



# Advancing Climate Science and Services in NOAA Climate Program Office

## Outline:

- Introduction on NOAA mission and priorities
- CPO programs and ongoing activities
- Summary and Discussions

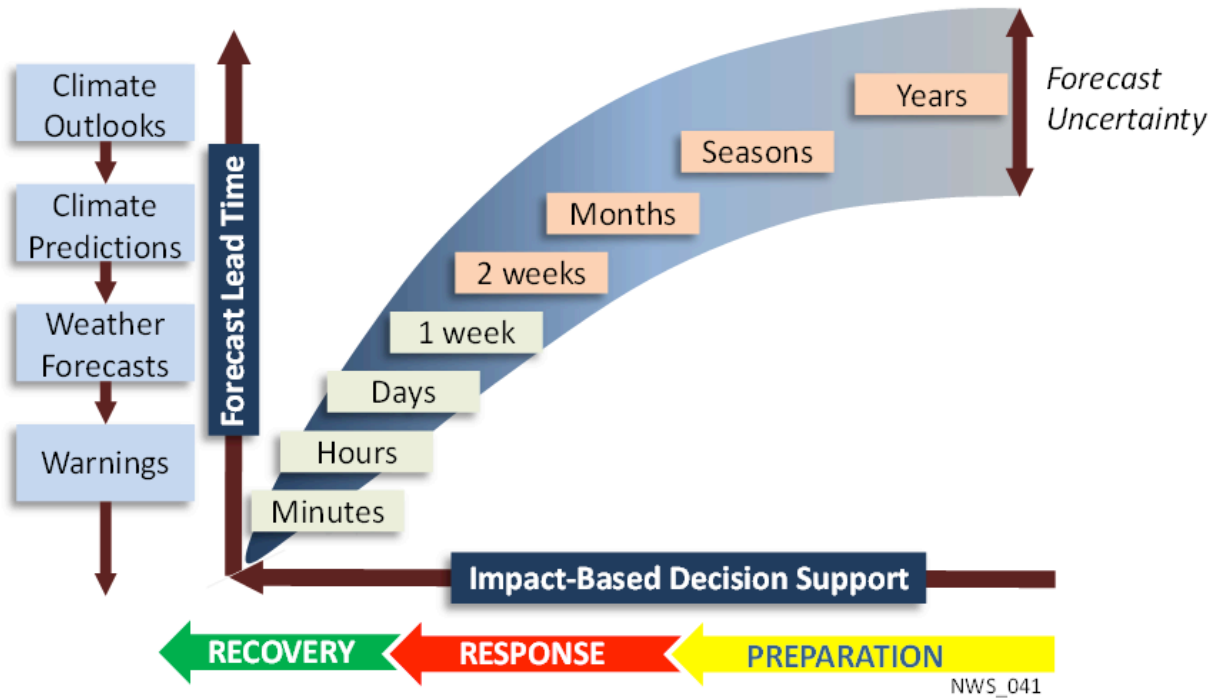
Jin Huang (NOAA Climate Test Bed)  
with inputs from CPO

Wayne Higgins and Annarita Mariotti

May 3<sup>rd</sup>, 2016

# NOAA is responsible to deliver

Timely, credible, useful - across all time scales



e.g. disaster management planning and response

e.g. crop selection, water management

e.g. infrastructure development

# NOAA's Mission Drivers for Climate

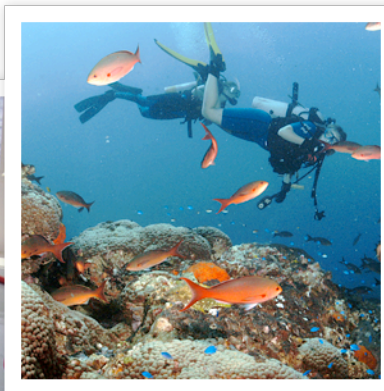
COMMERCE



COASTS



RECREATION



ECOSYSTEMS

**RESPONDING TO THE NEED FOR CLIMATE INFORMATION ACROSS ALL SECTORS OF OUR ECONOMY DRIVING NEW OPERATIONAL PRODUCTS & APPLICATIONS**



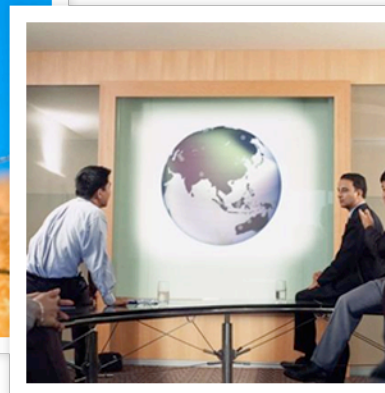
HYDROPOWER

FARMING



HEALTH

PRIVATE SECTOR



# NOAA Priority: Integration across four (initial) societal challenges critical to NOAA's mission

Coastal  
Inundation



Drought  
and Water



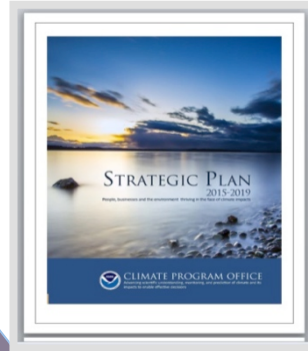
Extremes



Marine  
Ecosystems



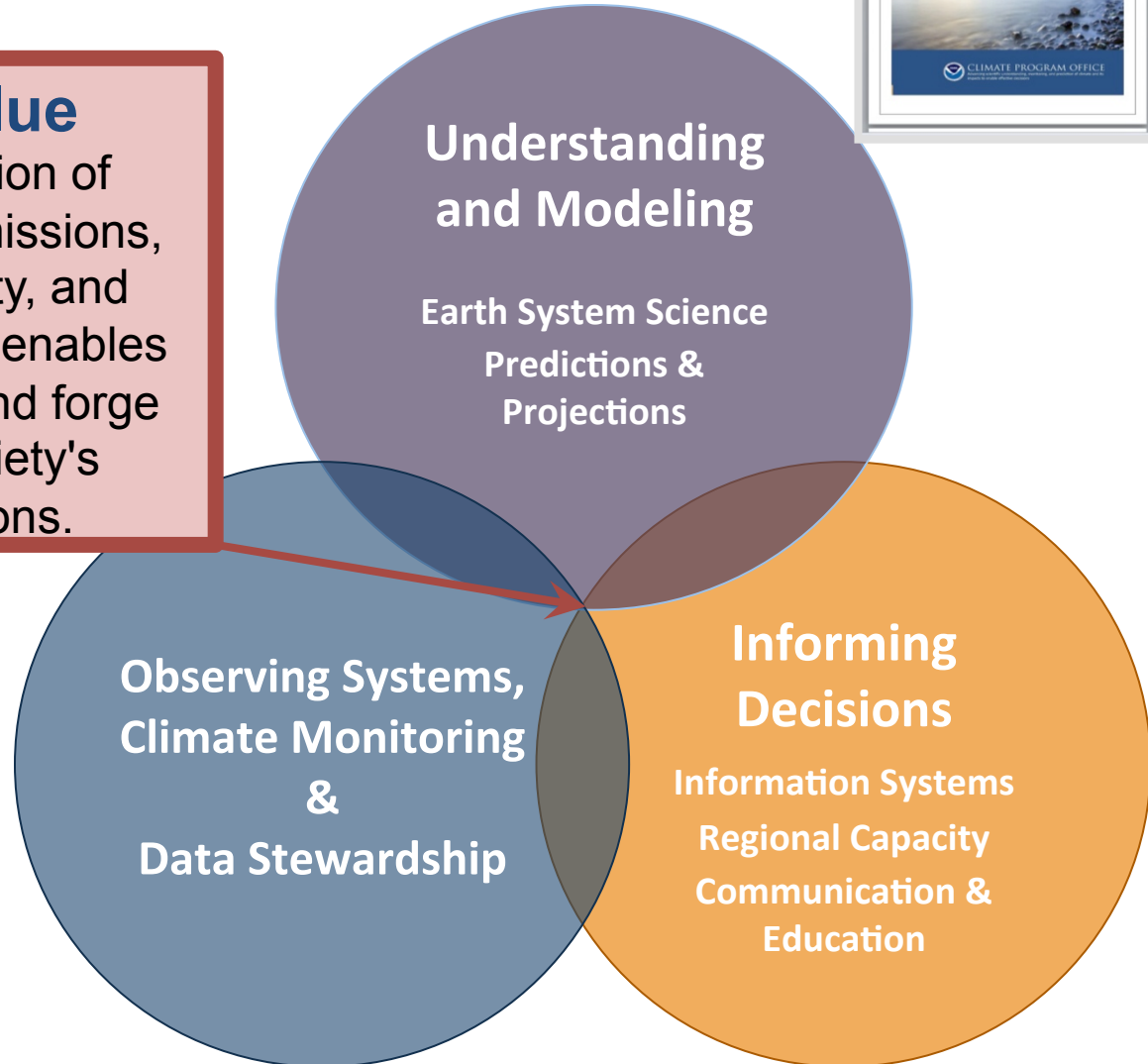
# What is the Role of NOAA's Climate Program Office?



## CPO's Unique Value

CPO's position at the intersection of NOAA's science and service missions, the climate research community, and the broader climate enterprise enables it to lead a research agenda and forge partnerships that enhance society's ability to make effective decisions.

***CPO Mission:*** We advance scientific understanding, monitoring, and prediction of climate and its impacts to enable effective decisions



# CPO Research

**One of CPO's key activities is supporting a unique and highly flexible climate research enterprise that focuses on:**

- **Competitive grant programs** and other types of support that advance and extend NOAA's foundational capabilities. Annual FFO.
- **Tighter integration between CPO's observing, modeling, earth system science, and decision research**
- **Research collaboration with labs, line offices and others across NOAA**
- **Partnerships with other federal agencies, academia, the private sector and the international community to develop and deliver targeted research and data products**
- **Research-derived knowledge and information** to improve public climate literacy and decision-making needed to maintain resilient economies and environmental services

# CPO FY16 Research Competitions

## Climate Observations and Monitoring (COM)

1. *In Situ* Technologies to Contribute to the Tropical Pacific Observing System 2020 Project

## Earth System Science (ESS)

2. Atmospheric Chemistry, Carbon Cycle, & Climate (AC4): **Fires in the Western US: Emissions and Chemical Transformations**
3. Climate Variability & Predictability (CVP): **AMOC-Climate Linkages in the N. and/or S. Atlantic**

## Modeling, Analysis, Prediction, and Projections (MAPP)

4. **NOAA Climate Test Bed** - Accelerating Transition of Research into Operations
5. Research to Advance **Prediction of Subseasonal to Seasonal** Phenomena

## Climate and Societal Interactions (CSI)

6. COCA – Ecosystem Services for a Resilient Coast in a Changing Climate
7. RISA – Regional Integrated Sciences and Assessments - Existing Regions
8. RISA – Regional Integrated Sciences and Assessments - New Regions
9. SARP – NIDIS: Coping with Drought
10. SARP - Water Resources and Extreme Events

# CPO ESS Program

## Scope/Objective:

- supports research to provide a process-level understanding of the climate system through observation, modeling, analysis, and field studies.

**Program Director (Jim Todd)**

**CVP program manager (Sandy Lucas)**

**AC4 Program managers (Monica Kopacz and Ken Mooney)**

## Examples of FY15 ESS projects/achievements:

- **DYNAMO campaign** aircraft observations improve understanding of MJO
- Understanding **Madden--Julian Oscillation** Initiation and Propagation
- Will future global **cloud** changes amplify global warming ?
- Understanding **Arctic Sea Ice Mechanisms and Predictability**
- Wintertime Atmospheric Response to **North Atlantic Ocean Circulation** Variability
- **Sea level change and subsidence in the Delaware Estuary** during the last 2200 years
- CVP-funded research tests **microphysical** schemes in the WRF model
- **Nitrogen Cycle** improvements in the GFDL Earth System Models (*Horowitz et al*)
- Emissions from thawing **permafrost** add trillions in economic impacts (Hope & Schaefer)



# MAPP Program Research Goals

Advance understanding and prediction of variability and changes in Earth's climate system and infuse research advances into NOAA's service activities

Prediction week-2 to interannual

Climate and Earth System Models

Drought Research

Long-Term Climate Outlooks

Climate Reanalysis

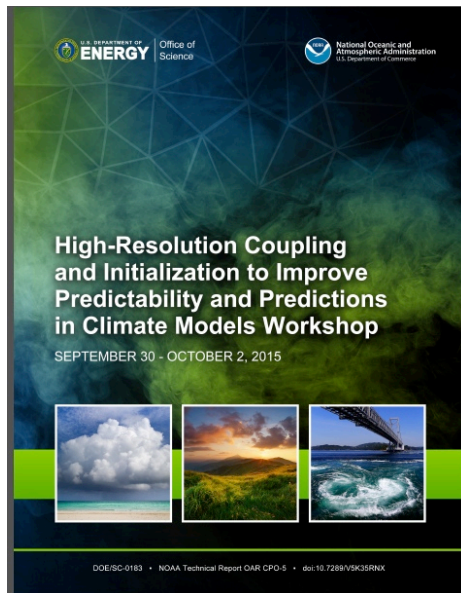
- MAPP Director (Annarita Mariotti)
- MAPP program managers (Dan Barrie, Heather Archambault)

# Examples of MAPP Research

- Spring ENSO Variations and North Atlantic SSTs Could Help Long-Range Prediction of **U.S. Tornado Outbreaks**
- Will climate change increase summertime temperature variability and **heat waves** by 2100?
- **Drought** understanding and prediction in the Central U.S.
- **high resolution** impacts on forecast skill of tropical cyclone activity in coupled systems
- **MAPP-CTB (in partnership with NCEP) projects to improve NCEP operational models and predictions**
  - Cloud-Climate Process Team 1 (Krueger, Moorthi, et al)
  - Cloud-Climate Process Team 2 (Bretherton, Jongil, et al)
  - Lake Module (J-M Jin, Ek, et al)
  - Land Module, Noah MP (Chen, Ek, et al)
  - Aerosol Module (Lu, Hou, Moorthi, et al)
  - North American Multi-Model Ensemble (NMME)

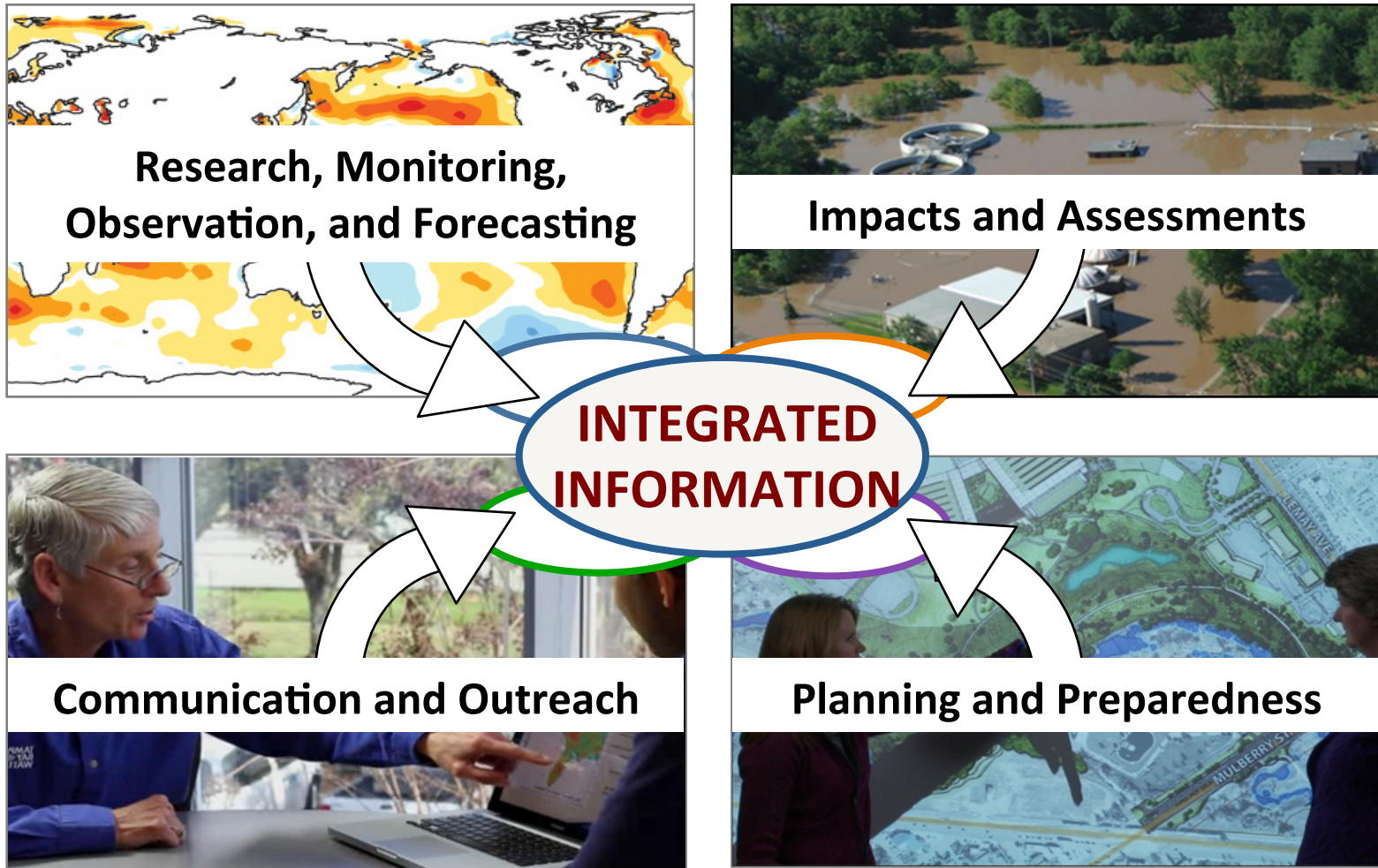
# High Resolution Workshop

- DOE-NOAA jointly hosted a workshop on *High-Resolution Coupling and Initialization to Improve Predictability and Predictions in Climate Models* - 30 September to 2 October 2015
- A report summarizes the current status of the research suggests potential experimental research framework for addressing major questions while considering computing resource requirements.



Workshop Participants: The workshop included over 40 participants from various leading U.S. climate modeling and operational prediction institutions, including representatives from several international groups. Image courtesy of William Chong, NOAA/CPO.

# Integrated Information Systems



National Integrated Drought Information System (NIDIS) is an example of integrated information systems

# Summary and Discussions

- CPO programs support the global observing system, **advance understanding of the Earth system, improve models and forecasts, and communicate, educate, and engage**
- CPO knits these investments together into **Integrated Information Systems** that inform early warning to early action.
- **How can GEWEX/RHP play a unique role in contributing to the NOAA mission? e.g.,**
  - to advance earth system models and prediction capabilities
  - to understand the processes and phenomena leading to drought and extremes, especially at regional scales
- **Other opportunities in NOAA**
  - RTAP (for R20); NGGPS
  - National Water Center