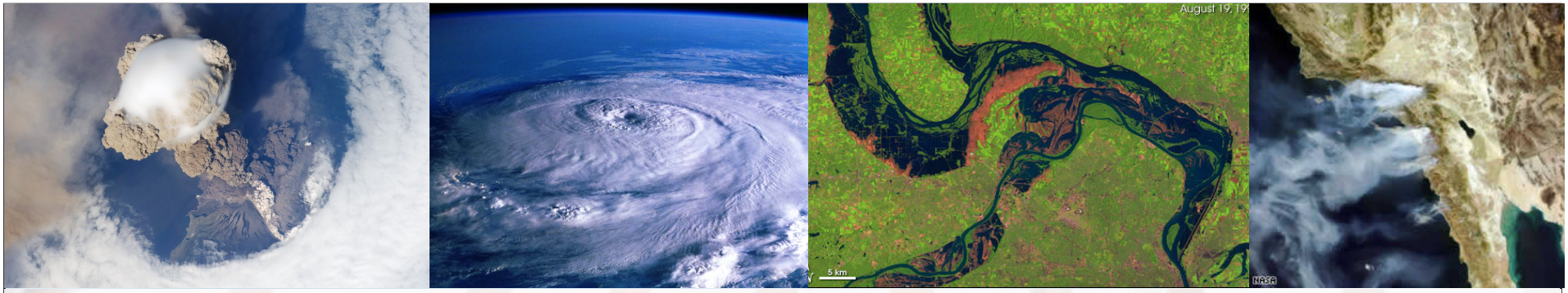


NASA Role Toward Increasing National Resilience to Natural Hazards and Disasters

Craig Dobson

NASA HQ

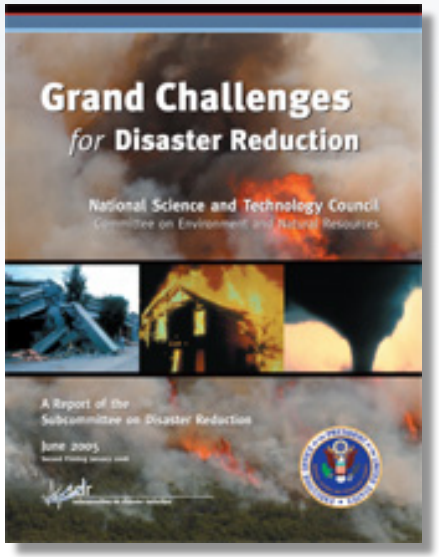
Resilience to Hazards and Disaster

- Defn. – ability to recover quickly from misfortune or change
- Resilience to hazards and disaster results in less loss of life and property during an event and a faster and less costly recovery
- Resilience requires attention to the full hazard management cycle:
  - Understanding of hazards
  - Hazard and vulnerability assessment
  - Forecast and warning
  - Response
  - Recovery
  - Mitigation

Natural Hazards and Disasters Focus

NASA basic and applied research programs and observations support the White House Office of Science and Technology Policy (OSTP) Committee on Environment and Natural Resources (CENR) Subcommittee on Disaster Reduction (SDR)

- **Six Grand Challenges:**



1. **Provide hazard and disaster information where and when it is needed**
2. **Understand the natural processes that produce hazards**
3. **Develop hazard mitigation strategies and technologies**
4. **Recognize and reduce vulnerability of interdependent critical infrastructure**
5. Assess disaster resilience using standard methods
6. Promote risk-wise behavior

NASA → Other Agencies

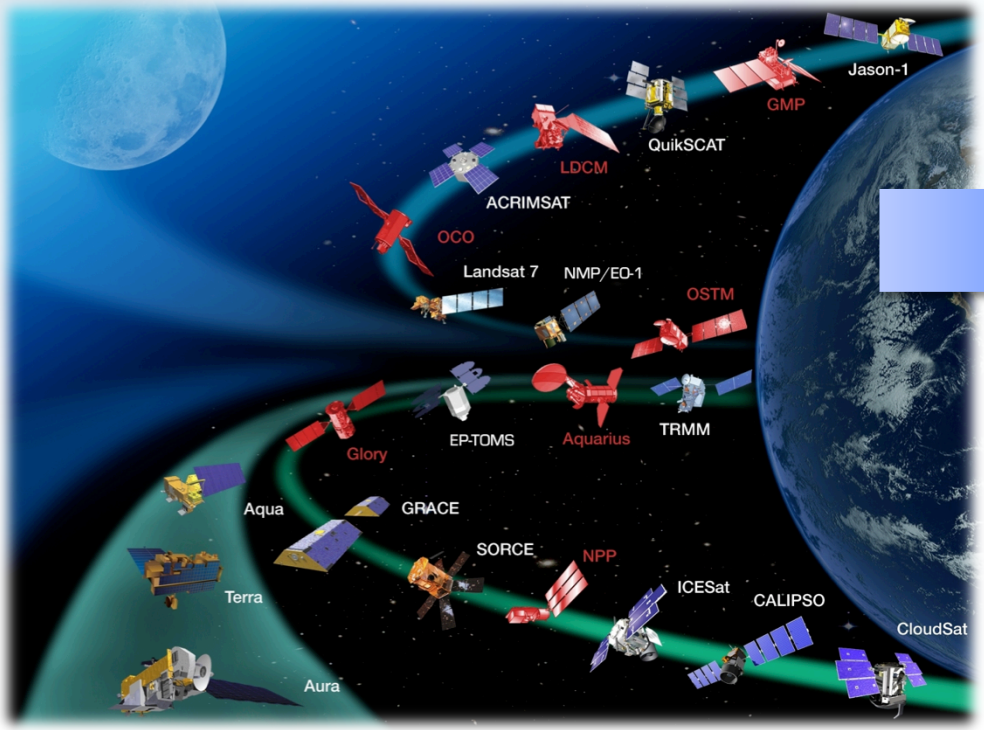
Natural Disasters
Objective and Contributions

To bring NASA capabilities in the area of spaceborne and airborne platforms and observations, higher level data products, and modeling and analysis to improve forecasting, mitigation, and response to natural disasters

- As an agency with spaceborne, airborne, and modeling and analysis capabilities, NASA contributes to:
  - ❶ **Provide hazard and disaster information where and when it is needed**
- As a research agency NASA contributes to:
  - ❷ **Understand the natural processes that produce hazards**
  - ❸ **Develop hazard mitigation** strategies and **technologies**
  - ❹ **Recognize** and reduce **vulnerability of interdependent critical infrastructure**

Natural Disasters Plan

- NASA began developing a natural disaster response plan in 2010
- Flow NASA observations to the end user, as appropriate
- Be responsive to natural disasters within the context of NASA's mission
- Understand and catalogue NASA capabilities and end users



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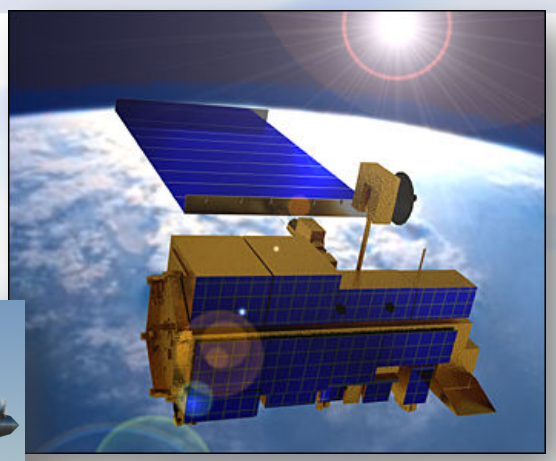
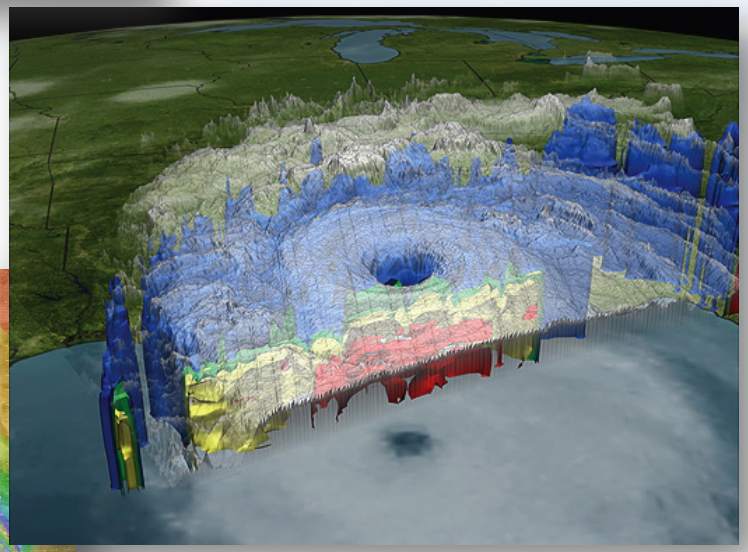
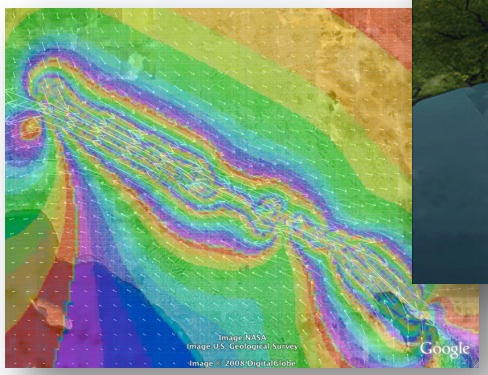
Catalogue NASA Capabilities for a Disaster Response Plan

- Spaceborne
  - Existing missions: MODIS, ASTER, Landsat, QuikSCAT, TRMM, EO-1, JASON…
  - Decadal Survey Missions: SMAP, DESDynI, HyspIRI
- Airborne Instruments
  - UAVSAR – Radar
  - LVIS – Lidar
  - AMS, MASTER – Thermal Infrared
  - HIWRAP, APR2, HAMSR, HIRAD, PALS MAPIR – Active and passive microwave
- Data processing and analysis
- Modeling and analysis







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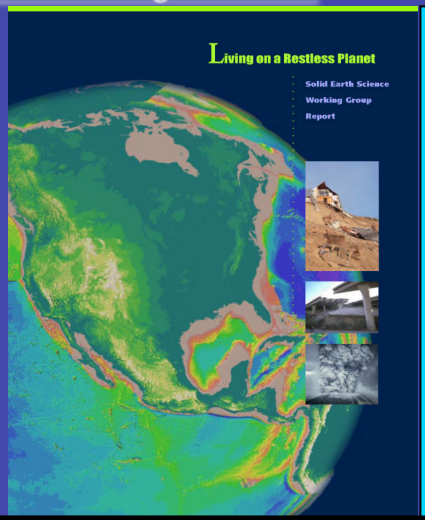
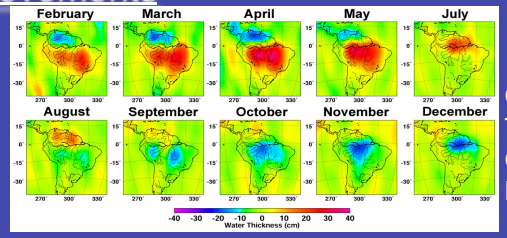
Earth Surface and Interior Focus Area

ESI Strategic Goals-



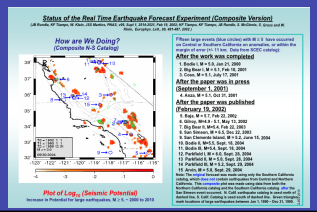
1. What is the nature of deformation at plate boundaries and what are the implications for earthquake hazards?
2. How do tectonics and climate interact to shape the Earth's surface and create natural hazards?
3. What are the interactions among ice masses, oceans, and the solid Earth and their implications for sea level change?
4. How do magmatic systems evolve and under what conditions do volcanoes erupt?
5. What are the dynamics of the mantle and crust and how does the Earth's surface respond?
6. What are the dynamics of the Earth's magnetic field and its interactions with the Earth system?

ESI Achievements

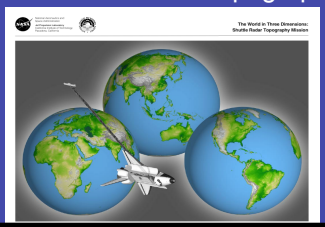


GRACE:1st Time Variable Gravity & Mass Flux

Earthquake Forecasting
13 of 14 Earthquakes



SRTM
1st Uniform Global Topography



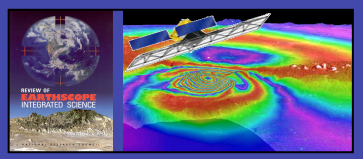
ESI Component Programs

Natural Hazards
Predictive Models
Remote Sensing
Natural Laboratories

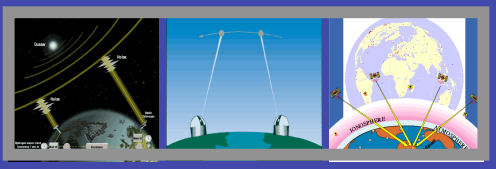
Space Geodesy
Celestial Ref Frame
Terrestrial Ref Frame
Earth Rotation
Crustal Dynamics

Planetary Interior
Geomagnetic Models
Gravity Models
Geodynamic Models

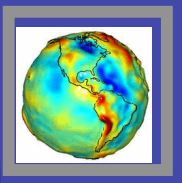
ESI Strategic Mission Priorities



1. Develop Geodetic Imaging
Approach: DESDynI, International Partners



2. Renew Global Geodetic Network
Approach: GGOS Partnerships



3. Expand Geopotential Field Exploration
Approach: GRACE-FO, International Partnerships, Technology Development, GRACE-II

Applied Sciences Program

Program Elements

Agricultural Efficiency

Air Quality

Climate

Natural Disasters

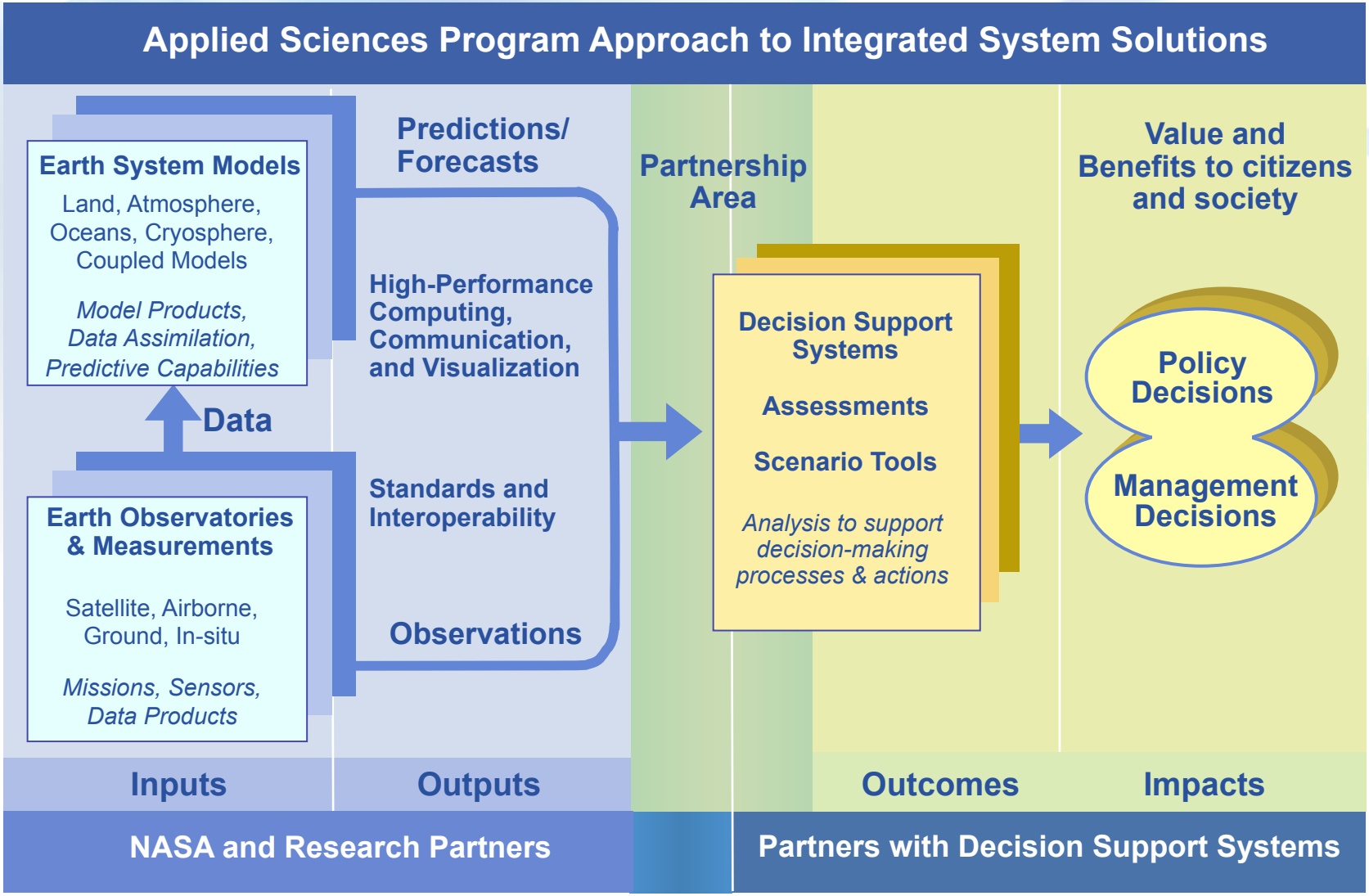
Ecological Forecasting

Public Health

Water Resources

Weather

Applied Sciences Program



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