Earth Science Division

NASA-MEST Technical Group for Geostationary Atmospheric Composition

Data Systems and Policies

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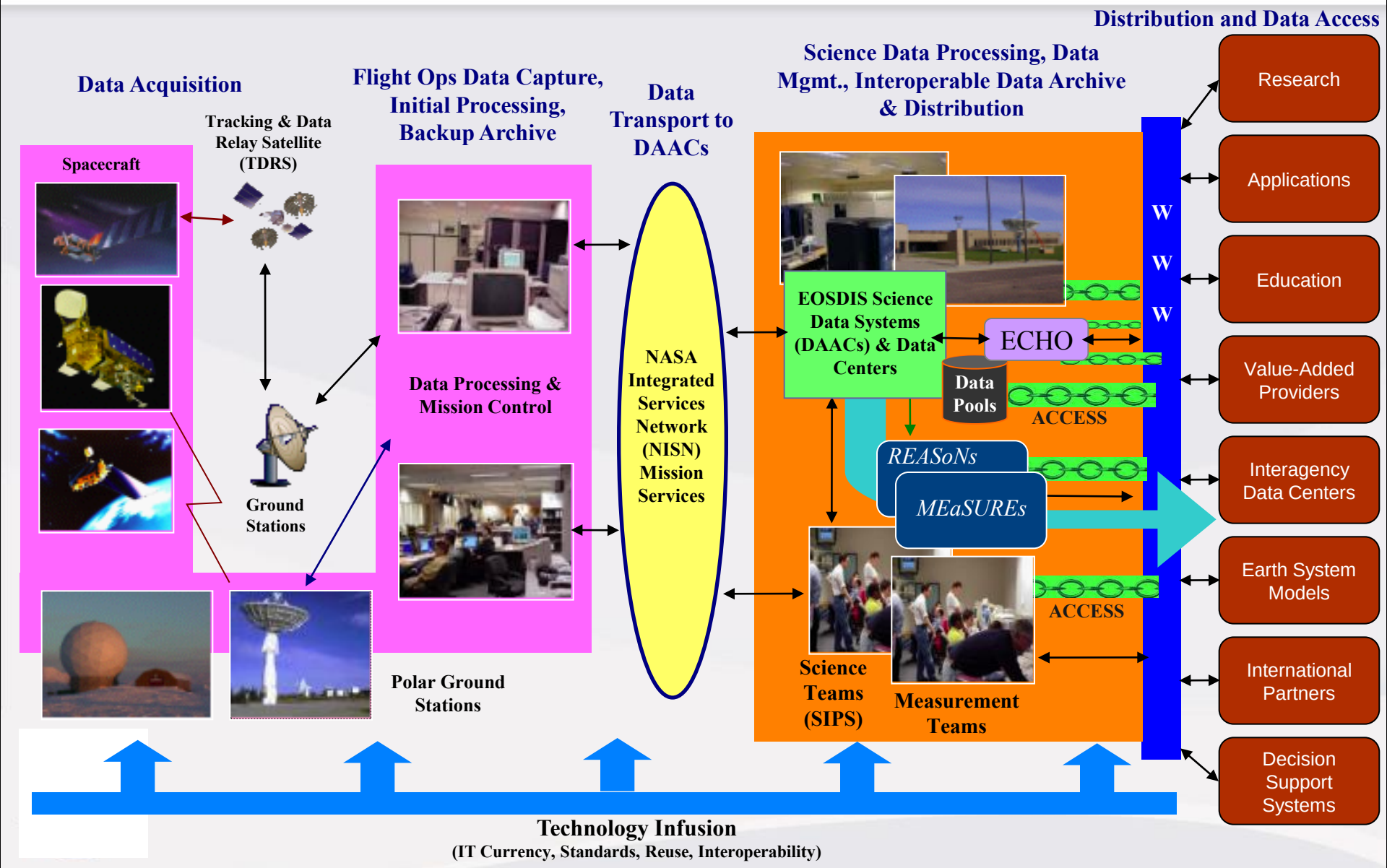
NASA Headquarters

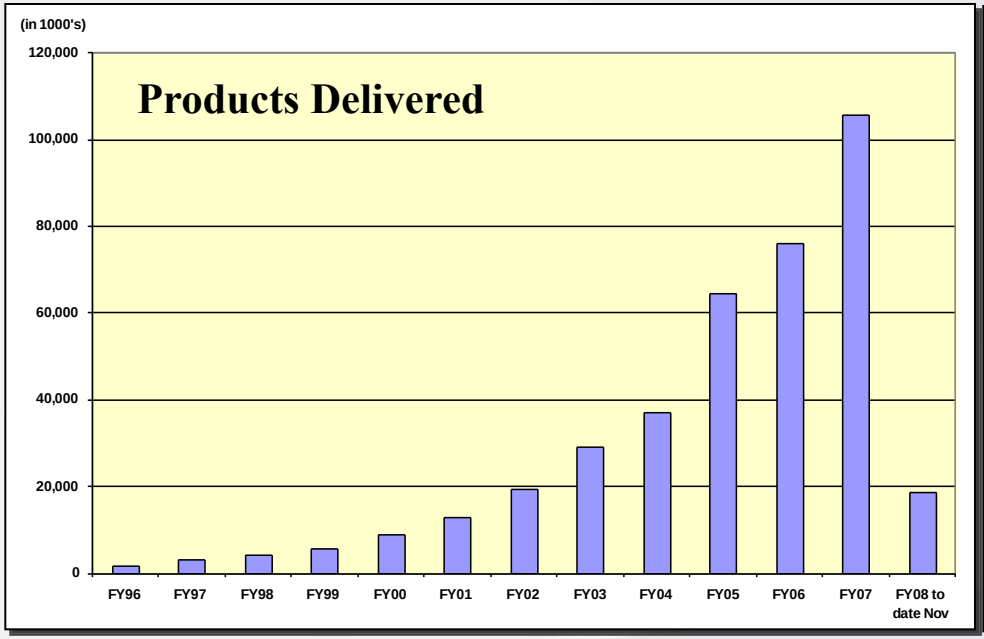
Earth Science Data System Architecture

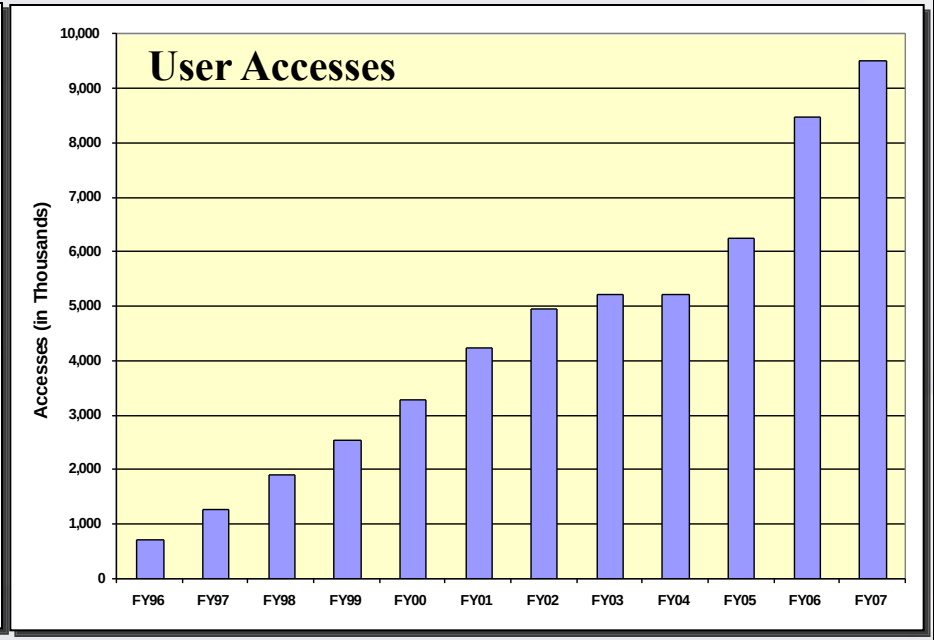


EOSDIS Key Metrics

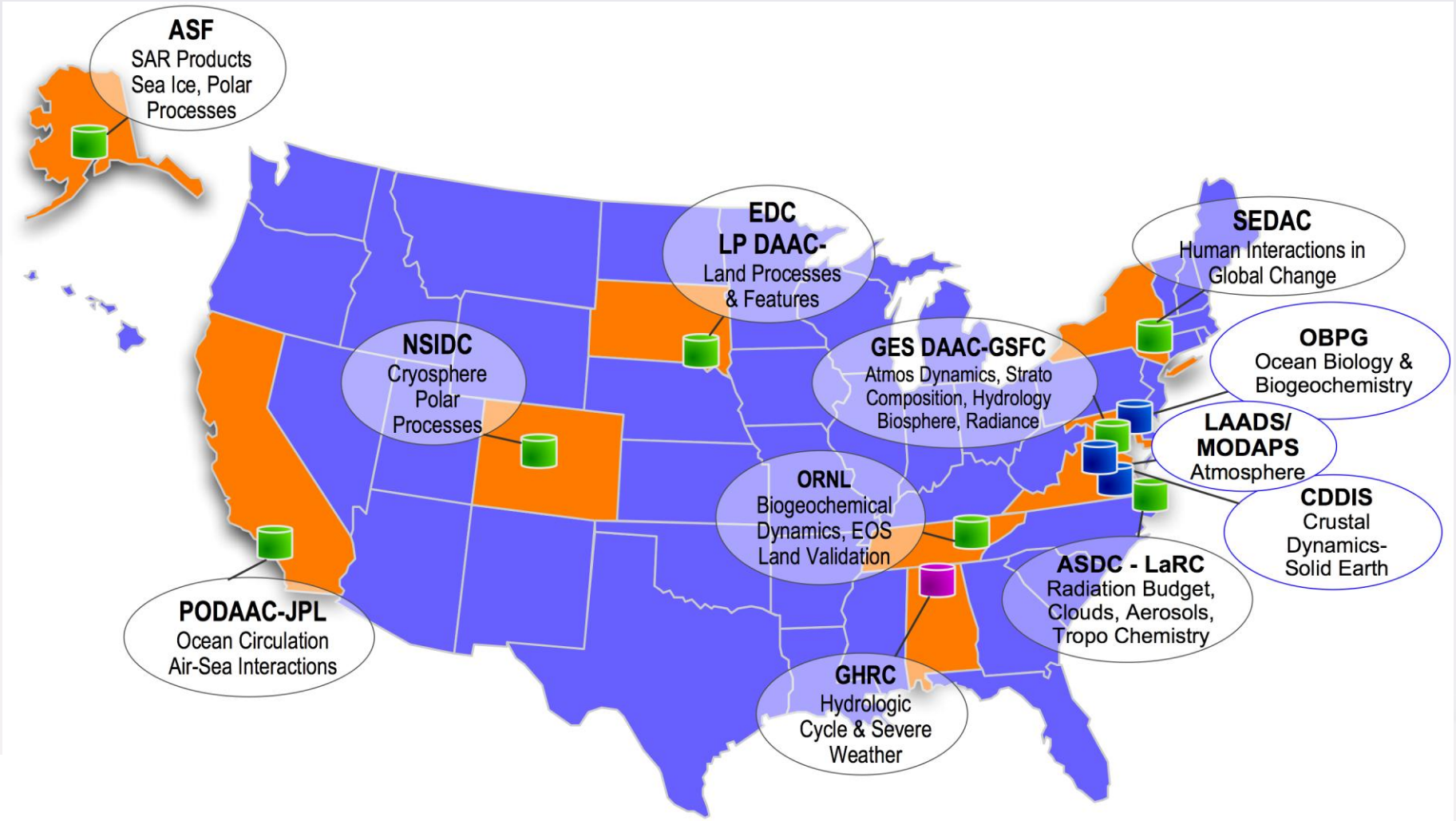
EOSDIS Metrics (Oct 1, 06 to Sept 30, 07)	
Unique Data Products	>2700
Distinct Users at Data Centers	~3.0M
Daily Archive Growth	3.2 TB/day
Total Archive Volume	4.9 PB
End User Distribution Products	>100M
End User Daily Distribution Volume	4.2 TB/day

ESDIS Project Supports		
Science System Elements	Data Centers	11
	SIPS	14
Interfaces	Interface Control Documents	41
Partnerships	US	8
	International	18
Missions	Science Data Processing	7
	Archiving and Distribution	51
	Instruments Supported	75





EOSDIS-Supported Data Distribution Systems



Core: Evolving EOSDIS

In early 2005, NASA embarked on an EOSDIS Evolution Study

Address multi-faceted goals/issues:

- Manage archive volume growth
- Improve science need response and data access
- Reduce recurring costs of operations and sustaining engineering
- Update age of systems and components
- Move towards more distributed environment

A vision for the 2015 timeframe was developed to guide conduct of study

EOSDIS Evolution “Step 1” Plan approved by NASA Headquarters in late 2005.

Key Benefits of EOSDIS Evolution "Step 1" Plan

✓ Maximize Science Value

- Data access easier and data products quickly available to science community
- MODIS data more closely integrated with science community
- Potential pathfinder for migration of other data into science communities

✓ Substantial Cost Savings

- Addresses operational and sustaining engineering
- Takes advantage of current IT advances
- Investments provide return on value within 3 years

✓ Manageable Risk

- Minimizes software development efforts
- Builds upon existing systems
- Utilizes steps within plan as proof of value before proceeding
- Reduces footprint for EOSDIS Core System

Earth Science Data System Vision for 2015

Vision Tenet	Vision 2015 Goals
Archive Management	✓ NASA will ensure safe stewardship of the data through its lifetime. ▪ The EOS archive holdings are regularly peer reviewed for scientific merit.
EOS Data Interoperability	▪ Multiple data and metadata streams can be seamlessly combined. ▪ Research and value added communities use EOS data interoperably with other relevant data and systems. ▪ Processing and data are mobile.
Future Data Access and Processing	✓ Data access latency is no longer an impediment. ✓ Physical location of data storage is irrelevant. ✓ Finding data is based on common search engines. ✓ Services invoked by machine-machine interfaces. ✓ Custom processing provides only the data needed, the way needed. ✓ Open interfaces and best practice standard protocols universally employed.
Data Pedigree	▪ Mechanisms to collect and preserve the pedigree of derived data products are readily available.
Cost Control	✓ Data systems evolve into components that allow a fine-grained control over cost drivers.
User Community Support	✓ Expert knowledge is readily accessible to enable researchers to understand and use the data. ✓ Community feedback directly to those responsible for a given system element.
IT Currency	✓ Access to all EOS data through services at least as rich as any contemporary science information system.

✓ Addressed in Step 1 Evolution

Approach for Earth Science Decadal Survey Missions and Beyond

Integrated approach to Earth System Science

Working from an established foundation

- Missions in Orbit
- Missions in Development
- Established networks

Decadal Survey Recommendations/Guidance

NASA Earth Science Objectives & Approach

Data Systems Challenge and Charter

From presentation by Stephen Volz

The Intellectual Challenge

The Earth is an integral, complex system

- Many processes, with varying time and spatial scales
- Quantitatively describing the interactions between processes is key

Measurements must span all important variables, and all important scales

Research leads to greater understanding, which is codified in numerical models – prediction

Societal benefits result when understanding is combined with measurements to generate useful information products

From presentation by Stephen Volz

NASA Earth Science Data Systems Evolution Needs

Define an approach to evolve what is working now into what we want to have in 2020 and beyond

Keep what works within the existing systems, and identify what must be changed

Consider how best to identify and involve the end user communities in the data system and product definition

Define a recommended approach for guiding the new missions' data system definition and development

Identify necessary actions and activities for the near term (0-2 years) that supports these developments

From presentation by Stephen Volz

Community: MEaSUREs
Making Earth System data records for Use in Research Environments

- Overall objective of MEaSUREs is to select projects to provide Earth science data products and services driven by NASA's Earth science goals and contributing to advancing Earth system "missions to measurements" concept.
- For creating these basic records, a science measurement focus brings together expertise in multiple instrument characterization and calibration, data processing, science-based product generation and distribution, science tools, and interactive relationships with the broader science community.
- MEaSUREs may also solicit infusion or deployment of applicable science tools that contribute to data product quality improvement, consistency, merging or fusion, or understanding.
- Initial MEaSUREs solicitation focused on the creation of Earth System Data Records (ESDRs), including Climate Data Records. An ESDR is defined as a unified and coherent set of observations of a given parameter of the Earth system, which is optimized to meet specific requirements in addressing science questions.

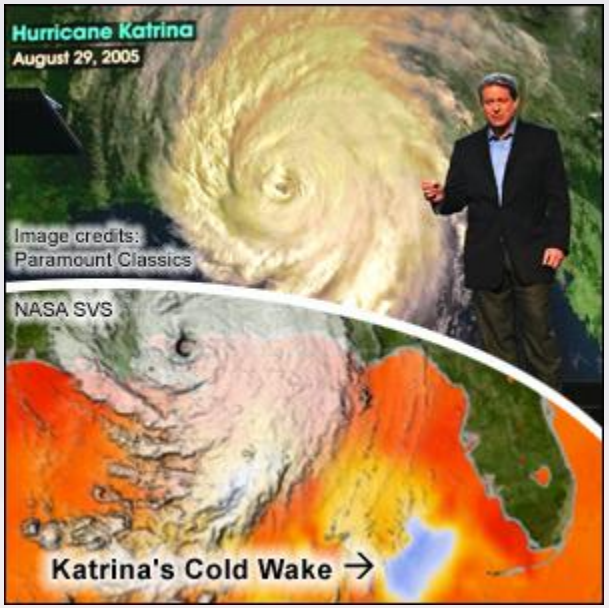
DISCOVER

Distributed Information Services: Climate and Ocean products and Visualizations for Earth Research

DISCOVER Satellite Data Disagrees with Model-predicted Rain Changes

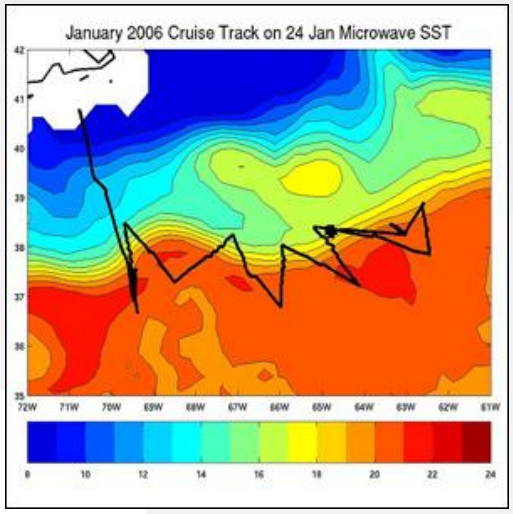
The 20-year microwave satellite record of water vapor, evaporation, and precipitation is higher than the model predicted increase (6% vs. 2%). Modelers are re-examining the impact on global warming predictions.

DISCOVER Sea Surface Temperatures Help to Deliver the Message in *An Inconvenient Truth*



DISCOVER's passive microwave- derived SSTs identify ocean areas of high heat content that are crucial for the formation of hurricanes. Conversely, cold water upwelling in the wake of Hurricane Katrina identifies areas where hurricane formation and intensification are suppressed.

NSF-funded Project Relies on DISCOVER Sea Surface Temperatures



Ship track across SST gradient during CLIMODE cruise 24 Jan 2006

Identifying Gulf Stream sea surface temperature frontal boundaries is important to better understand air-sea interactions, which improves climate models. DISCOVER SSTs and ocean surface winds aided scientists in deploying instrumentation across ocean boundaries during CLIMODE experiment cruises.

Community: ACCESS
Advancing Collaborative Connections for Earth System Science

The objective of NASA's Advancing Collaborative Connections for Earth System Science (ACCESS) program is to enhance and improve existing components of the distributed and heterogeneous data and information systems infrastructure that support NASA's Earth science research goals. The Program also seeks to:

- … increase the interconnectedness and reuse of key information technology software and services in use across the broad spectrum of Earth system science investigations.
- … enable the freer movement of data and information within a distributed environment of providers and users, and the exploitation of needed tools and services to aid in measurable improvements of Earth science data access and data usability.

A 2007 call resulted in 30 proposals of which 10 were selected for funding (~3.5M/year).

A 2009 call resulted in 35 proposals which are now being reviewed.

NASA's Earth Science Open Data Policy

To better meet the challenges of understanding the the Earth system and improving the prediction of Earth system change, NASA promotes the full and open sharing of all NASA data with the research and applications communities, private industry, academia, and the general public.

- NASA provides open access to data with no period of exclusive access.
- Most of the data are provided at no charge to the user except in cases impacted by international agreements.
- NASA actively encourages a free and open data policy with other international organizations.
- NASA is a participant and contributor to the Inter-agency Working Group on Digital Data (IWGDD). The IWGDD was formed under the auspices of the National Science and Technology Council's Committee on Science. The Group was charged with …

> *".. creating a strategic plan for the Federal government to foster the development of a framework for reliable preservation and effective access to digital scientific data."*
>
> - Harnessing the Power of Digital Data for Science and Society, Jan 2009