

# IGIM: Interagency Group on Integrative Modeling within the USGCRP

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ESPC Meeting  
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# U.S. Global Change Research Program

- USGCRP comprises **13 Federal agencies** that conduct or use research on global change and its impacts on society



- “... assist the Nation and the world to **understand, assess, predict and respond** to human-induced and natural process of global change.”
  - Global Change Research Act, 1990

## Through USGCRP, agencies:

- Coordinate global change research and advance science across the U.S. government
- Use research results and products to inform decisions and responses to a changing climate
- Deliver mandated products, including the quadrennial National Climate Assessment (NCA), Our Changing Planet (OCP)
- Promote international cooperation on global change research and coordinate U.S. activities with the programs of other nations and international organizations

# Current Interagency Groups

(<https://www.globalchange.gov/about/iwgs>)

- Carbon Cycle Interagency Working Group
- Federal Adaptation and Resilience Group
- Indicators Interagency Working Group
- Integrated Observations Interagency Working Group
- Interagency Crosscutting Group on Climate Change and Human Health
- **Interagency Group on Integrative Modeling**
- Interagency Integrated Water Cycle Group
- International Activities Interagency Working Group
- Process Research Coordinating Committee (Clouds, Chemistry, and Aerosol Processes Cluster)
- Social Science Coordinating Committee
- Sustained Assessment Working Group



# Introduction

Gerald Geernaert (DOE) IGIM Chair

Annarita Mariotti (NOAA) IGIM Vice Chair

Ron Sands (USDA) IGIM Vice Chair

- Consists of representatives from DOE, NASA, Navy, NOAA, NSF, USDA with climate and earth system modeling interests and investments
  - Meets monthly to improve coordination of federal climate and earth system modeling activities.
- Actively coordinates USGCRP federal research and development for modeling and prediction on climate/Earth system modeling for times scales S2S – centennial
  - Supported by individual agencies within their mission scope

# Interagency Group on Integrative Modeling

## Mission:

“ to coordinate global-change related modeling activities across the Federal government and provide guidance to USGCRP on modeling priorities. IGIM scope encompasses the atmospheric, oceanic, cryospheric, and terrestrial domains; human systems are treated as an integral component of each domain.”



# IGIM Focus Areas during FY18-20

- IGIM convenes an annual **US Climate Modeling Summit (USCMS)**
- Support and coordination for the **CICE –consortium**
- Continued support and coordination for **OBS4MIP**
- Advance climate and **Earth system modeling and predictions** (e.g. high resolution, addressing biases, evaluating uncertainties) leveraging on USCMS and NRC reports recommendations
- Simulations for and analysis of the **6th Coupled Model Intercomparison Project (CMIP6)**
  - Some CMIP6 are involved in predictions and understanding at shorter time scales
  - In support model development
- Coordination and funding activities for **Land-atmosphere interactions** (Climate Process Teams)
- Increase awareness of **integrated modeling activities**, e.g., AgMIP, Stanford Energy Modeling Forum (EMF), IM3, E3SM, Hyper-Facets, LUMIP, ScenarioMIP, other

# Overview: US Climate Modeling Summit

- The annual USGCRP IGIM Climate & Earth System Modeling Summit (CMS) convenes the leads from the major (“CMIP-class”) national climate, earth system model development groups [DOE-E3SM, NASA-GMAO, NASA-GISS, NOAA-GFDL, NOAA-CFS, NSF-CESM]
- Overarching Goal of Summit: To enhance coordination toward a common national climate and earth system modeling strategy and communication with the broader modeling community.
- Modeling center leaders to engage in discussion on major objectives and difficulties
- Agency representatives to present relevant current priorities, directions, issues
- Dialogue regarding whether and how we might improve strategies to further U.S. climate and earth science and mission objectives

# USCMS Meetings and Workshop Themes



Summit	Dates	Host	Workshop
1st	11-Feb-2015	NOAA	CMIP
2nd	10-Mar-2016	USGCRP-ICF	
3rd	27-Jun-2017	NASA HQ	Arctic
4th	5-Apr-2018	NOAA	Land-Atmos Interactions
5th	4-Apr-2019	NASA GMAO	Modes of Variability



# CICE Consortium

to enhance sea ice model development  
for and by the community

- Acceleration of scientific development
- Acceleration of R&D transfer to operational use
- Vehicle for collaboration and sharing



NAVAL  
POSTGRADUATE  
SCHOOL



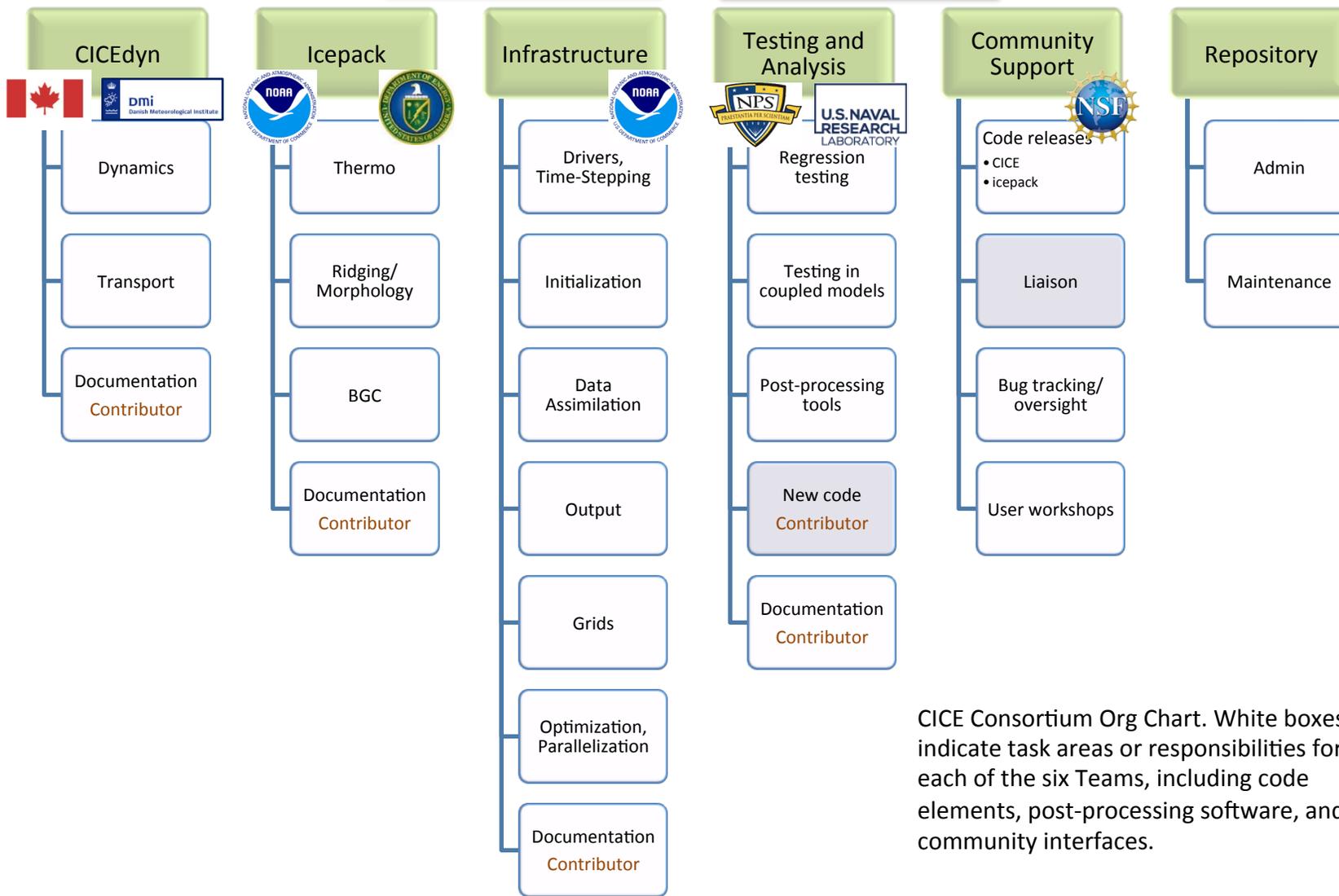
# Executive Oversight Board

Lead Coordinator



Co-Lead

Software Engineer



CICE Consortium Org Chart. White boxes indicate task areas or responsibilities for each of the six Teams, including code elements, post-processing software, and community interfaces.

# Advance climate and Earth system modeling and predictions leveraging on USCMS and NRC reports recommendations

- Enhancements in capturing the complexity of Earth System processes together with increased spatial resolution are essential for improved Earth System modeling yielding better scientific information on predictability, predictions, and projections on the regional scale.
  - Understanding and predicting the extremes in regional climate e.g., seasonal temperature and precipitation anomalies, and Arctic summertime sea-ice
  - Quantifying uncertainties in the hydrologic cycle and impact on decadal-scale droughts

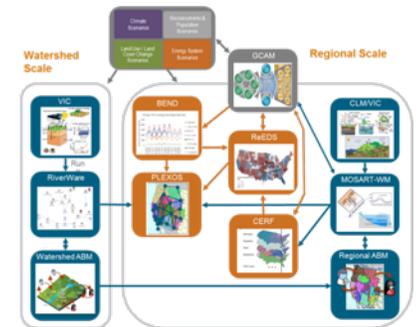
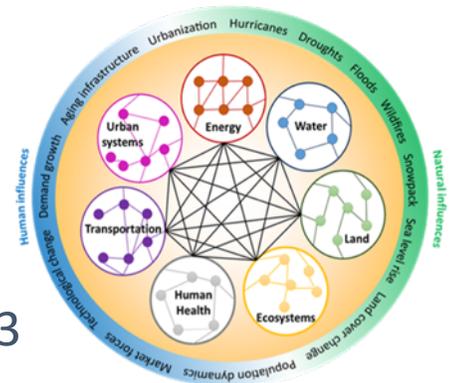


# Simulations for and analysis of the 6th Coupled Model Intercomparison Project (CMIP6)

- CMIP6 is designed to address three broad scientific questions: (1) How does the Earth System respond to forcing?; (2) What are the origins and consequences of systematic model biases?; (3) How can we assess future Earth system changes given variability, predictability and uncertainties?
  - US Modeling centers are actively engaged in conducting simulations with their latest Earth System Models
  - There will be an increased focus on the analysis and evaluation of output from CMIP6
  - These will contribute to advance predictions across timescales; e.g. Decadal Climate Prediction Project

# Increase awareness of integrated modeling activities

1. Explore the complex interactions and potential co-evolutionary pathways within the integrated human-Earth system, including natural, engineered, and socioeconomic systems and sectors.
2. Increasingly, the spotlight is shining on sectoral interactions, compounding stressors, and complex systems
  - New, more inclusive, collaboratively (interagency) led, NCA4 chapter; select NCA3 chapters, and USGCRP activities and products
  - EMF interagency modeling studies, AGMIP, LUMIP, ScenarioMIP, Hyper-Facets, E3SM, IM3 and other couplings across diverse communities
  - Internationally, ESM, IAV, IAM (WGs 1, 2, and 3) convergences, integrated storylines and scenarios
  - Example: DOE, NSF, and NGA Town Hall at AGU – IGIM themes
3. In some respects, the capabilities and tools (data, models, obs, and software/computation) are only now ready for more convergent science.



# Select Interagency Highlights from Our Changing Planet FY14- FY18

[In addition to any US-CLIVAR highlights, also supported by a subset of the same agencies]



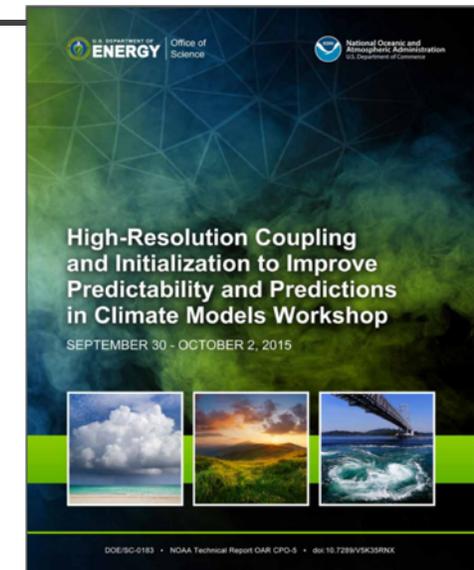
# Workshop on High-Resolution Coupling and Initialization to Improve Predictability and Predictions in Climate

## Models

- **When & where:** September 30–October 2, 2015 at NCWCP, College Park, Maryland
- **Organizers & participants:**
  - Scientific community: J. Kinter (COLA/GMU), T. O'Brien (LBNL), S. Klein (LLNL), S.-J. Lin (GFDL), B. Medeiros (NCAR), S. Penny (UMD/NCEP), W. Putman (NASA), K. Raeder (NCAR)
  - Agency representatives: A. Mariotti (CPO/MAPP), R. Joseph (DOE)
  - 40+ participants from U.S., international modeling & operational prediction institutions
- **Goals:**
  - Enhance interaction between climate prediction & projections communities
  - Synthesize status of research & document challenges for initialized high-res. simulations for both communities
  - Identify criteria for multi-model experimental framework to address critical research questions in context of available computing resources
- **Key outcomes:**
  - Opportunity for a coordinated investment through common experimental frameworks for investigating (1) coupled system biases, (2) high-resolution for model components
  - Suggestion to define and share process-based metrics to aid model development & stakeholder-defined operational prediction metrics
  - Comprehensive workshop report



Workshop photo (credit: Will Chong)

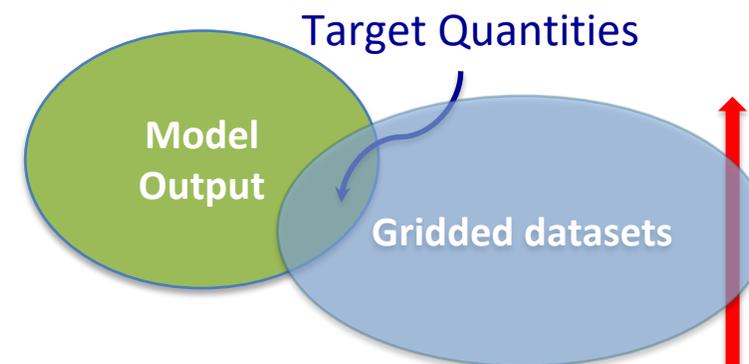


# obs4MIPs

<https://www.earthsystemcog.org/projects/obs4mips>

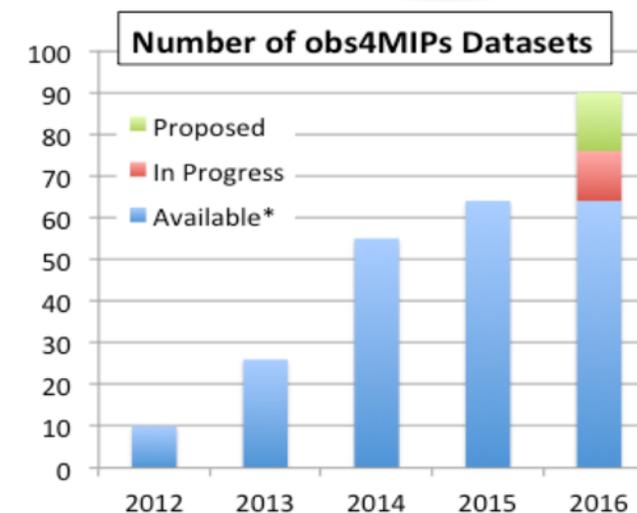


- A project for identifying, documenting and disseminating observations for climate model evaluation in WCRP model intercomparisons, notably CMIP.
- Data (and tech notes) accessible with the distributed CMIP model output via ESGF, adhering to same conventions
- Guided by the WCRP Data Advisory Council obs4MIPs Task Team



NASA JPL  
NASA Goddard  
NOAA NCEI  
ESA  
DOE and others

Complete (~125\*)  
In Progress\* (~15)  
Proposals from Data Call (~100)

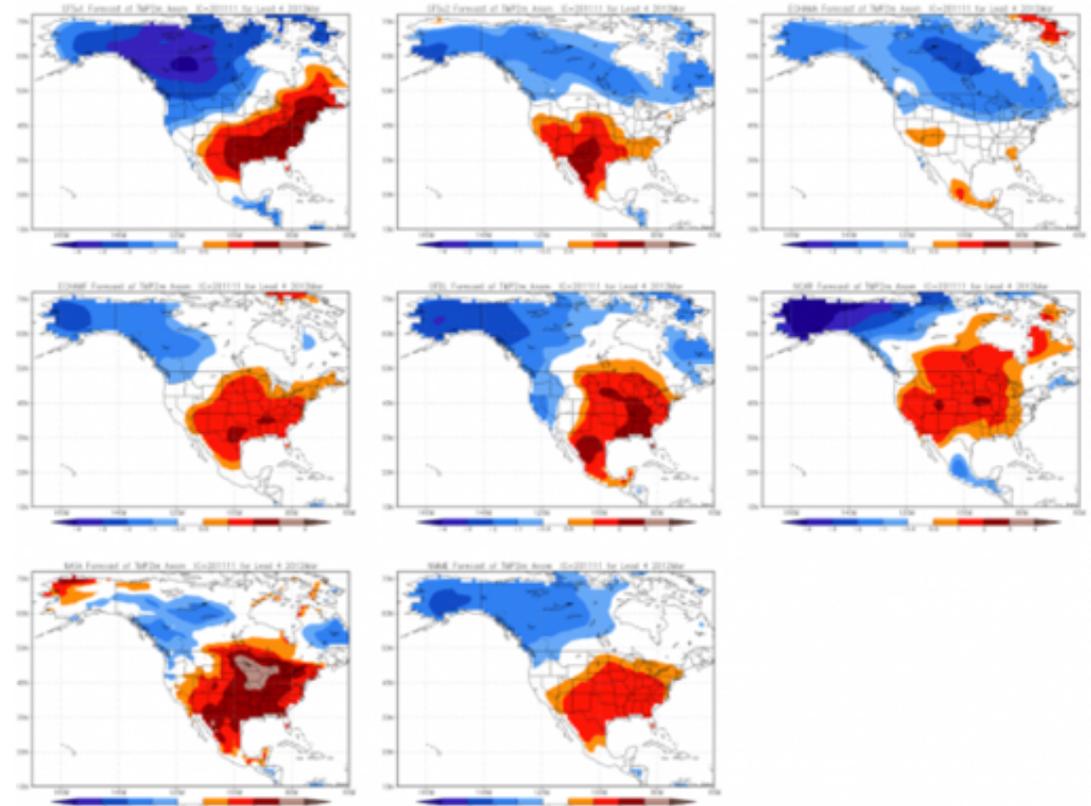


.... and growing!



# North American Multi Model Ensemble (NMME) System

- North American Multi Model Ensemble (NMME) System - research and development for seasonal to interannual prediction and applications



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Thanks!

And

