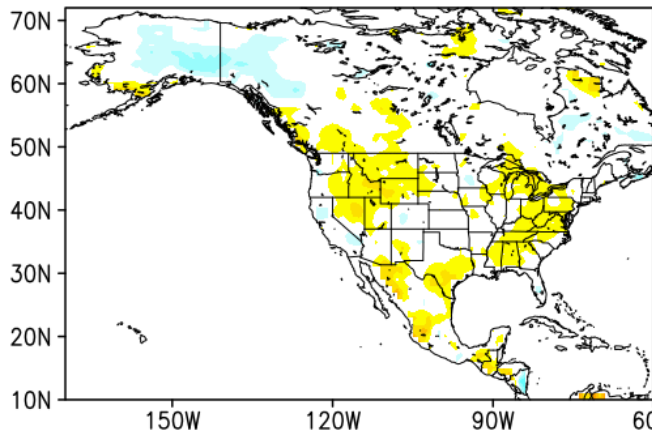
a) 2m Temperature Dec–Jan–Feb

a) Precipitation Dec–Jan–Feb



c) 2m Temperature Jun–Jul–Aug

c) Precipitation Jun–Jul–Aug

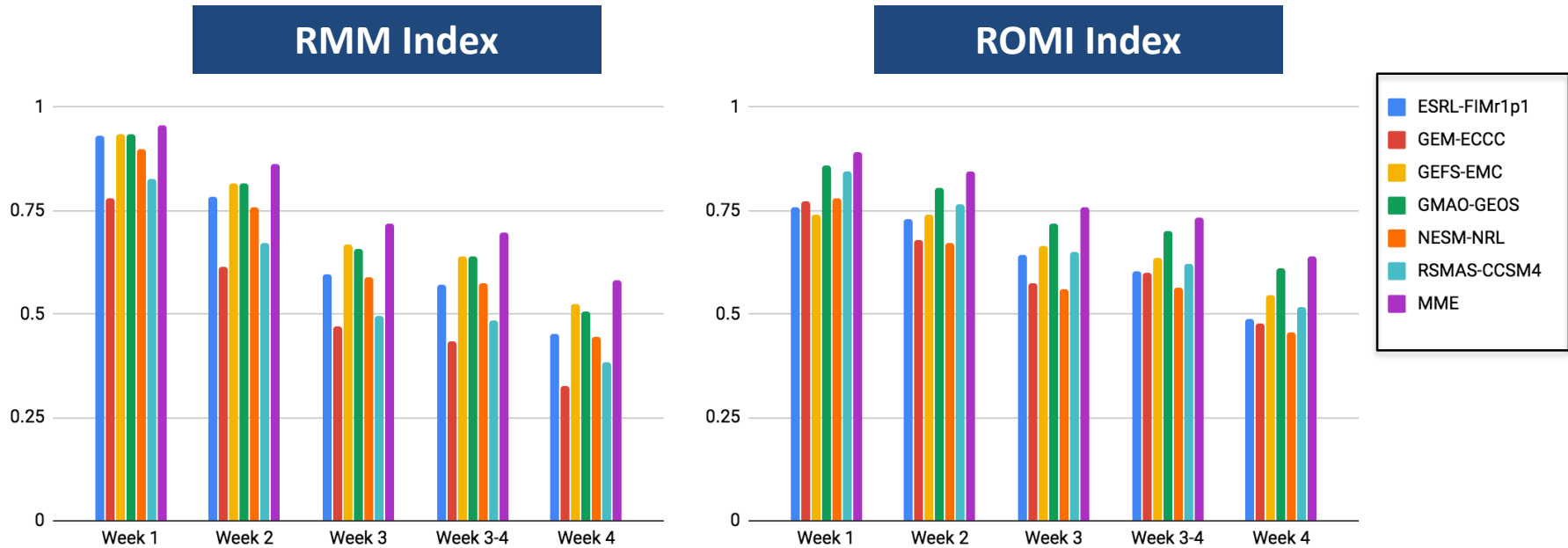


Winter

Summer

- Consistent with ACC
- There is skill for T2M
- Little skill for precip

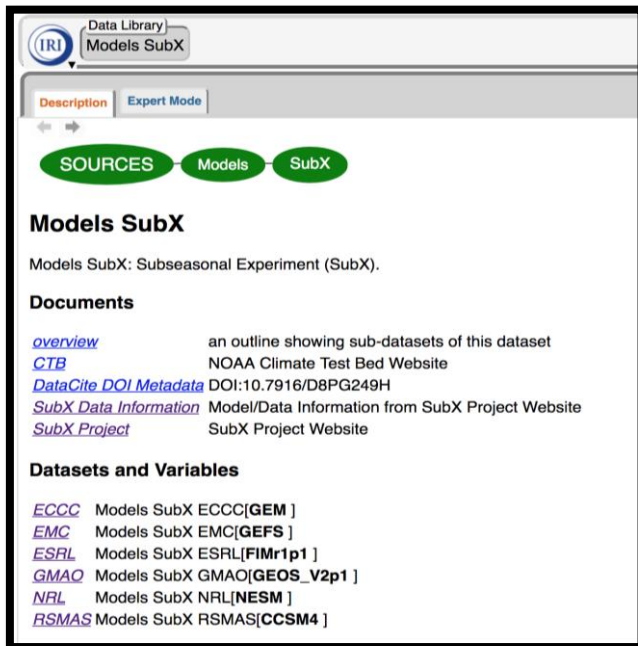
MJO Skill: Anomaly Correlation



- Skill >0.5 at week 3-4
- Skill is similar to WWRP/WCRP S2S Models
- Two most skillful models have very different configurations
- MME has higher skill than individual models

Real-time Forecasts

- CPC processes for their week 3-4 outlooks
- SubX Team processes for publicly available forecast plots
- All data are publicly available



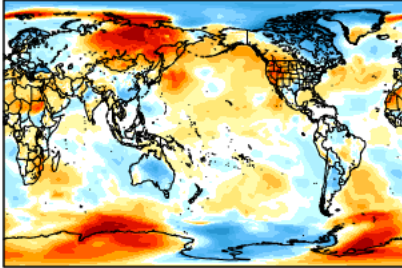
The screenshot shows the IRI Models SubX data library page. At the top, there is a logo for IRI and the text 'Data Library Models SubX'. Below this, there are two tabs: 'Description' (selected) and 'Expert Mode'. A navigation bar contains three green ovals labeled 'SOURCES', 'Models', and 'SubX'. The main content area is titled 'Models SubX' and includes a description: 'Models SubX: Subseasonal Experiment (SubX)'. Under the 'Documents' section, there are several links with descriptions: 'overview' (an outline showing sub-datasets of this dataset), 'CTB' (NOAA Climate Test Bed Website), 'DataCite DOI Metadata' (DOI:10.7916/D8PG249H), 'SubX Data Information' (Model/Data Information from SubX Project Website), and 'SubX Project' (SubX Project Website). The 'Datasets and Variables' section lists several datasets: 'ECCC' (Models SubX ECCO[GEM]), 'EMC' (Models SubX EMC[GEFS]), 'ESRL' (Models SubX ESRL[FIMr1p1]), 'GMAO' (Models SubX GMAO[GEOS_V2p1]), 'NRL' (Models SubX NRL[NESM]), and 'RSMAS' (Models SubX RSMAS[CCSM4]).

<http://iridl.ldeo.columbia.edu/SOURCES/.Models/.SubX/>

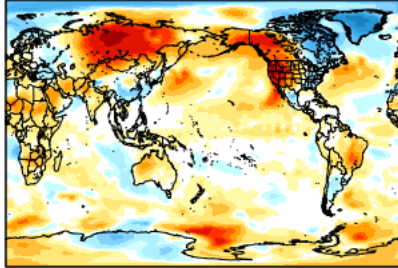
Example: Real-time forecast maps on SubX Website

SubX Week 3-4 2m Temperature Anomalies (deg C): Valid 2 weeks ending OCT 12

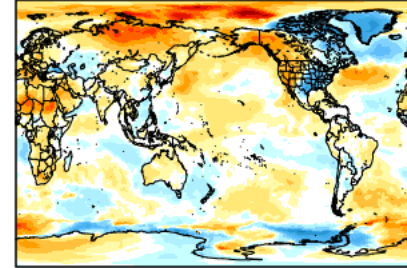
ESRL-FIMr1p1 (IC: 09/12 ; 4 Ens)



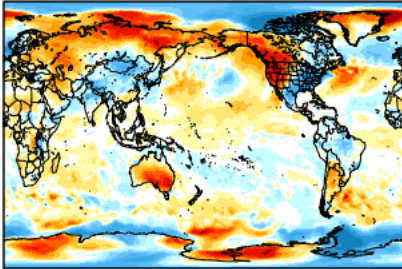
RSMAS-CCSM4 (IC: 09/09 ; 9 Ens)



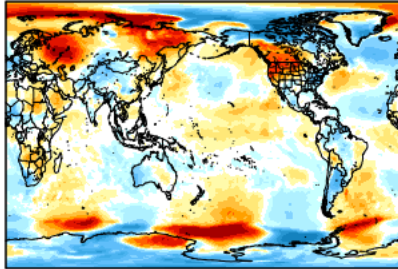
EMC-GEFS (IC: 09/12 ; 21 Ens)



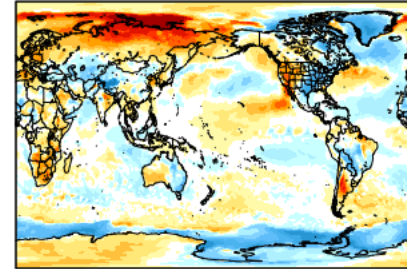
GMAO-GEOS_V2p1 (IC: 09/08 ; 4 Ens)



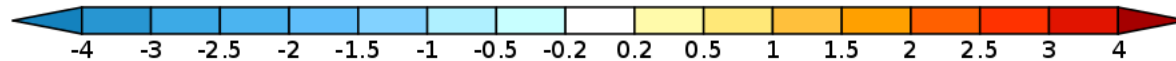
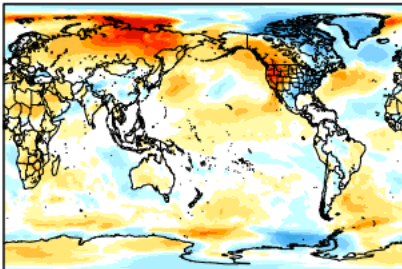
NRL-NESM (IC: 09/08-09/11 ; 4 Ens)



ECCC-GEM (IC: 09/13 ; 21 Ens)



MME (63 Ensemble Members)



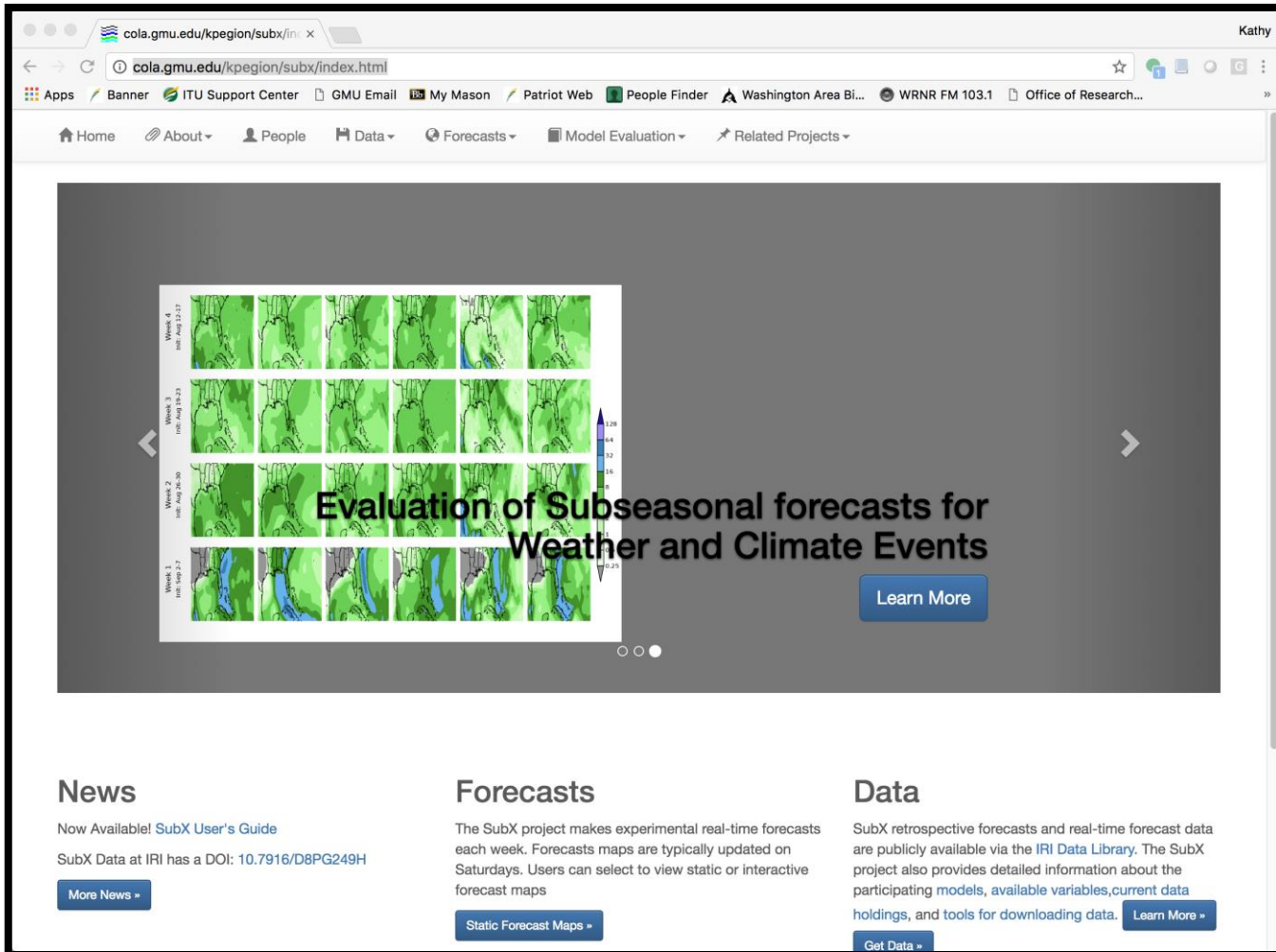
<http://cola.gmu.edu/kpregon/subx/forecasts/forecasts.html>

Summary

- SubX provides a publicly available re-forecast and real-time forecast database for S2S research, operations, and applications.
- SubX Complimentary to other S2S efforts:
 - real-time forecasts
 - research models
- Evaluation of model biases, skill, sources of predictability demonstrate skill at subseasonal timescales in specific regions and seasons and benefit of MME
 - Much more to be done...
- SubX provides useful contributions to operational week 3-4 forecast guidance
- SubX is an ideal framework for testing model improvements
 - Sun, Lantao et al., Contribution of stratospheric processes to tropospheric predictive skill on subseasonal time scale in NCAR's CESM1

Where to find more information:
<http://cola.gmu.edu/kpegiion/subx/>

NEW



The screenshot shows the website cola.gmu.edu/kpegiion/subx/. The main content area features a grid of weather maps with the title "Evaluation of Subseasonal forecasts for Weather and Climate Events" and a "Learn More" button. Below this, there are three columns: "News" with a link to "SubX User's Guide", "Forecasts" with a link to "Static Forecast Maps", and "Data" with a link to "Get Data".

- SubX Data Users Guide
- Codes for Downloading and processing data
- Model Evaluation Plots
- Real-time Forecast Plots

Weather Research Science Working Group (WRSWG)

Introduction and Description of Activity

Duane Waliser & Sim James

OFCM

Office of the Federal Coordinator for
Meteorological Services and Supporting Research

GROUPS

PUBLICATIONS

MEETINGS

ABOUT

Image Courtesy of NOAA



OVER A HALF-CENTURY OF MULTI-AGENCY COLLABORATION

Office of the Federal Coordinator for Meteorology

The OFCM is the overall coordinating body of the Federal Weather Enterprise of which the WRSWG is a part.

OFCM focus: Establish a routine among federal agencies of getting together at the right frequency with the right people to create awareness of, discuss opportunities within, and devise action plans to address, common issues in conducting meteorological services and research.

- a) Coordinate: Facilitate the exchange of information, plans and concerns among the FWE to help the nation get the most out of the approximately \$5.3B spent annually on meteorological services and supporting research.
- b) Advise: Provide strategic and operational views of interagency federal weather efforts in order to support related decisions at high levels.
- c) Plan: Produce and maintain key documents including:
 - a) Federal Weather Enterprise Budget and Coordination Report
 - b) Federal Meteorological Handbooks
 - c) National Hurricane Operations Plan

Historical, Legal Perspectives



The Bureau of the Budget shall provide the Congress in connection with the budget presentation for fiscal year 1964 and each succeeding year thereafter, a horizontal budget showing (a) the totality of the programs for meteorology, (b) specific aspects of the program and funding assigned to each agency, and (c) the estimated goals and financial requirements.

Public Law 87-843, Section 304 (1962)

The Director of the Office of Science and Technology Policy shall establish an Interagency Committee for Advancing Weather Services to improve coordination of relevant weather research and forecast innovation activities across the Federal Government...The Federal Coordinator for Meteorology shall serve as co-chair of this panel.

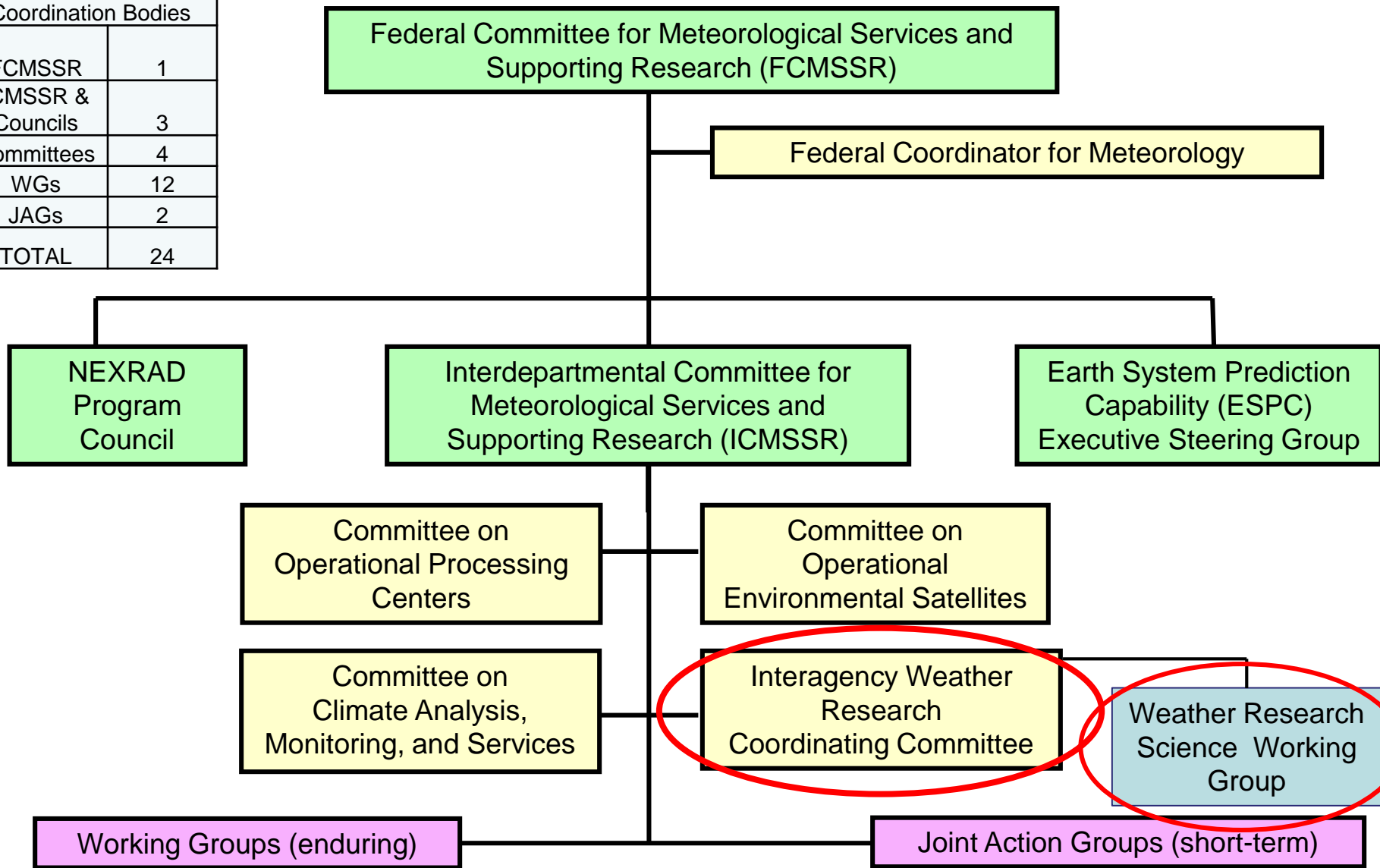
Public Law 115-25, Section 402 (2017)

Photo Credit: Architect of the Capitol



Federal Weather Enterprise Coordinating Infrastructure

Coordination Bodies	
FCMSSR	1
ICMSSR & Councils	3
Committees	4
WGs	12
JAGs	2
TOTAL	24



Interagency Weather Research Coordination Committee

The IWRCC is one of the committees OFCM is responsible for coordinating.

IWRCC focus: The IWRCC promotes and helps to coordinate basic and applied U.S. research activities aimed at a better fundamental understanding and improved prediction of high-impact weather .

In particular, IWRCC helps to...

- a) Coordinate U.S. agency weather research priorities,
- b) Promote U.S. interests in the participation of well-defined international projects
- c) Explore and engage with new national and international weather research initiatives, including those associated with the THORPEX legacy projects. IWRCC provides a forum where agencies can best leverage efforts among themselves and in the international community to achieve agency goals.

Weather Research Science Working Group

The SWG is the Working Group subordinate to the IWRCC. It is composed of a combination of Subject Matter Experts across government and academia.

WRSWG focus: The WRSWG promotes scientific leadership for the coordination in the World Weather Research Project (WWRP) of the World Meteorological Organization (WMO) three major weather research projects related to THORPEX:

- Polar Prediction project (PPP)
- Subseasonal to Seasonal Prediction Project (S2S)
- High Impact Weather Prediction Project (HIW)

The WRSWG promotes scientific leadership for the coordination of U.S. involvement in the PPP, S2S and HIW efforts. Additionally, the WRSWG informs the IWRCC on matters concerning the scientific integrity and progress of such projects. (E.G. S2S Database)

Weather Research Science Working Group

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US Agency S2S Support

Emphasis on Subseasonal

A Rough, High-Level Inventory

*S2S Emphasis of
Weather Research Working Group (WRWG) of the
Interagency Weather Research Coordination Committee (IWRCC)*

*Duane Waliser (S2S co-chair) Carolyn Reynolds, Andrea Lang,
Kathy Pegion, Jessie Carman, Daryl Kleist
Executive Secretary: Sim James*

August, 2018

NASA

Overall Thrust of Contributions: Earth Observations, Earth System Science and Modeling, Weather Modeling and Data Assimilation

Foundational Contributions: GEOS-5, MERRA-2, EOs (e.g. GPM, SMAP, JASON-x, etc)

Research Contributions:

- Subseasonal component of Modeling, Analysis and Prediction (MAP): 5 Investigations (Sobel, Wang, Kuang, Rosseauex, Alexander).
- MJO component of the CYGNSS Science Team: 3 Investigations (Maloney, Waliser, Lang).
- GMAO Hindcast/Forecast contribution to NMME Subseasonal SubX Activity via co-support from NOAA (Achuthavarier, Koster, Marshak).
- NASA Applied Science SERVIR project downscaled global NMME forecasts and distributed to the SERVIR regions (Irwin, Limaye).

Other Contributions:

- Support of 2016 NAS Study on Next Generation Earth System Prediction: Strategies for Subseasonal to Seasonal Forecasts

ONR

Overall Thrust of Contributions: Ocean, Atmosphere and Sea Ice Processes/Interactions, Field Programs and Modeling; NWP and Data Assimilation

Foundational Contributions: Navy Earth System Model (NESM)

Research Contributions:

- Departmental Research Initiative (DRI; Eleuterio) – Propagation of IntraSeasonal Tropical Oscillations (PISTON) – ~15 investigators and Summer'18 Field Program in S. China Sea.
- Departmental Research Initiative (DRI; Ferek) – Overcoming the Barrier to Extended Range Prediction over the Arctic – ~15 investigators and field activities in 2019 and 2020.
- NRL Hindcast/Forecast contribution to NMME Subseasonal SubX Activity (Barton, Metzger).

Other Contributions:

- Support of 2016 NAS Study on Next Generation Earth System Prediction: Strategies for Subseasonal to Seasonal Forecasts

NSF

Overall Thrust of Contributions: Basic research - process understanding, field program activity and model development.

Foundational Contributions:

- PI-Based Fundamental Research - Including Disciplinary, Multi-/Inter-disciplinary and Science+Technical Synergies
- Community Earth System Model (CESM)
- Field Campaign Support (e.g. DYNAMO)

Research Contributions:

- At any given time, at least 40 or more PI-led research activities relevant to S2S research (e.g. 18 started since 2015 relevant to MJO; 34 to ENSO)

NOAA

Overall Thrust of Contributions: Operational prediction, basic and applied weather and climate research, observing systems and field experiment activities.

Foundational Contributions: CFS Model/Forecast System, CFS-R, Earth Observations (e.g. tropical moorings, operational weather satellites)

Research Contributions Presented on Following Slides

NOAA/OAR S2S Activities

- **OAR Labs and Programs:**

- Advance core capabilities and engage the broad internal/external community
- Engage both weather and climate communities to address S2S challenges

- **Examples:**

- **GFDL** Global high-resolution modeling of the coupled climate system, with seamless predictability from day to subseasonal to seasonal timescales (e.g. severe storms, floods/droughts/fire)
- **ESRL:** Medium-range modeling; attribution for extremes; forecasting for water management
- **OWAQ:** High-impact weather research (extreme precipitation, severe storms, tropical cyclones) transition activities; risk communication and social science
- **CPO:** Foundational climate research; observations; process studies; transition activities; products, tools, communication and engagement



NOAA CPO S2S Research and R2O Efforts

- **S2S predictability & prediction research**
 - CVP process studies on MJO: DYNAMO, Year of Maritime Continent
 - MAPP FY16 S2S research & transition initiatives (e.g., S2S Task Force, SubX)
- **Improve S2S modeling under the unified modeling framework**
 - Assess benefits of high-resolution modeling
 - Improve physical representations in models via Climate Process Teams
 - Coupled data assimilation
 - Model software infrastructure
- **Climate reanalysis:** OAR-NWS Service Level Agreement gap project
- **Ensemble Predictions (CTB/R2O)**
 - NMME seasonal forecast system (in operation)
 - SubX Project to test real-time S2S ensemble predictions
- **Test weeks 3-4 prediction tools** (e.g., hybrid statistical-dynamical)
- **S2S Applications** (e.g., drought/NIDIS; Marine ecosystem; coastal inundation).
- **Tropical Pacific Observing System (TPOS):** design the future ocean observing system for forecasts at S2S and longer timescales.

DOE

Overall Thrust of Contributions: Earth system modeling, modeling variability and extremes, observations, high performance computing

Foundational Contributions: Energy Exascale Earth System Model (E3SM), ARM observations, leadership in high performance computing

Research Contributions:

- E3SM for modeling variations of water cycle, biogeochemical, and cryospheric processes across a range of scales (labs, NCAR and universities)
- CAPT (The Cloud-Associated Parameterization Testbed) to use short term forecasts for diagnosis of model biases (LLNL, universities) related to precipitation and clouds
- (ILIAD) InitialIzed-ensemble Analysis/Development framework is designed to create, execute, and analyze ensembles of hindcasts using the E3SM and DOE/NSF Community Earth System Model (CESM) to evaluate and examine behavior of extreme events
- Modeling and analysis of various modes of variability, extreme events, and tropical-extratropical teleconnections from subseasonal to century time scales (LLNL, PNNL, LBNL, NCAR, universities)
- Development of metrics and diagnostics for understanding model behaviors (labs and universities)
- Observing and modeling processes (e.g., clouds and radiation) as fundamental building blocks of S2S predictions (labs and universities)

Other Contributions:

- Support of 2015 High-Resolution Coupling and Initialization to Improve Predictability and Predictions in Climate Models Workshop, September 30 – October 2, 2015, College Park, MD