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# **Water Cycle Coordination under the US Global Change Research Program: Integrated, interagency approaches to global change relevant observations and modeling**

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U.S. Global Change  
Research Program

# 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.”*

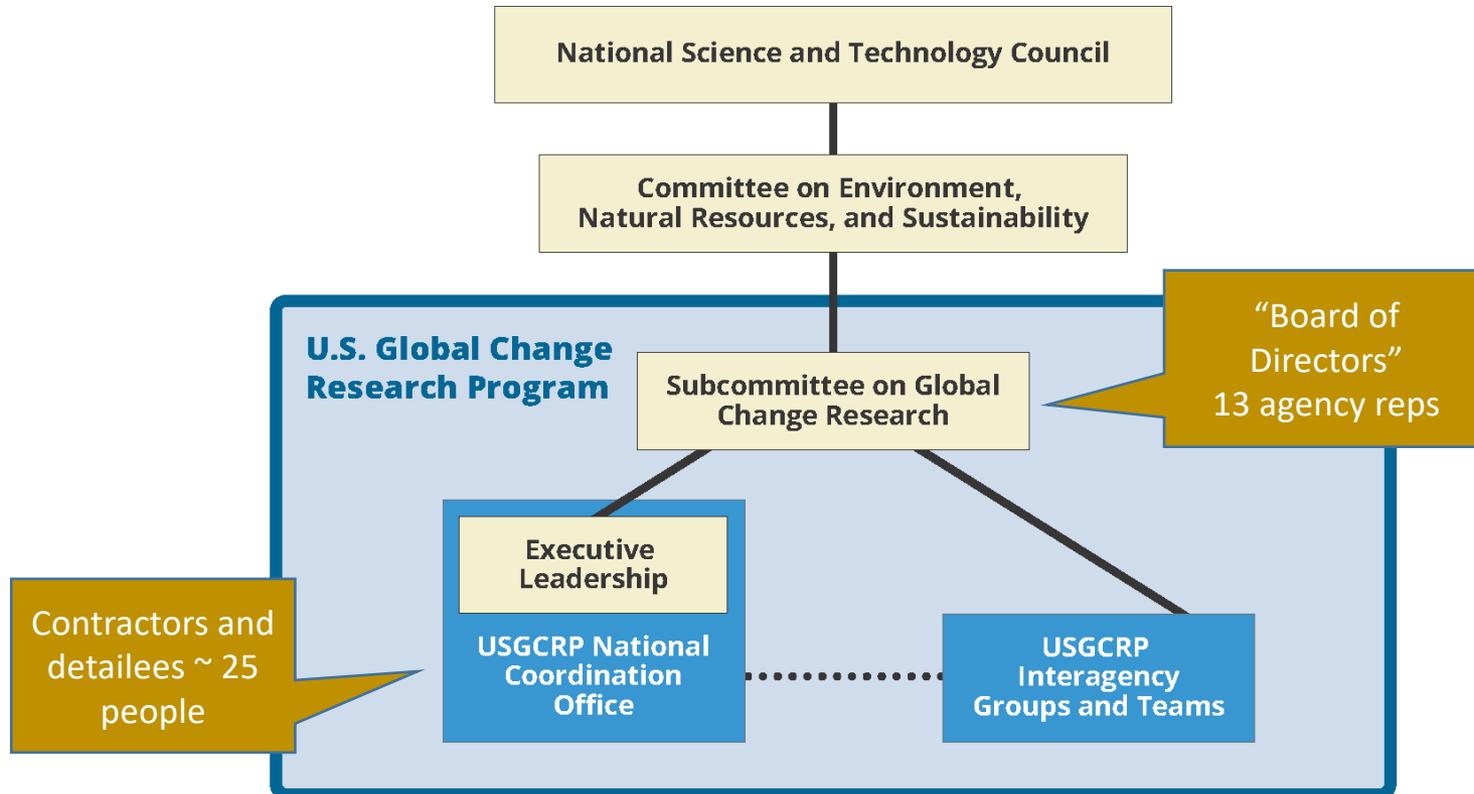
*Global Change Research Act, 1990*

## USGCRP's four strategic goals:

- **Advance Science** - Advance scientific knowledge of the integrated natural and human components of the Earth system to understand climate and global change.
- **Inform Decisions** - Provide the scientific basis to inform and enable timely decisions on adaptation and mitigation.
- **Conduct Sustained Assessments** - Build sustained assessment capacity that improves the Nation's ability to understand, anticipate, and respond to global change impacts and vulnerabilities.
- **Communicate and Educate** - Advance communication and education to broaden public understanding of global change and develop the scientific workforce of the future.



# USGCRP Lines of Oversight and Coordination



Office of Science and Technology Policy (OSTP), Executive Office of the President
 
 — Primary lines of oversight
 

 ..... Primary lines of coordination



# Current Interagency Groups

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

- Interagency Group on **Integrative Modeling** (IGIM)
- Integrated Observations
  
- Adaptation Science
- Carbon Cycle
- Climate Change and Human Health
- Global Change Information
- Indicators
- **Integrated Water Cycle**
- International Activities
- Social Science Coordination
- Sustained Assessment

## **Task Teams and other efforts**

Process Research – Clouds,  
Chemistry & Aerosol Processes

Process Research – Biodiversity &  
Ecosystems

Scenarios and Interpretative Science

Arctic Priority Task Team  
Methane Cycling Priority Task Team



# Interagency Group on Integrative Modeling (IGIM)

- USGCRP's Interagency Group on Integrated Modeling (IGIM) coordinates global change-related modeling activities across the Federal Government and provides guidance to USGCRP on modeling priorities including uncertainty quantification and data requirements. IGIM's scope encompasses the atmospheric, oceanic, cryospheric, and terrestrial domains; human systems are treated as an integral component of each domain.
- Includes participants from DOE, EPA, NASA, Navy, NOAA, NSF, USDA with climate modeling interests and investments

## Selected Activities

- To improve the coordination and communication of national climate modeling goals and objectives, IGIM convenes an [annual U.S. Climate Modeling Summit](#), beginning in 2015. The Summit brings together representatives from the U.S. "[Coupled Model Intercomparison Project](#) (CMIP)-class" climate model development centers and from operational climate prediction programs.
- Topical workshops (2017,2018) in conjunction with USCMS to focus on advancing the science around a modeling topic
  - 2017: Arctic Modeling Workshop
  - **2018: Land – Atmosphere Interactions and Extremes**



# Land Atmosphere Interactions (LAI) and Extremes

*(An example of how & why USGCRP agencies are pursuing data and model integration)*

- **Trajectory of increasing complexity and comprehensiveness** in land surface model (LSMs) components of global climate models
- **New and high resolution data sets are key to many improvements**
  - Recognition of the impact/opportunities of SMAP (NASA's "Soil Moisture Active Passive" satellite), and criticality of other data sets (GRACE, GFED) to improvements (globally available datasets)
  - New avenues of research into LAI are enabled by data constraints provided by co-located field and remotely sensed measurements
  - High resolution vegetation and soil datasets coupled with dynamic models drive improvements in land surface representation
- **Recognition of the need to better represent the role of humans and build the data and knowledge bases for (better) representation of**
  - Land use, fire suppression & ignition, agricultural processes and phenology, water management

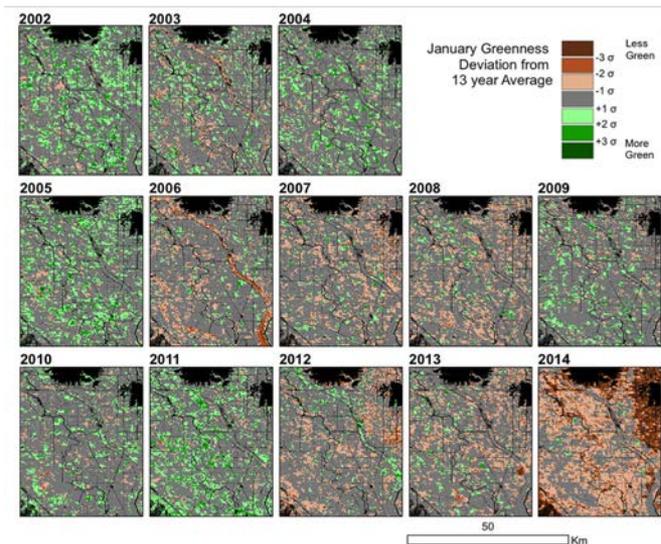


# Recent Highlights of USGCRP Work on Water Cycle Extremes and Impacts

- Mapping Fallowed Farmland During Drought (Our Changing Planet FY16<sup>1</sup>)
- Building Capacity Among Water Resource Managers (OCPFY16)
- Explaining Extreme Events from a Climate Perspective (OCP FY16)
- Understanding Atmospheric Rivers and West Coast Precipitation (OCP FY17<sup>2</sup>)
- Focusing on the California Drought (OCP FY17)



Flooding from heavy rains damaged Boulder, Colorado, in September 2013—one of several extreme events examined in the collaborative report. (Source: S. Zumwalt, FEMA)



The greenness of croplands in January is shown relative to the 13-year average from NASA MODIS records. Satellite imagery can be a powerful tool for understanding the impacts of drought on agricultural lands. (Source: NIDIS Newsletter, April 2014)



# The Integrated Water Cycle Group (IWCG)

- The IWCG
  - **coordinates research relevant to understanding the integrated water cycle** and its associated local, regional and global impacts in response to short-term and long-term perturbations;
  - **advances capabilities and infrastructure** that support water cycle observation, modeling and predictability at a range of scales;
  - and **develops approaches to apply and translate** our understanding and inform decisions surrounding preparedness and resilience.
- Approved by the Subcommittee on Global Change Research as a new USGCRP interagency group on February 14, 2018
- Participating agencies include: NOAA (CPO & NWS), EPA, DOE, NASA, NSF, DOD (Army, ACE), USDA (USFS, ERS, NIFA, NRCS), DOI (USGS, USFWS, USBR)
- Cross membership and coordination with Adaptation Science, Modeling, Observations, Scenarios, Social Sciences.
- **First meeting: April 11, 2018**

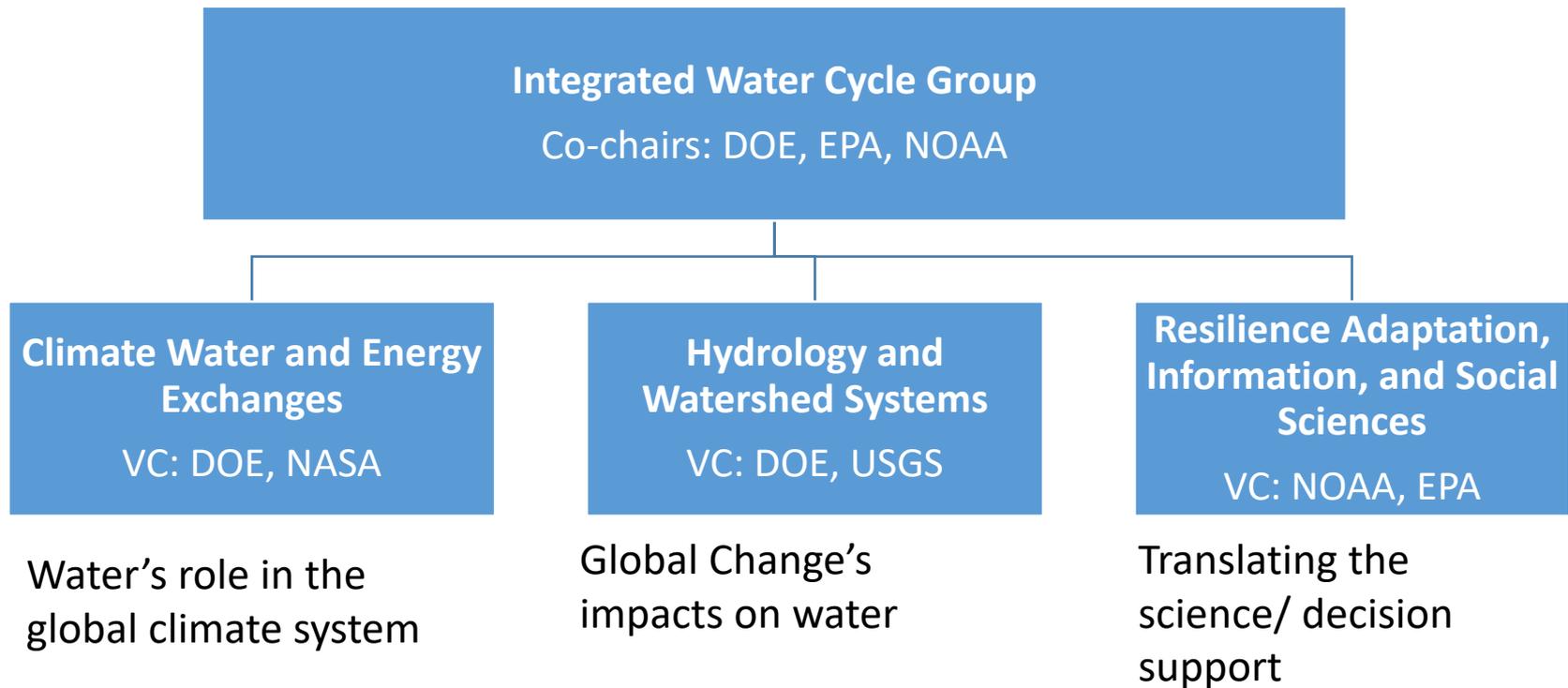


# Principles: The IWCG

- **Focuses on global change-related research and activities** related to the **integrated water cycle** – the movement of water among ocean, atmosphere, land, biosphere, and cryosphere, as well as the interaction of these with human activities
- **Recognizes that interagency and interdisciplinary approaches are required** to understand the integrated water cycle in the context of global change
- **Maintains a multi-scale perspective when considering** the global change effects on the integrated water cycle, including its alterations, impacts, and interactions across scales
- **Seeks an end-to-end approach** spanning coordination of fundamental scientific research through to activities that support the application, use and translation of knowledge gained through that research
- Addresses the need to **maintain and advance foundational capabilities and research infrastructure** to support water cycle science
- **Recognizes the need for engagement and lines of communication** with related activities and efforts



# IWGC *Working* Structure



# Hydrology and Watershed Systems Subgroup/Workstream

- Provides a focal point for interagency activities and research that address how **hydrology at different scales is impacted by global change**
- Provides a space to focus on the **observations, data, analyses, research, modeling, tools and frameworks** needed at different temporal and spatial scales
- Provides a conduit between “global change” and “science translation”
- Will foster strong connections for the IWCG with other more hydrology-centric interagency efforts
- Many agencies were involved in the process of [Looking Forward: Priorities for Managing Freshwater Resources in a Changing Climate National Action Plan Update](#) (November 2016)



# 2016 National Action Plan Update: Data and Research recommendations

- Recommendation: Sustain and expand existing monitoring networks and data collection on hydrologic and meteorological conditions and water demand
  - Identify and address data gaps and needs for water resource management
  - Expand adoption of regional monitoring networks to establish baseline conditions for evaluating impacts due to climate change
- Recommendation: Modernize statistical analyses of observational data sets to improve understanding of emerging trends associated with climate change
  - Update National Oceanic and Atmospheric Administration Precipitation Frequency Datasets
  - Strengthen Flood Frequency Guidelines
  - Improve Streamflow Statistics
- Recommendation: Improve reliability and accessibility of water-related projections of future conditions
  - Evaluate the feasibility of developing the capability to project water temperature under future climates
  - Evaluate the feasibility of integrating climate-impacted hydrology projections with projections of population and land use



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Stay Tuned!  
And thank you!

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