NOAA's Climate Goal
Climate Data Management Issues

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Data Archiving and Access Requirements Working Group (DAARWG)
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Briefing Outline

- NOAA Climate Goal Overview
- NOAA Climate Data Management Challenges
- Examples of Climate Goal Efforts to Meet these challenges

NOAA's Climate Goal

Five Programs

Climate Goal: ***Understand climate variability and change to enhance society's ability to plan and respond***

Climate Programs	Goal Performance Objective	Outcomes
COA - Climate Observations & Analysis	**Describe and understand the state of the climate system through integrated observation, analysis, and data stewardship.**	**A Predictive understanding of the global climate system on time scales of weeks to decades with quantified uncertainties sufficient for making informed & reasoned decisions**
Climate Forcing	**Reduce uncertainty in climate projections through timely information on the forcing and feedbacks contributing to change in the Earth's climate.**	**Climate-sensitive sectors and the climate-literate public effectively incorporating NOAA's climate products into their Plans and decisions**
Climate Predictions and Projections	**Improve climate predictive capability from weeks to decades, with an increased range of applicability for management and policy decisions.**	
Climate and Ecosystems	**Understand and predict the consequences of climate variability and change on marine ecosystems.**	
Regional Decision Support	**Increase [number and use] availability of climate products and services to enhance public and private sector decision making**	

Climate Obs. & Analysis Program

Three Capabilities

Capabilities	*Capability Drivers*	*Desired Outcomes*
Observations	• Foundation for other 2 capabilities • Critical to understanding climate	• Integrated & complete ocean, surface, upper air, & space observing systems • Support Mission Outcome "A *predictive understanding of the global climate system*"
Data Management	• Essential for fidelity of archived records • Provides archive, access, stewardship	
Analysis of Climate System	• Dependent upon first 2 capabilities • Critical to societal benefits	

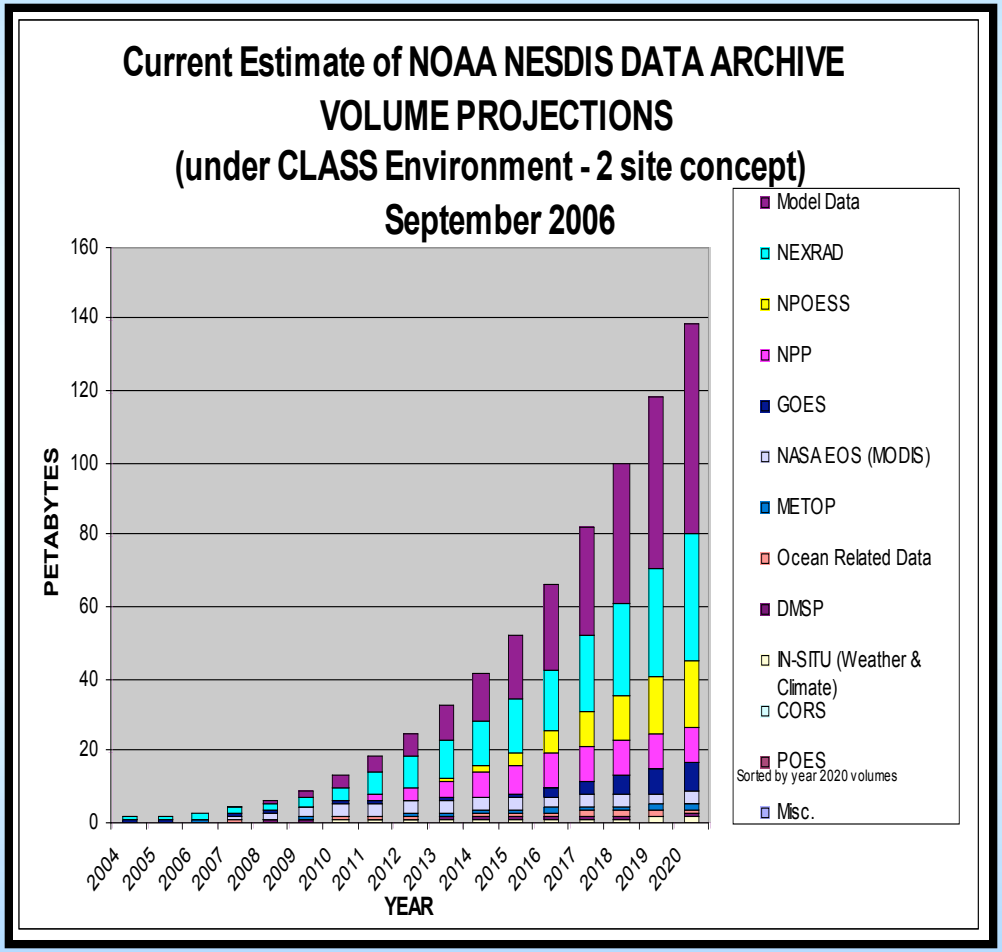
NOAA Climate Data Management Challenges

Data Management Challenges

NOAA Climate Goal Perspective

General Data Management Challenges

- **Archive:**
  - **New systems will lead to large increase in data volume and archive requirements**
- **Access**
  - **Integrated data access capability to solve complex interdisciplinary societal issues**
  - **Unrestricted full and open access to data by all users**
- **Current systems already face challenges**



Data Management Challenges

NOAA Climate Goal Perspective

How do we achieve functional interoperability of users, information, and systems across an already existing collection of heterogeneous clients and data systems?

- **Issues**
  - User expertise varies within disciplines, and especially across
  - Variety of data, information, tools, system/network performance levels exist
  - Desire to take advantage of existing systems & capabilities
  - Not realistic to redesign and replace all existing systems with one, large, integrated capability

- **Challenges**
  - New systems being built need an architectural model to follow
    - Standards/protocols, component based architecture, open-source library tools, maximum interoperability
  - Must maintain flexibility and adaptability for technology changes

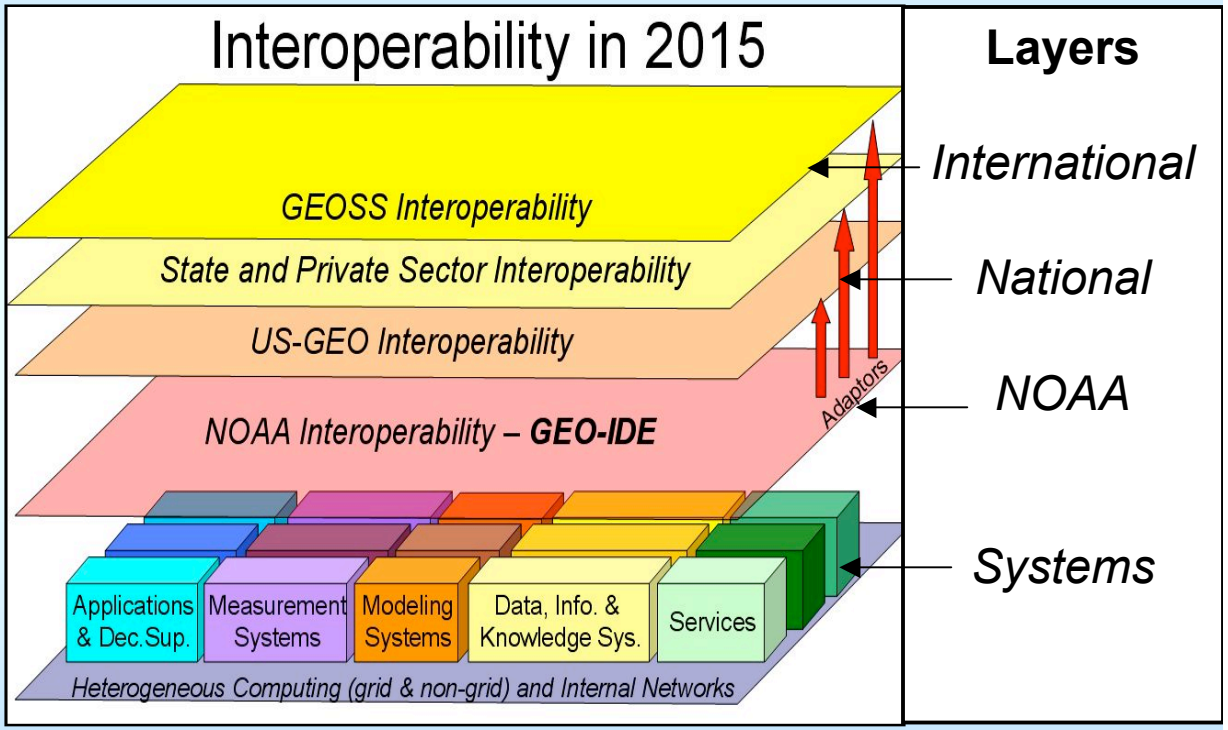
Examples of Climate Goal Efforts to Meet these Challenges

GEO-IDE

(Global Earth Observation Integrated Data Environment)

Overall Framework to Integrate NOAA's many systems

- **Promotes standards:**
  - **Syntax** (formats)
  - **Semantics** (terminology)
  - **Interfaces** (Service-Oriented Architecture)
- **Provides interoperability on legacy systems**



Adopt, adapt, and as a last resort create standards for data, metadata & interfaces for discovery, transport, & description of NOAA data/services

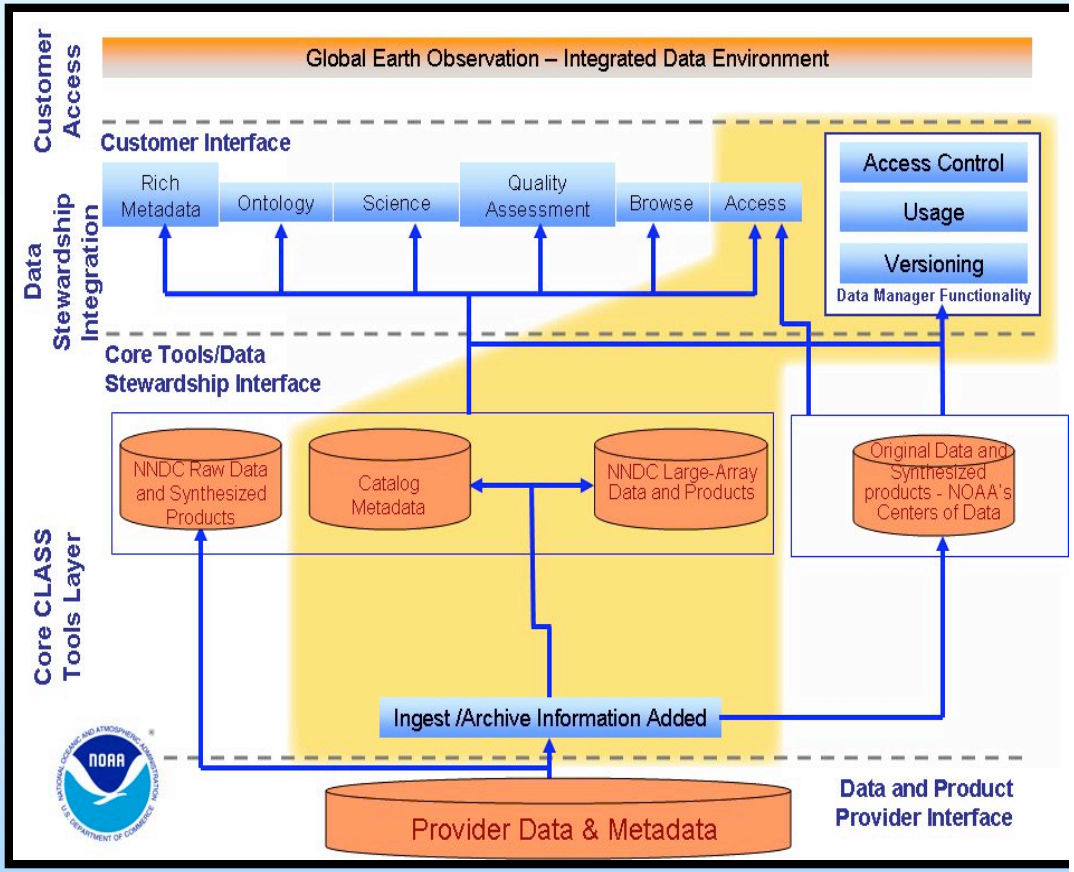
Preserving & Accessing the Climate Record

CLASS and GEO-IDE

CLASS to evolve into a system for archive & access to all NOAA data

Comprehensive Large Array data Stewardship System (CLASS) will:

- Be a flexible interoperable framework compatible with the GEO IDE model
- Enables Scientific Data Stewardship activities to make data more useful to global clientele
- Incorporates an Open-Architecture capability allowing use of automated machine interfaces



Scientific Data Stewardship (SDS)

Initial work for developing Satellite Climate Data Records (CDR)

- **Judge the current state of a CDR data set via a Maturity Model (below)**
- **Data set maturity score used to prioritize CDR development**
- **42 GCOS Essential Climate Variables highest priority for CDR's**

Conceptual Maturity Model Cycle for CDR's

CDR data maturity: 3 dimensions

Scientific Maturity: rigorous validation, accessibility, others

Preservation Maturity: guaranteed preservation, assurance of cost, others

Societal Impact: bibliometric metrics, policy utilization, others

Maturity Level Scoring

(for each Dimension)

1. **Initial:** Unpredictable results
2. **Managed:** Repeatable performance
3. **Defined:** Cross-project interoperability
4. **Quantitatively Managed:** Improved performance & Compliance with Fed. Enterprise Architecture
5. **Optimized** – Rapidly configurable performance; & Continuous Process Improvement

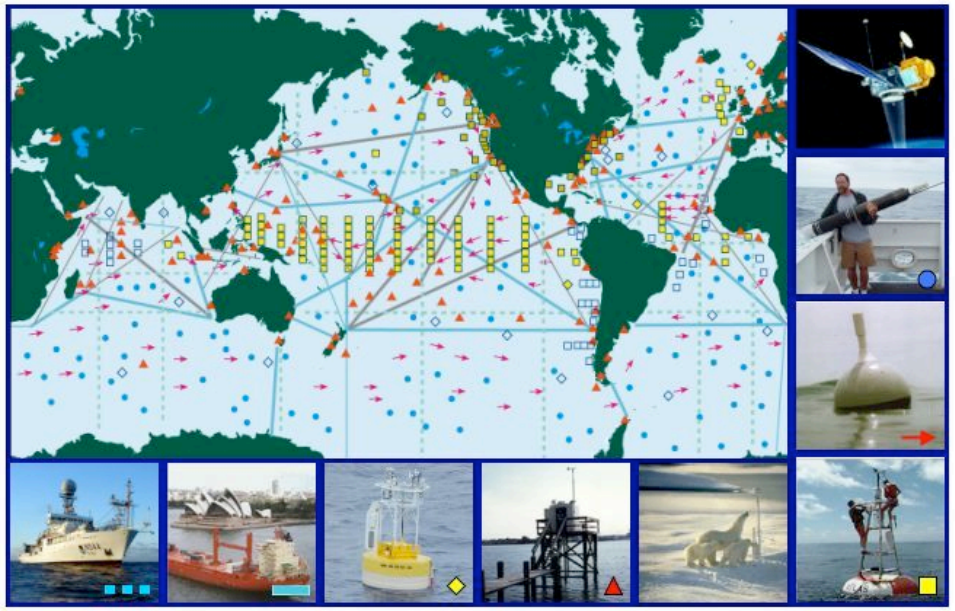
Data set maturity score: computed for each CDR based upon 3 dimensions

A CDR is a time series of (satellite) measurements of sufficient length, consistency, & continuity to determine climate variability & change (NRC, 2004)

Example of a Major Observing System

Integrated Ocean Observing System (IOOS) Global Component

- **Build & sustain a global ocean observing system that supports**
  - **Operational forecast centers**
  - **International research programs**
  - **Major scientific assessments**
- **Blue water component of IOOS will document:**
  - **Trends in sea level change**
  - **Ocean carbon sources/sinks**
  - **Ocean storage & global transport of heat & fresh water**
  - **Ocean-atmosphere exchange of heat and fresh water**



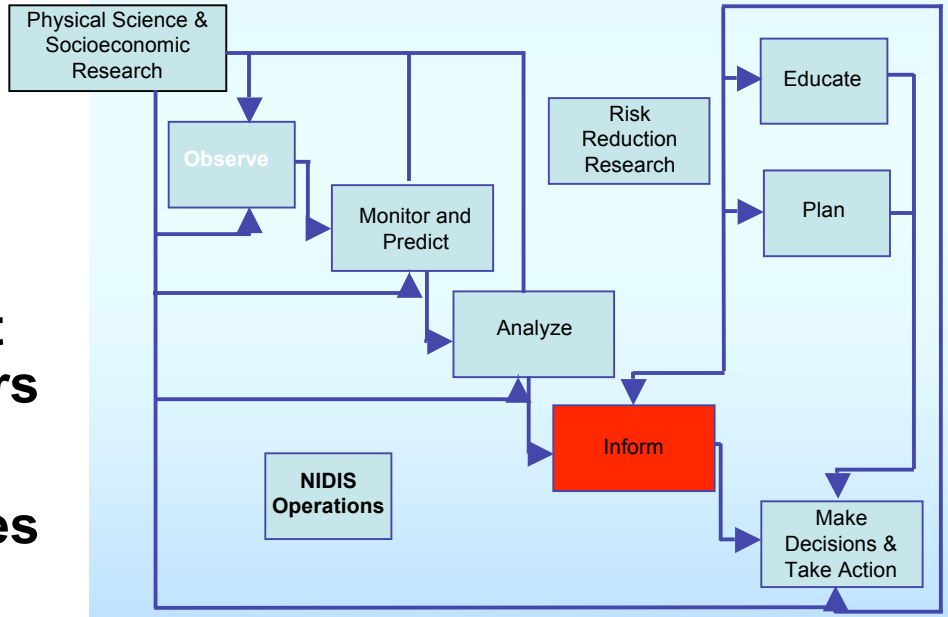
- **Tide gauge stations**
- **Drifting Buoys**
- **Tropical Moored Buoys**
- **Profiling Floats**
- **Ships of Opportunity**
- **Ocean Ref. Stations**
- **Ocean Carbon Networks**
- **Arctic Obs. System**
- **Dedicated Ship Support**
- **Data & Assimilation Subsystems**
- **Management and Product Delivery**
- **Satellites -- SST, Surface Topography, Wind, Color, Sea Ice**

Climate Data Access

Example of NIDIS and Web Portals Technology

Goals & Objectives - Implement an integrated national drought monitoring & forecasting system

- Create drought early warning system
- **Provide interactive delivery systems via web (web portal)**
- Provide education of drought impacts & why drought occurs
- Improve predictive capabilities
- Includes information for drought mitigation



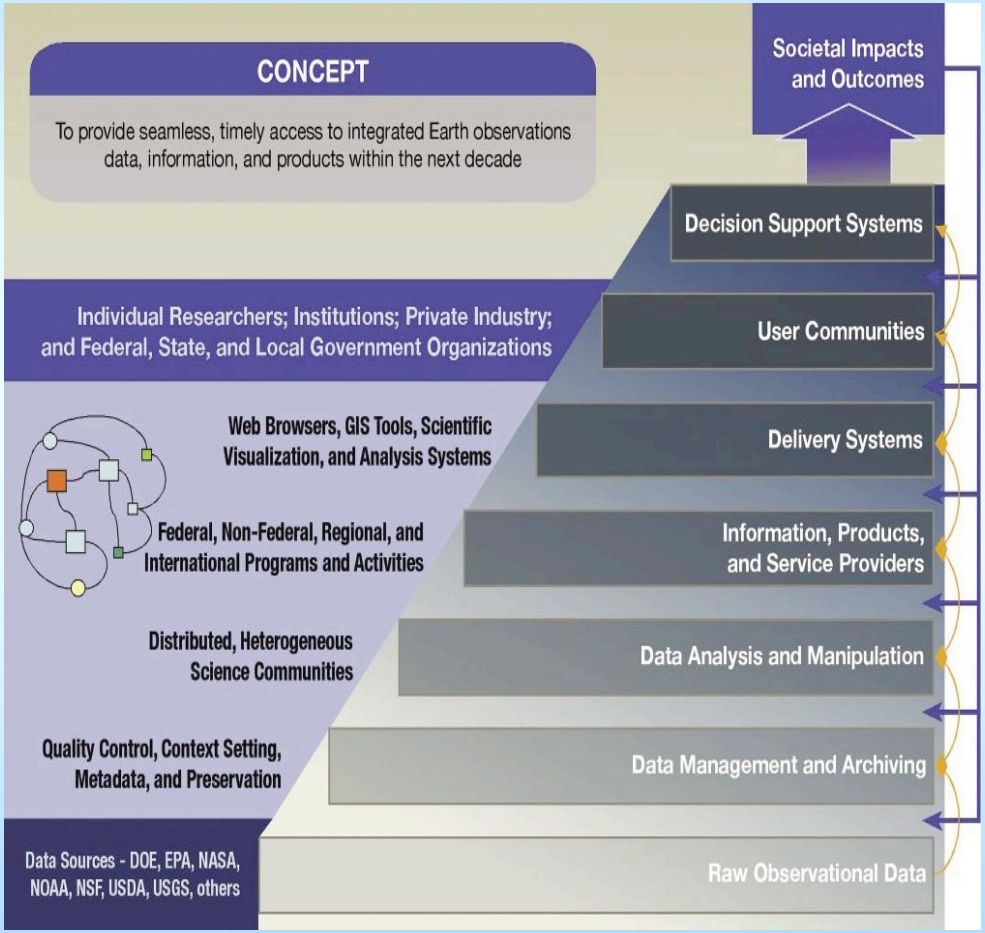
National Integrated Drought Information System (NIDIS) Business Processes

National Integrated Drought Information System

U.S. Drought Portal

Portal Concept: Must be capable of operating across agencies

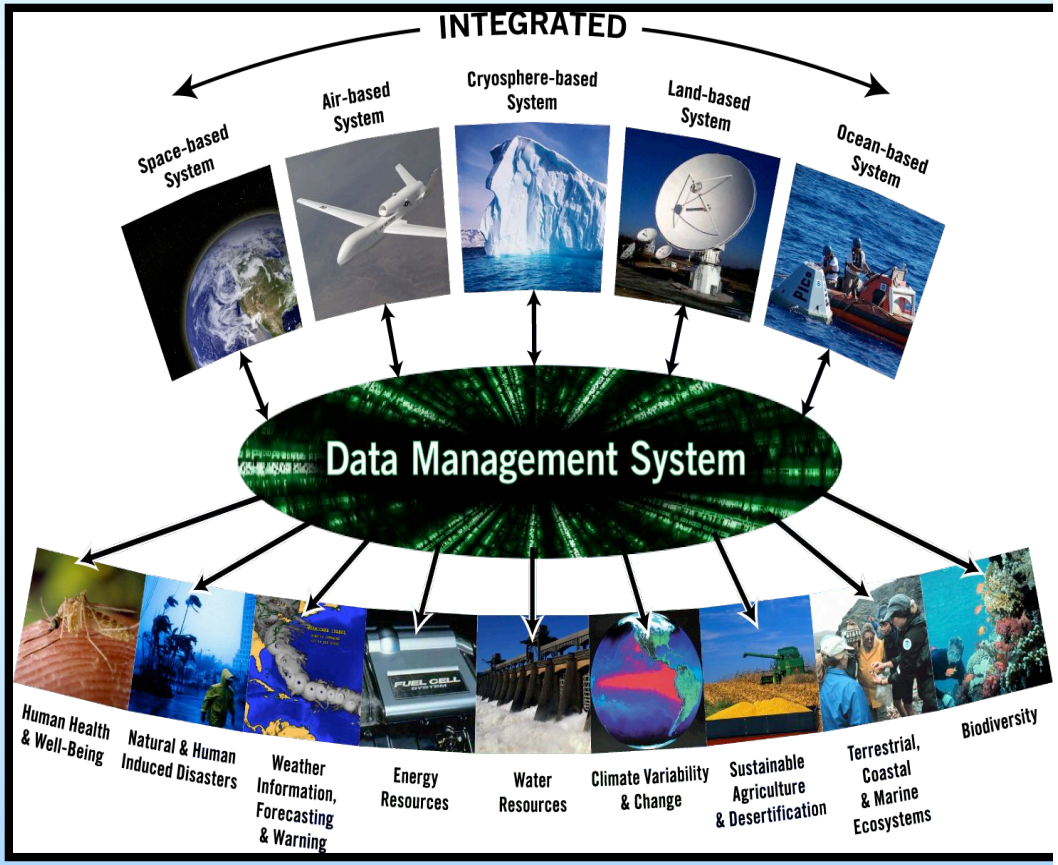
- Concept for Drought:
  - Internet portal to provide a drought early warning system from U.S. county to national scale
  - Portal will provide seamless and timely access to Integrated Drought observations



Relationship to National & International Efforts

Integration of observation & data management supports U.S. & International Integrated Earth Observing Systems: IEOS & GEOSS

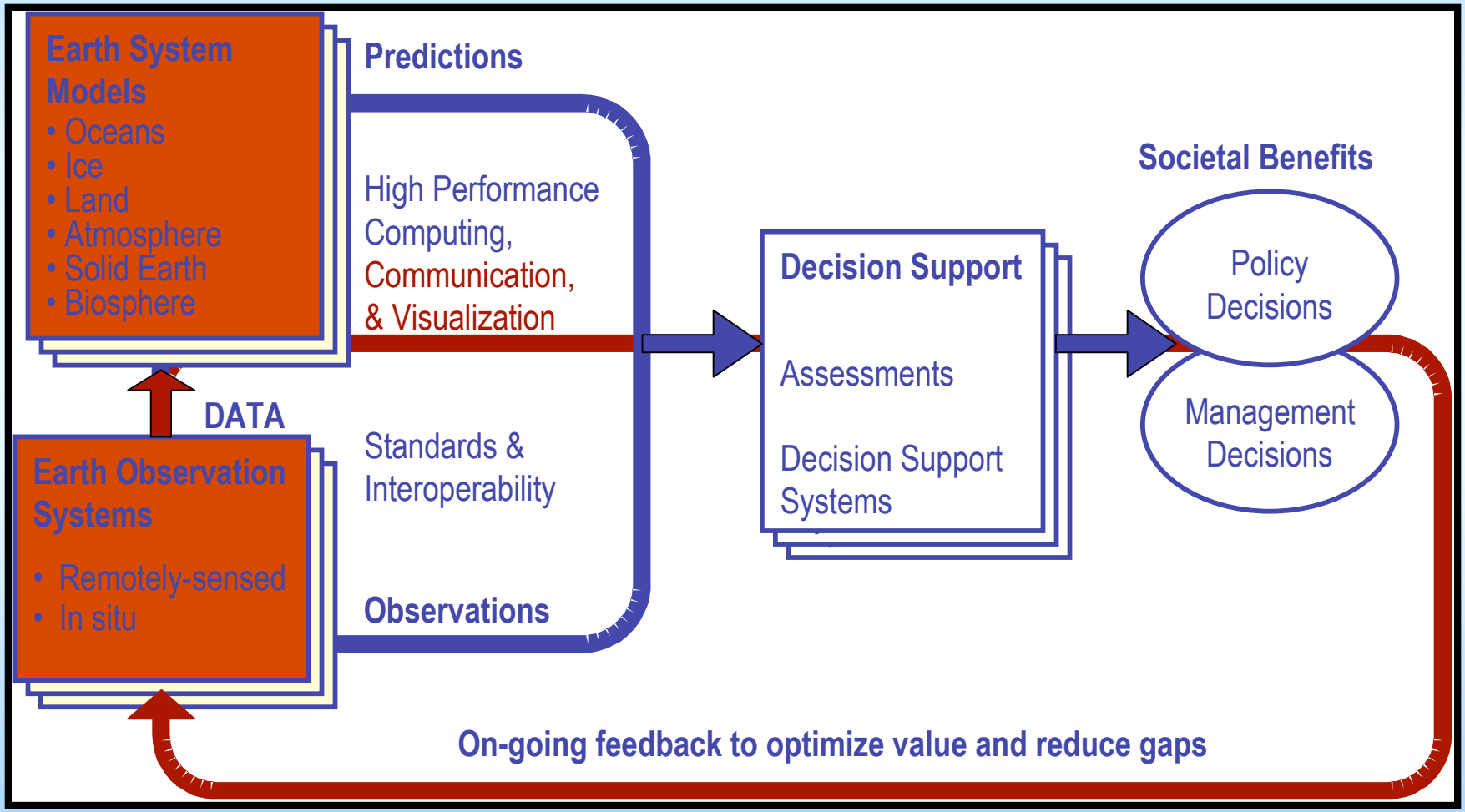
- **Integration among science disciplines:**
  - Improves analysis & services for decision makers
  - Results in enhanced societal benefits



Where DAARWG fits in

(highlight in red below)

Which Earth Observations System's data/models are archived & made accessible



Questions