USGS
science for a changing world

Facing Tomorrow's Challenges

Applied Sciences for Societal Benefit
USGS's Global Change Program

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U.S. Geological Survey

Climate Change and A National Hazards, Risk, and Resilience Assessment Program

Key Needs for The Utilization of Modeling as a Decision-Support Tool:

- Improved forecasting capability based on understanding physical processes and changes to social infrastructure
  - Immediate DOI needs include region-scale model projections for resource management and decision making based on appropriately calibrated and validated input and output data
  - Quantification and communication of the uncertainties in the physical and social science datasets and model projections and the impacts on decision making
- Enhancing and developing new partnerships to form a coordinated hazard and risk assessment program for decision makers

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Climate Variability and Change

Clarifying the Record and Assessing the Consequences

Key Needs for Effective Use of Modeling as a Tool for Decision Support:

- **Integration of climate effects monitoring data with other Earth observations, appropriately calibrated and validated!!**
- **Integration of multidisciplinary Earth-science research results from within and from outside the USGS**
- **Coupled *regional-scale* climate-change model codes with socio-economic models for robust, dynamic, scenario analyses for decision making. It is ESSENTIAL that all data associated with these processes are rigorously calibrated and validated!**

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Example of Data Needs: Three Different Approaches for Obtaining Average Temperature Changes in Climate Science and Applications

- **University of East Anglia – UK**
  - **Utilizes the "Climate Anomaly Method": comparison of temperature anomaly observed for a given year compared to 30-year base period**
- **NASA – Goddard Institute of Space Studies**
  - **Utilizes the "Reference Station Method": calculates an average on small grids developed from a network of about 6000 stations, the longest term record in each grid is dubbed the "reference station" for that grid and is the "gold" standard for modeling the grid**
- **NOAA**
  - **In the 1990s started the "First Difference Method": calculates the temperature change from one year to the next at each of about 7200 stations (in 2006 NOAA adopted a more statistically rigorous method, especially for data-sparse areas)**

These are the leading methods used for all global climate modeling data. None of the methods are valid without calibrated and validated checks of observational data used for inputs.

Potential Partners for USGS in Science Applications

New Directions for the USGS Global Change Program

- **NASA's Goddard Institute of Space Studies, New York, NY**
  - **Mission: Investigate the Interactions of Climate (both Variability and Change) on Systems and Sectors Important to Human Well-Being**

- **NOAA's Regional Integrated Sciences and Assessments (RISA)**
  - **Mission: The RISA program supports research that addresses complex Climate Sensitive Issues of Concern to Decision Makers Such as Fisheries, Water, Drought, Wildfire, and Public Health**
- **Proposed Regional Climate Science Centers for the U.S. Department of the Interior**
- **U.S. EPA – Watershed-scale model projections and impacts on water resources**
- **U.S. DOE – impacts to the nations' energy resources**
- **USDA – impacts to agriculture and water**

- **International Partnerships are also Essential for Success**

  GEO/CEOS/GCOS are Extremely Important to a Global Understanding and Communication of Uncertainty and the Impact on Decision Support

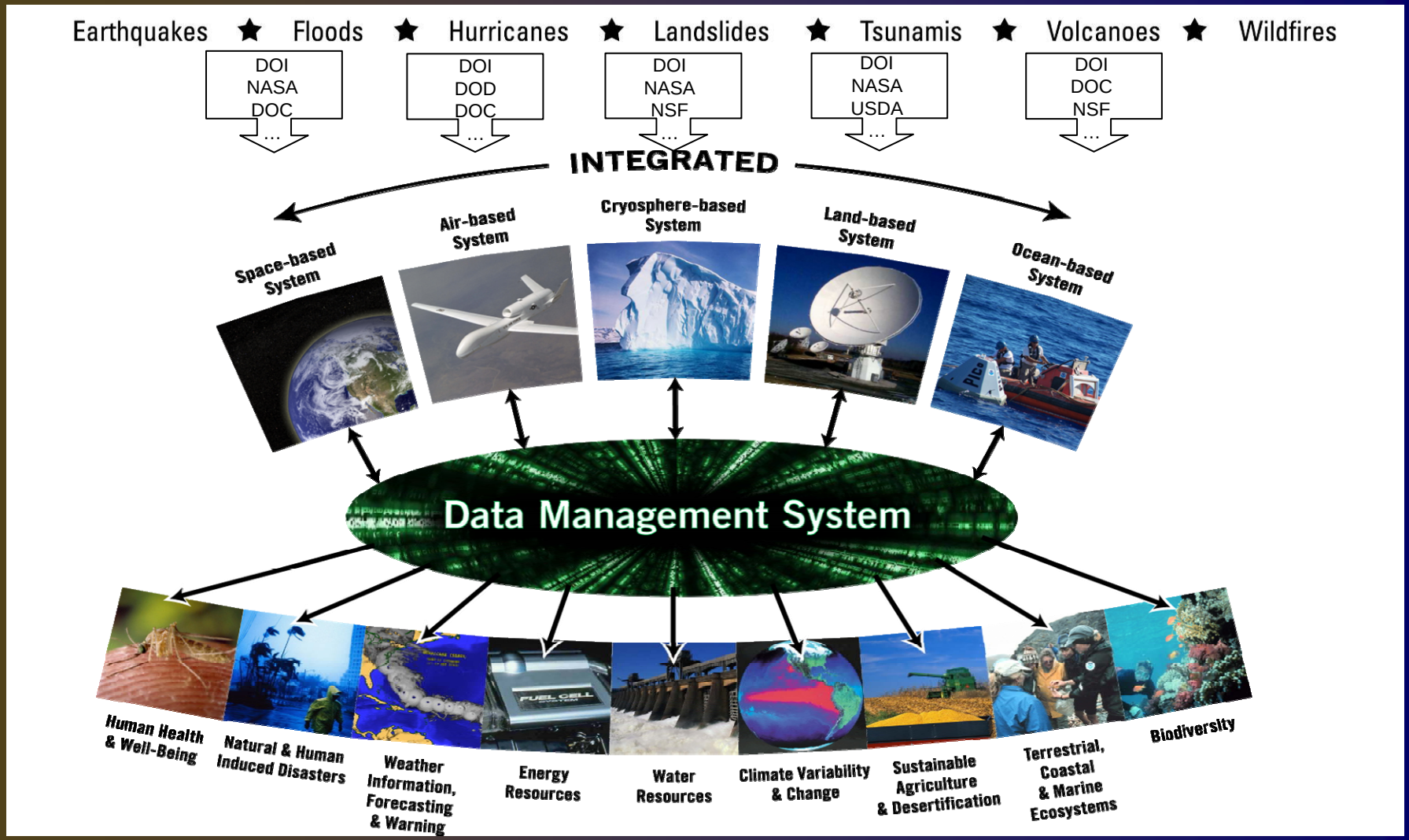
Greg’s Back up

U.S. Leadership on GEOSS

"Population growth, resource development, natural disasters and climate change are having significant impacts on the Earth's surface. The use of remote sensing satellites to monitor these developments more effectively and sustainably will play a critical role in shaping our national as well as international response plans."

Secretary of Interior, Dirk Kempthorne, 14 August 2007

NLIP supports GEO space, air, and land societal benefit needs



DOI Secretary Kempthorne @ GEO Summit

U.S. address to the gathered nations on 11/30/2007.

Secretary Kempthorne and USGS Director, Mark Meyers participating in a GEO session.

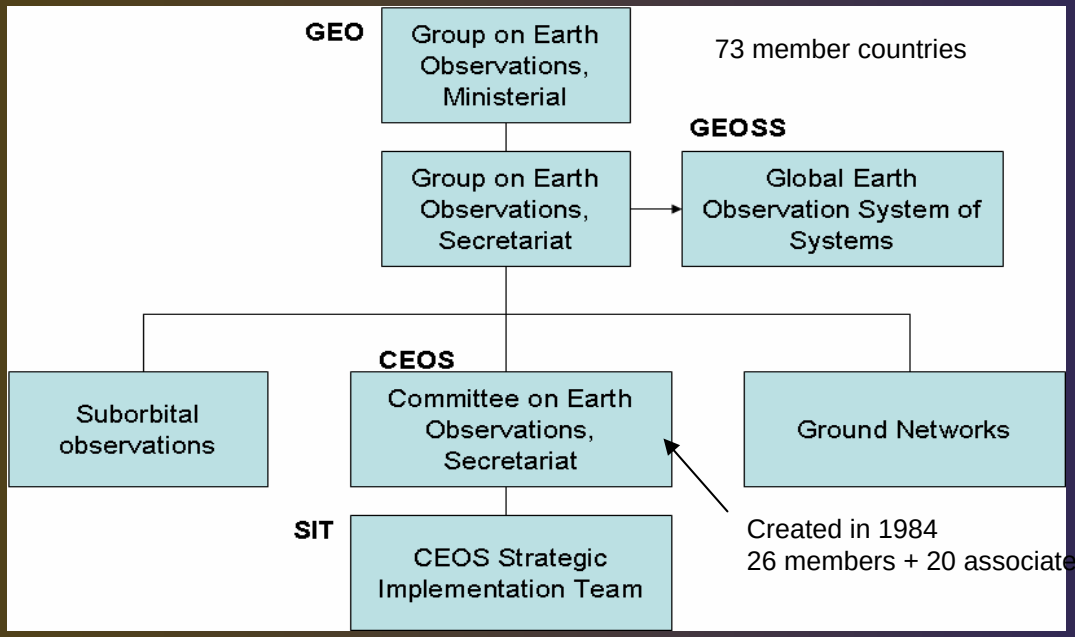
"The global partnership we call GEO is a mechanism for each of us to provide what is needed by the others."

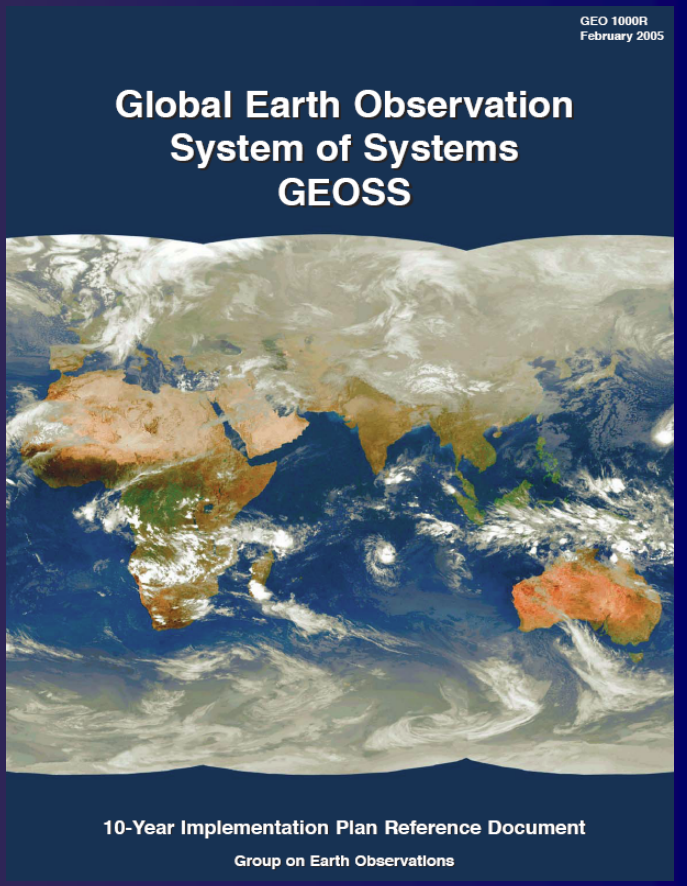
"And under US GEO leadership, this year the United States committed itself to continuing to provide Landsat-type imagery of the globe for the benefit of the US and the world."

"If we are to make real advances in each of the social benefit areas of GEO we must share data, information and knowledge across national, cultural and language barriers. We must achieve global data compatibility. We must embrace the idea of science without borders."

"The United States reaffirms its commitment to the Group on Earth Observations. We are committed to the advancement of Earth observation to address global economic, environmental and social issues."

CEOS Constellations to meet GEO objectives





- **CEOS constellation studies to support technical and scientific cooperation and collaboration among space agencies that meet GEO objectives and support national priorities.**
  - **Atmospheric Composition (NASA)**
  - **Precipitation (NASA/JAXA)**
  - **Ocean Surface Topography (NOAA/EUMETSAT)**
  - **Land Surface Imaging (USGS)**

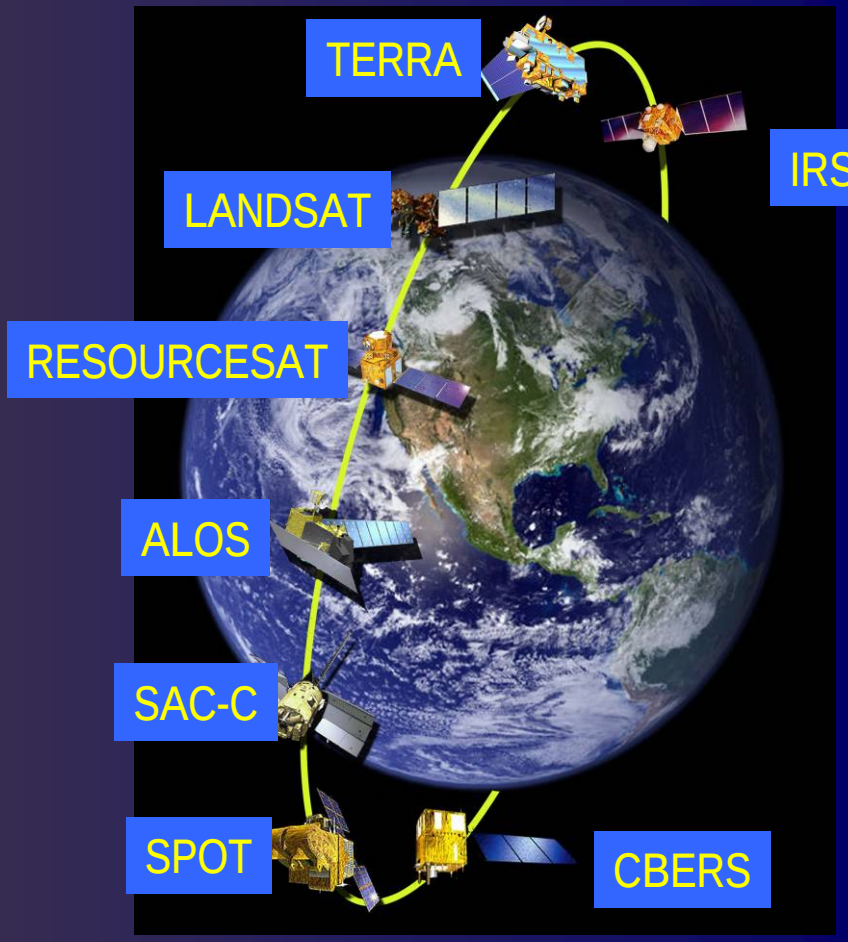
Land Surface Imaging Constellation

- **Formal Agreement** among CEOS agencies, to ***more formally coordinate operation*** of assets with goals to:
  - Harmonize data policy,
  - Coordinate ground system assets, and
  - Provide coordinated acquisition and data management.

- Create a suite of **constellation standards** for <u>moderate-resolution</u> land surface imaging that can guide development of future systems.

- **Provide data** for development of a key *Climate Data Record*.

- Provide potential **recommendations & guidelines** to GEO for GEOSS policy.



NEON Test Sites

- The National Ecological Observation Network
- Continental-scale research platform for discovering and understanding the ecological principles that govern the responses of the large-scale biosphere, and feedbacks within the geosphere, hydrosphere, and atmosphere.
- The mission is to provide the capacity to forecast future states of ecological systems for the advancement of science and the benefit of society.
- The Observatory's network will collect ecological data necessary to develop the scientific understanding and theory necessary to manage the Nation's grand ecological challenges.
- http://www.neoninc.org/
- 20 regional test sites

NEON Requirements for Spaceborne Data

- NEON will rely on USGS, NOAA, NASA for space-based image data
- Coordination between Agencies
  - Multiple sources of data (in-situ, airborne, satellite) used to create “Earth Science Data Records” (EDSRs)
  - Which requirements may fall in between agency responsibilities?
- Opportunity to exercise “cyber infrastructure” required to operate synchronized, multiple source data streams