

The background of the slide is a light blue gradient with a faint grid pattern. On the left side, there is a large, semi-transparent image of the Earth, showing the continents of North and South America in a light blue/white color against the darker blue of the oceans.

USGS Land Remote Sensing: Overview

*2004 High Spatial Resolution Commercial Imagery Workshop
USGS Headquarters, Reston, VA
Nov 8-10, 2004*

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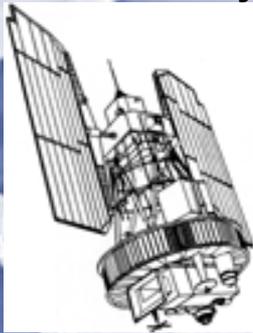
Satellite Remote Sensing at DOI

1966 - Initiated Earth Resources Observation Systems program

“...the time is now right and urgent to apply space technology towards the solution of many pressing natural resource problems being compounded by population and industrial growth.”

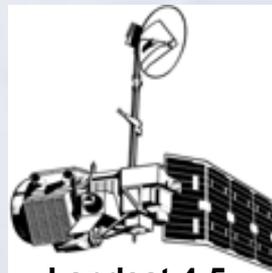
-- Secretary of the Interior

Stewart L. Udall (1966)



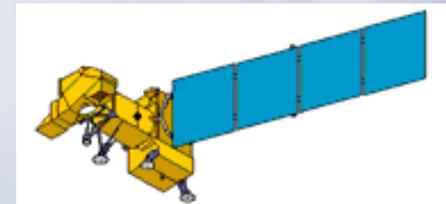
Landsat 1-3

Multi-Spectral Scanner (MSS) 79 meter
Return Beam Vidicon (RBV) 80/40 meter



Landsat 4-5

Multi-Spectral Scanner (MSS) 79 meter
Thematic Mapper (TM) 30 meter



Landsat 7

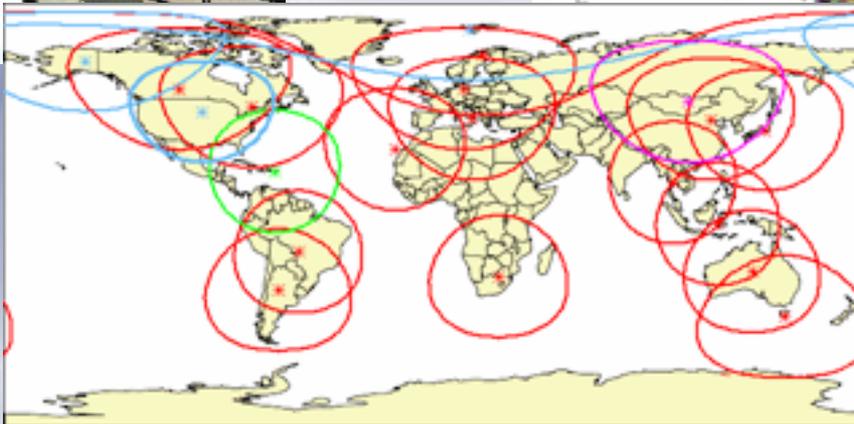
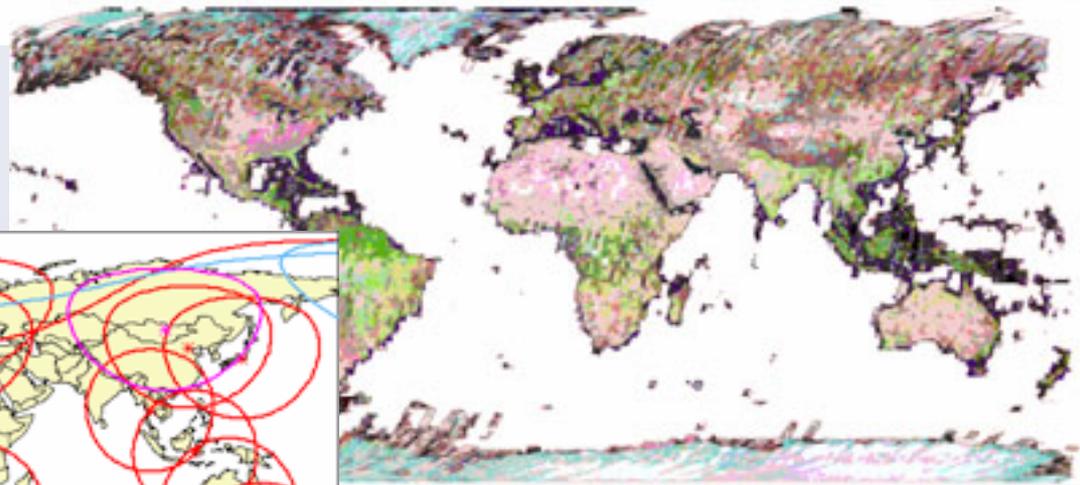
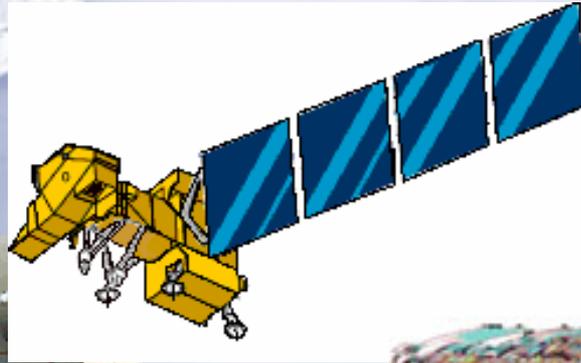
Enhanced Thematic Mapper Plus (ETM+)
30/15 meter

2004 - Manages (“owns and operates”) Landsats 5 & 7
archives earth observation data from 6 operational satellites

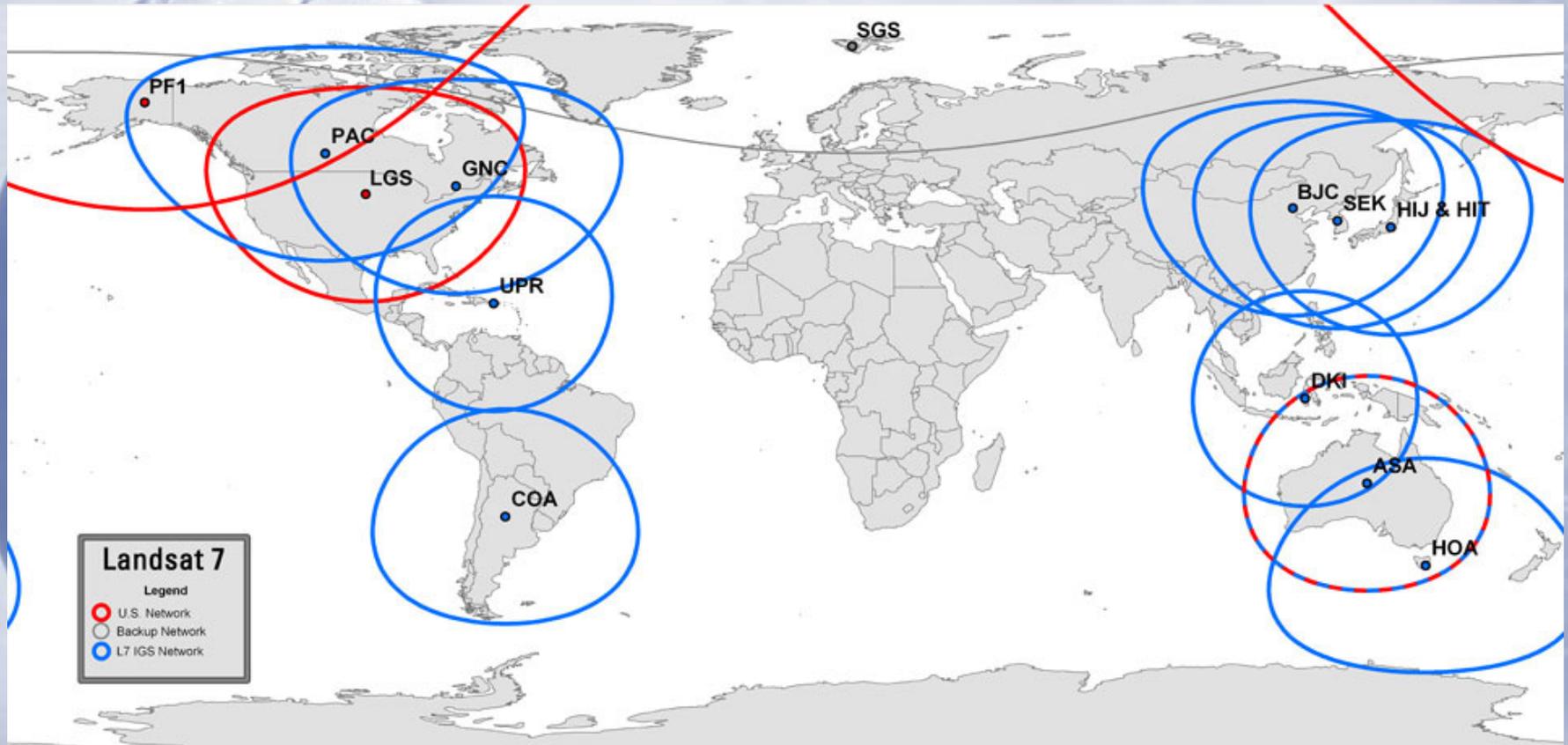
Components

- ✧ Satellite Mission Operations
 - ✧ Landsat 5 / Landsat 7
- ✧ Long-term Data Preservation and Access
 - ✧ NSLRSDA
 - ✧ Landsat Mission Archive
- ✧ Remote Sensing Research and Data Utilization
 - ✧ Education and Outreach
 - ✧ Investigations, Research and Applications

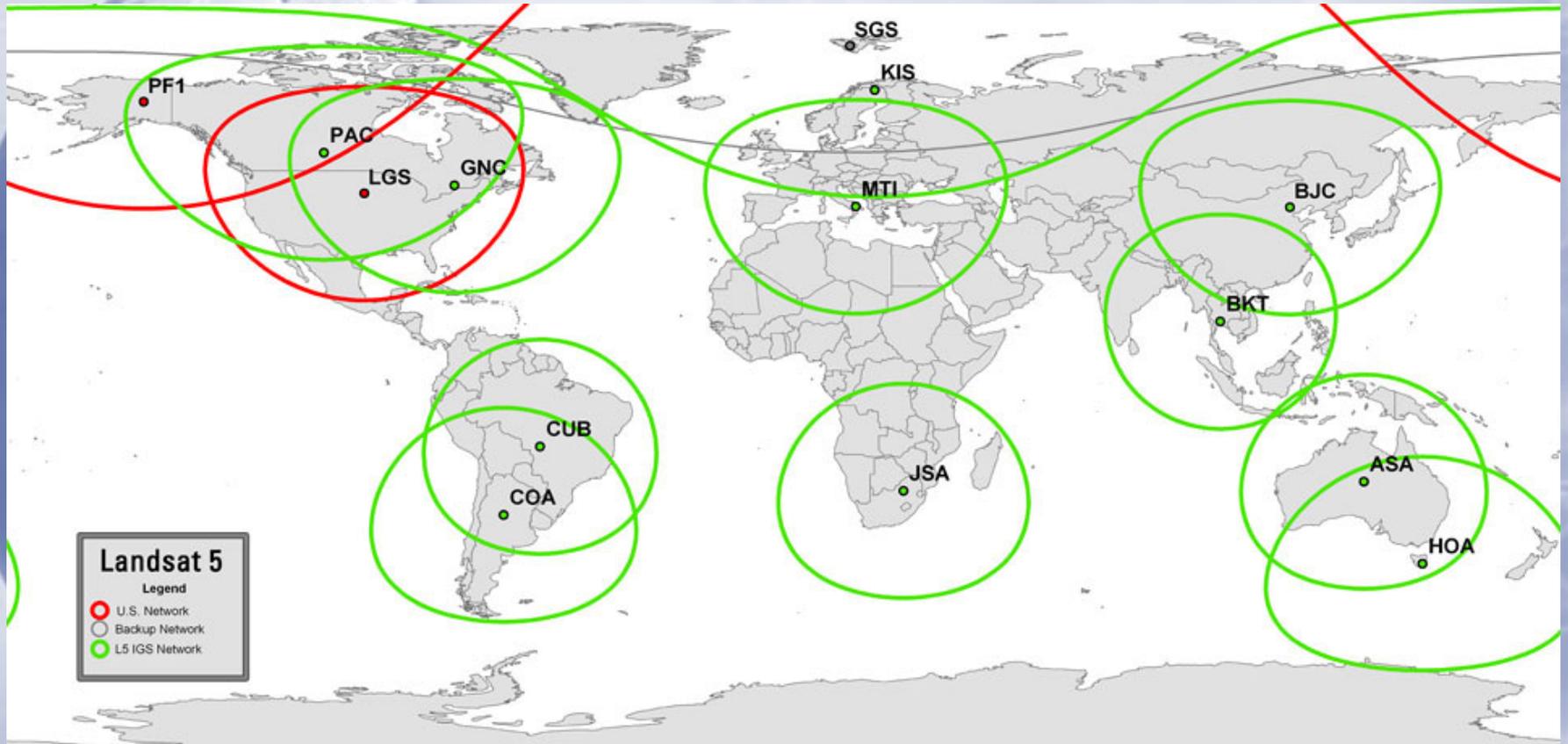
Satellite Mission Operations



Landsat 7 International Network



Landsat 5 International Network



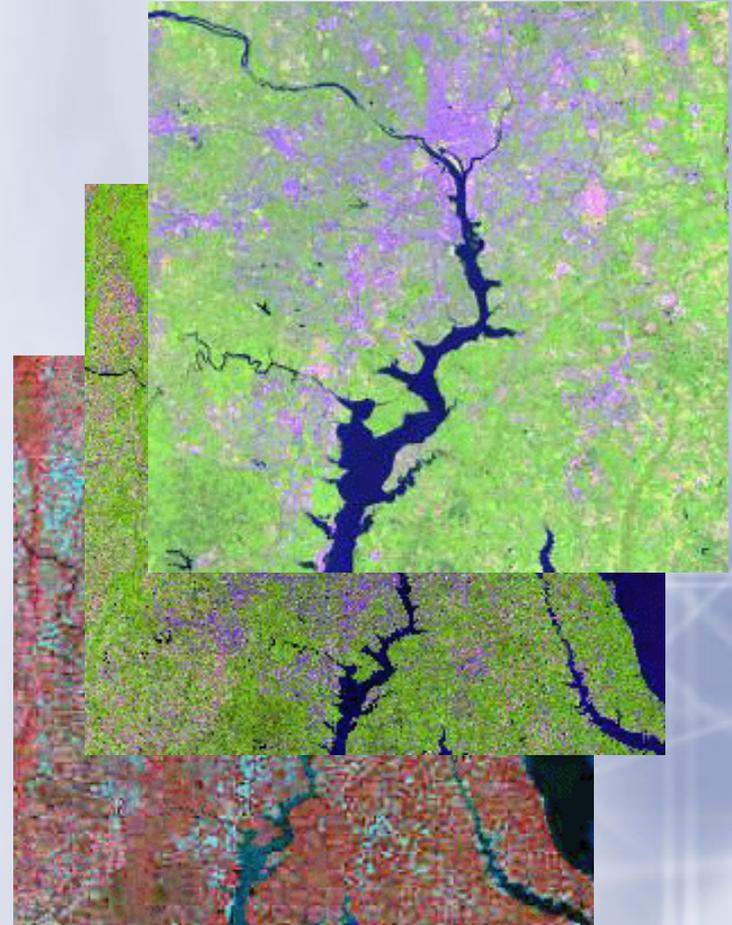
Projected Satellite Lifetimes

- ✧ Landsat 5 projected end of life 2009, based on remaining orbit-positioning fuel: launched 1984; three-year design life
 - ✧ Direct downlink mode only (partial global coverage)
 - ✧ Ten foreign ground stations back on line since Landsat 7 malfunction
 - ✧ Some subsystems running on back-up components
- ✧ Landsat 7 projected end of life 2010, based on remaining orbit-positioning fuel: launched April 1999; five-year design life
 - ✧ Sensor scan-line corrector inoperable due to malfunction; 75% of pixels intact
 - ✧ One of three gyros failed; satellite can operate on two
 - ✧ Other subsystems still operating nominally; global data collection
 - ✧ New fill-in products available
 - ✧ Landsat 7 data still worthwhile for some users, of limited use for others

Data Archive – 32 Years and Counting

- ✧ ETM+: Landsat 7
 - ✧ 370,000+ scenes
 - ✧ 490TB data in archive (RCC and L0Ra)
 - ✧ Archive grows by 300GB Daily
- ✧ TM: Landsat 4 & Landsat 5
 - ✧ 577,000+ scenes
 - ✧ Approximately 144TB of data in archive
- ✧ MSS: Landsat 1 through 5
 - ✧ 631,178 scenes
 - ✧ Approximately 19TB of data in archive

(As of December 2003)



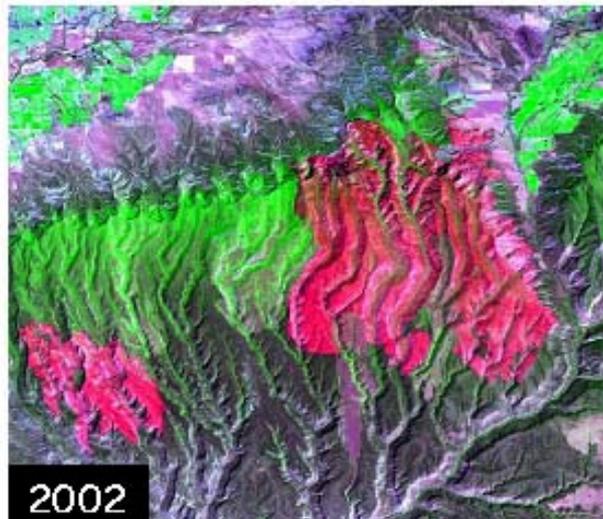
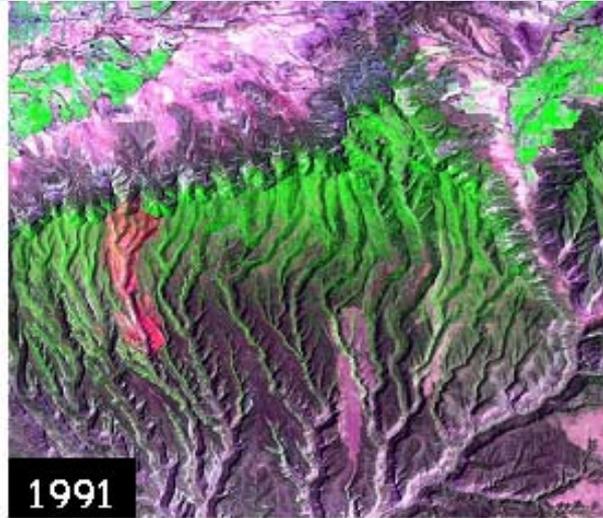
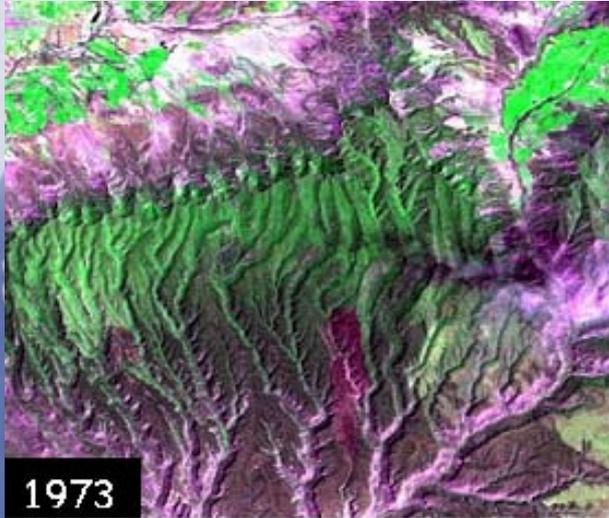
Urban Growth: Las Vegas



This Landsat image shows Las Vegas in 1973 (population 358,400). Purple areas represent roads and other urban infrastructure.

By 2000, Las Vegas (population 1,563,280) had sprawled in almost all directions, especially in the Northeast and southeast.

Wildfire: Warning, Analysis and Monitoring



A history of fires
over the last three decades

Mesa Verde National Park,
Colorado

Research and Applications

- ✧ Funds scientists and technicians in 5 major centers
 - ✧ Understand and characterize new sensors
 - ✧ Develop new applications and understanding of remotely sensed data
 - ✧ Help DOI agencies use remotely sensed information



Multiple Data Sources

- ✧ National Civil Applications Program (NCAP)

- ✧ Civil access to National Technical Means data

- ✧ Hazard / Emergency Response

- ✧ Homeland Security Support

- ✧ Technology Investigations

- ✧ Commercial Imagery

- ✧ Commercial Remote Sensing Space Policy

- ✧ Calibration/Validation

- ✧ Future Missions

- ✧ Landsat Data Continuity

US Commercial Remote Sensing Space Policy

- ✧ Policy signed by President Bush on April 25, 2003
- ✧ Policy Goal:
 - ✧ Advance and protect US national security and foreign policy interests by:
 - ✧ Maintaining the Nation's leadership in remote sensing space activities
 - ✧ Sustaining and enhancing the US remote sensing industry
- ✧ Synopsis of Policy directive to US Government:
 - ✧ Rely to the maximum practical extent on US commercial remote sensing space capabilities
 - ✧ Focus Government systems on needs that are practically met commercially
 - ✧ Develop long-term sustainable relationship with industry
 - ✧ Provide timely/responsive environment for licensing operations of commercial remote sensing space systems
 - ✧ Enable US industry to compete with foreign providers

Link to CRSSP fact sheet at - <http://crssp.usgs.gov/>

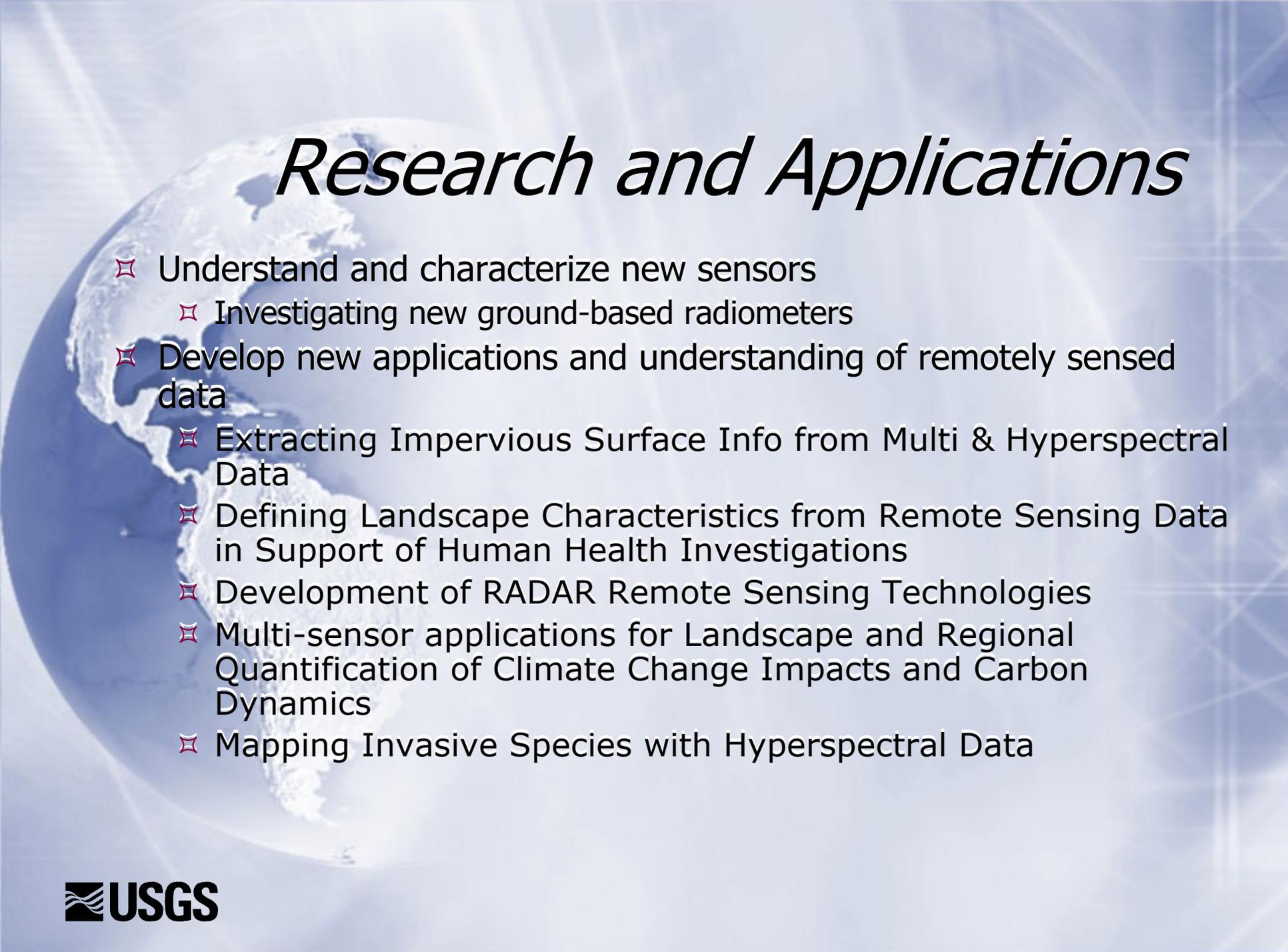
JACIE

✧ Supports CRSSP

- ✧ Increases confidence in U.S. commercial sources in the marketplace
- ✧ Showcases successful applications
- ✧ Provides a model of government/industry cooperation

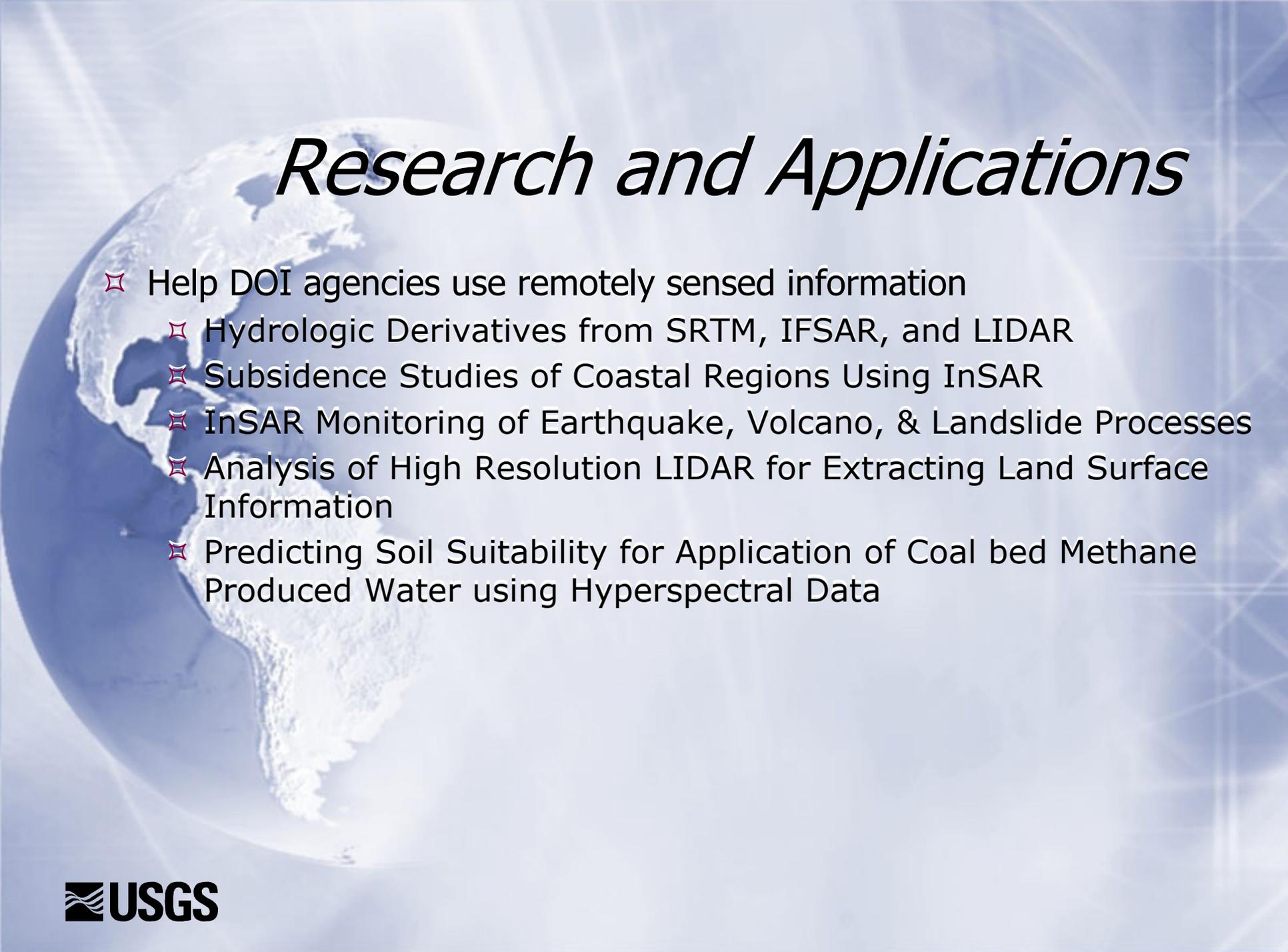
JACIE Future

- ✧ Broaden scope to include all commercial sensors:
 - ✧ National or international
 - ✧ Aerial or satellite
 - ✧ Optical, lidar, ifsar, hyperspectral, etc
- ✧ Take advantage of CRSSP near-term requirements data to influence priorities
- ✧ Demonstrate relevance of JACIE to US role in terrestrial monitoring
- ✧ Prepare for the next-generation of higher-resolution US commercial satellites
- ✧ Consider applications focus, e.g., hazards/risk mgt.
- ✧ Publish results



Research and Applications

- ✧ Understand and characterize new sensors
 - ✧ Investigating new ground-based radiometers
- ✧ Develop new applications and understanding of remotely sensed data
 - ✧ Extracting Impervious Surface Info from Multi & Hyperspectral Data
 - ✧ Defining Landscape Characteristics from Remote Sensing Data in Support of Human Health Investigations
 - ✧ Development of RADAR Remote Sensing Technologies
 - ✧ Multi-sensor applications for Landscape and Regional Quantification of Climate Change Impacts and Carbon Dynamics
 - ✧ Mapping Invasive Species with Hyperspectral Data



Research and Applications

- ✧ Help DOI agencies use remotely sensed information
 - ✧ Hydrologic Derivatives from SRTM, IFSAR, and LIDAR
 - ✧ Subsidence Studies of Coastal Regions Using InSAR
 - ✧ InSAR Monitoring of Earthquake, Volcano, & Landslide Processes
 - ✧ Analysis of High Resolution LIDAR for Extracting Land Surface Information
 - ✧ Predicting Soil Suitability for Application of Coal bed Methane Produced Water using Hyperspectral Data



AmericaView

- ✧ Administration/Coordination/User Support
- ✧ Global Visualization
- ✧ MODIS Direct Broadcast Operations
- ✧ Education Support

Future Missions and Technology Investigations

- ✧ Define requirements for new sensors and missions
- ✧ Understand new processing and distribution technologies
- ✧ Develop prototype and testbed implementations

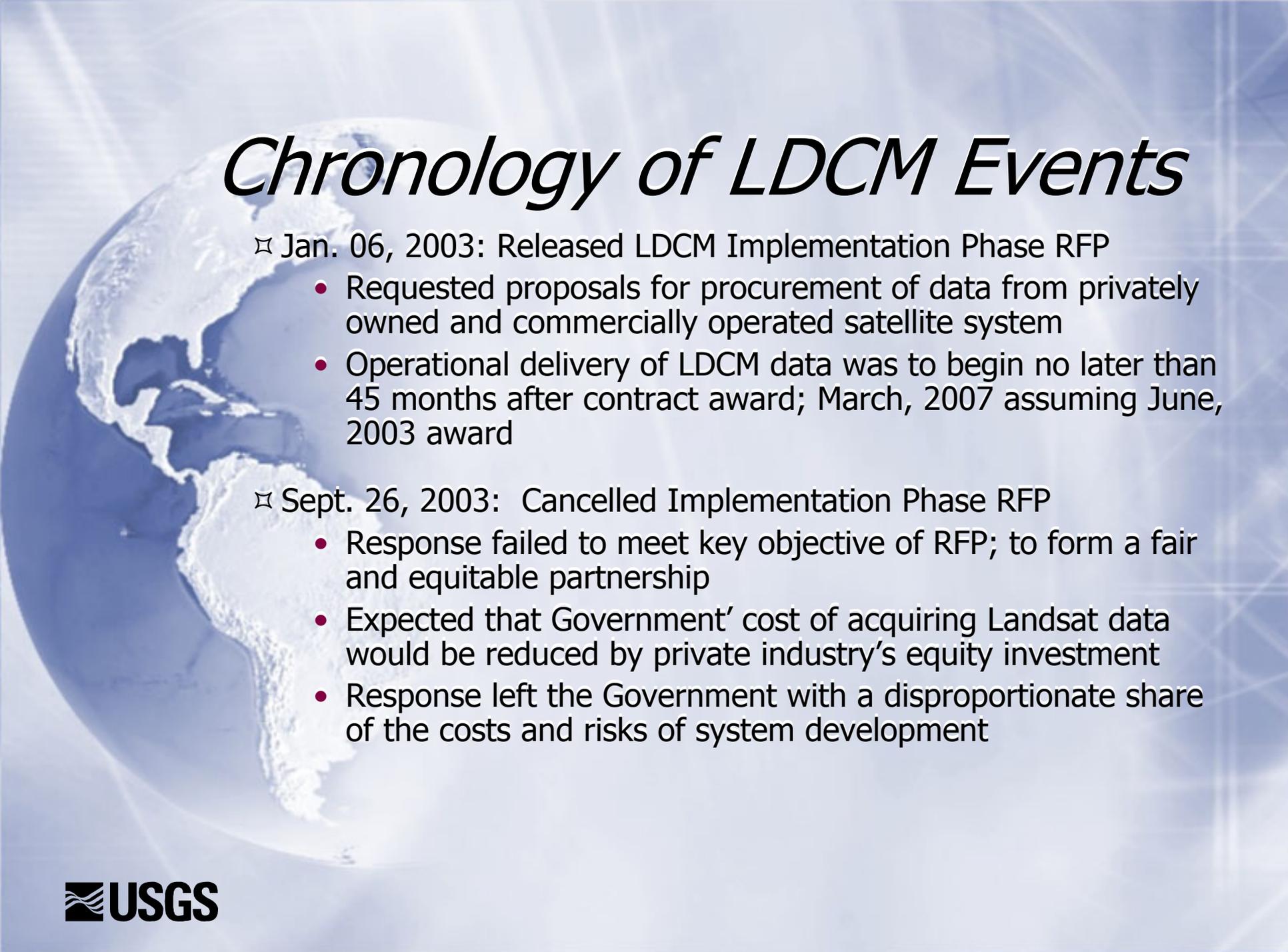
Landsat Data Continuity

- ✧ The Land Remote Sensing Policy Act of 1992 (P.L. 102-55) directed Landsat Program Management (now NASA & USGS) to assess options for a successor land remote sensing system to Landsat 7 including:
 - 1. Private sector funding and management**
 - 2. Establishing an international consortium**
 - 3. Funding and management by the United States Government**
 - 4. A cooperative effort between the United States Government and the private sector**

- ✧ “Preference should be given to the development of such as system by the private sector”

Chronology of LDCM Events

- ✧ July 09, 1999: Released RFI for procurement of Landsat-like data
 - Respondents did not believe Landsat 30m data was commercially viable
 - Favored contractor owned and operated systems, but were willing to consider innovative procurement options
- ✧ Nov.06, 2000: Posted first draft of LDCM Data Specification on Internet for public review and comment
- ✧ Jan. 09 - 10, 2001: LDCM Workshop at USGS HQ, Reston, VA
- ✧ April 26, 2001: LDCM Workshop at ASPRS Spring Meeting, St. Louis, MO
- ✧ Nov. 01, 2001: Released LDCM Formulation Phase RFP
 - Called for the formulation of preliminary system designs
- ✧ March 15, 2002: Awarded two \$5M Formulation Phase contracts
 - Resource 21 of Englewood, CO
 - DigitalGlobe of Longmont, CO
 - Formulation culminated with preliminary design reviews in Nov., 2002



Chronology of LDCM Events

- ✧ Jan. 06, 2003: Released LDCM Implementation Phase RFP
 - Requested proposals for procurement of data from privately owned and commercially operated satellite system
 - Operational delivery of LDCM data was to begin no later than 45 months after contract award; March, 2007 assuming June, 2003 award

- ✧ Sept. 26, 2003: Cancelled Implementation Phase RFP
 - Response failed to meet key objective of RFP; to form a fair and equitable partnership
 - Expected that Government' cost of acquiring Landsat data would be reduced by private industry's equity investment
 - Response left the Government with a disproportionate share of the costs and risks of system development

Chronology of LDCM Events

- ✧ Sept. 27, 2003 - August 12, 2004: Interagency Working Group
 - ✧ Sponsored by White House
 - ✧ Charged with finding a “way forward”

- ✧ August 13, 2004: Landsat Data Continuity Strategy
 - ✧ Landsat as national priority
 - ✧ Direction to “operationalize” Landsat
 - ✧ Migration to NPOESS platform
 - ✧ Investigate “gap-filler” mission
 - ✧ Request For Information

- ✧ September 8, 2004: Federal Users Roundtable
 - ✧ Agencies uses of Landsat
 - ✧ Consequences of a gap in data continuity

- ✧ September 17, 2004: Questionnaire released to non-Feds
 - ✧ This and previous input will influence decision on “gap-filler” mission

OSTP Questions

- ✧ 1. Please tell us about you and your organization.
- ✧ 2. Briefly summarize how Landsat 5 and/or Landsat 7 image data are used in your institution or company.
- ✧ 3. Are you able to use the degraded Landsat 7 data or current Landsat 5 data for your purposes, or is your mission compromised by the problems with Landsat 7?
- ✧ 4. What are your alternate data sources to meet your mission needs? What technical compromise is required? What is the cost differential? Could the alternate data sources satisfy your mission requirements for the long term?
- ✧ 5. If there is a gap in acquisition of Landsat data, how would such a gap affect your programs and mission?
- ✧ 6. How important is the cost of Landsat data to your programs? If Landsat data were free, would your institution/company use significantly more data to enhance your mission?
- ✧ 7. Would your programs use (or prefer) 10m resolution multispectral data if it were available at comparable cost?
- ✧ 8. What is the primary source of funding for your work that includes Landsat data?
- ✧ 9. Do you have other concerns about Landsat continuity that are not addressed by the previous questions?