



GROUP ON
EARTH OBSERVATIONS

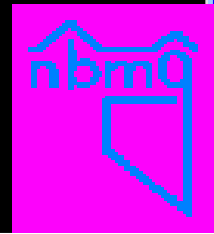
Developing the Global Geodetic Observing System Into a Monitoring System for the Global Water Cycle *A Project Review*

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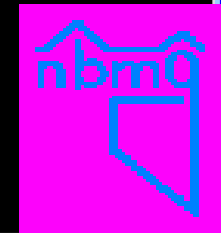
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Developing the Global Geodetic Observing System Into a Monitoring System for the Global Water Cycle *A Project Review*

- Review of Project Motivation, Objectives, Goals, and Approach
- Project Work Plan
- Achievements in 2008 and 2009
- Challenges
- Plan for 2010 to 2012



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Societal Motivation



■ Little or no water scarcity

■ Not estimated

■ Approaching physical water scarcity

■ Physical water scarcity

■ Economic water scarcity

Source: International Water Management Institute

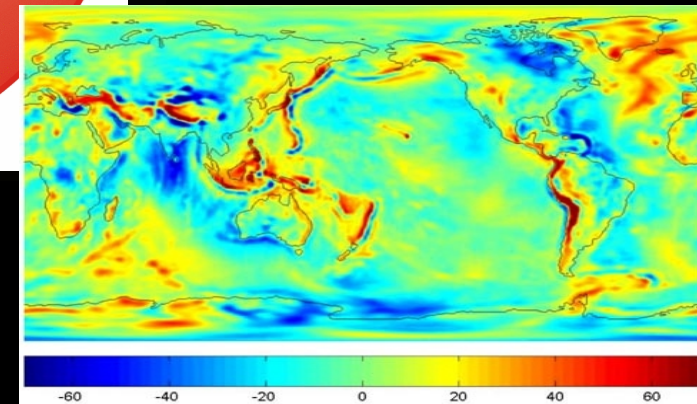
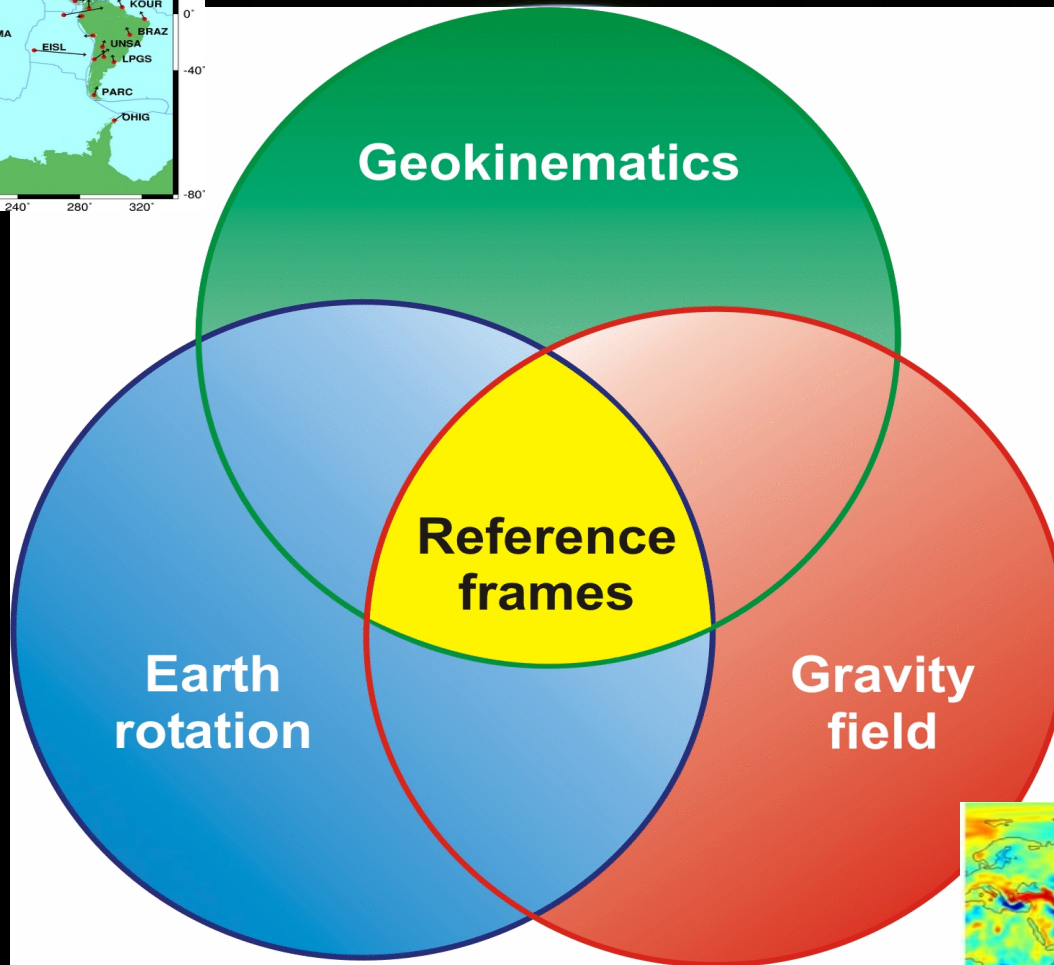
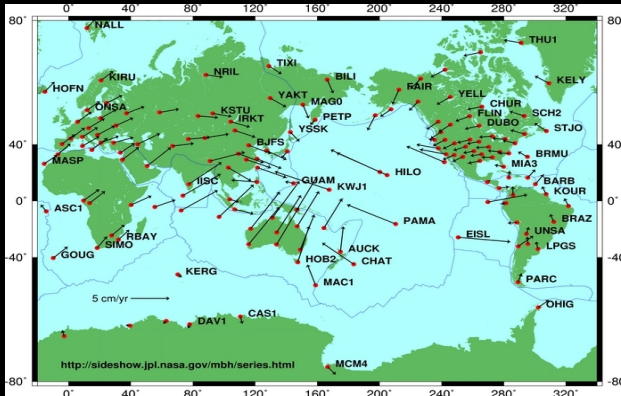
Science & Technology Motivation

The 'three pillars of geodesy':

- Earth's Shape (Geokinematics)
- Earth's Gravity Field
- Earth Rotation

Output:

Reference Frame
Observations of the Shape,
Gravitational Field and
Rotation of the Earth



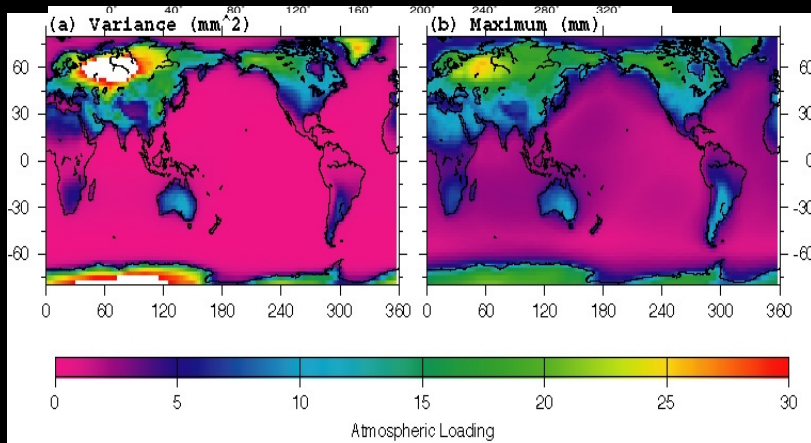
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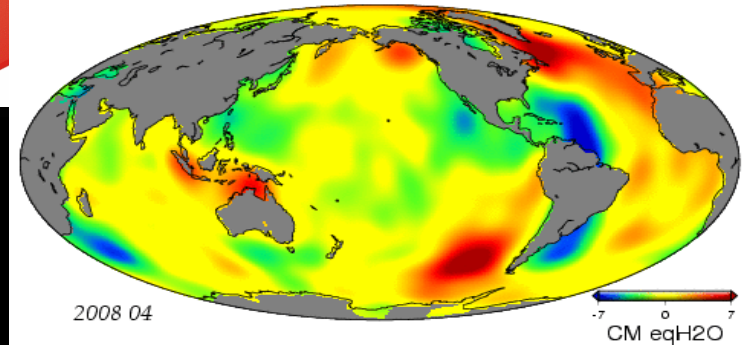
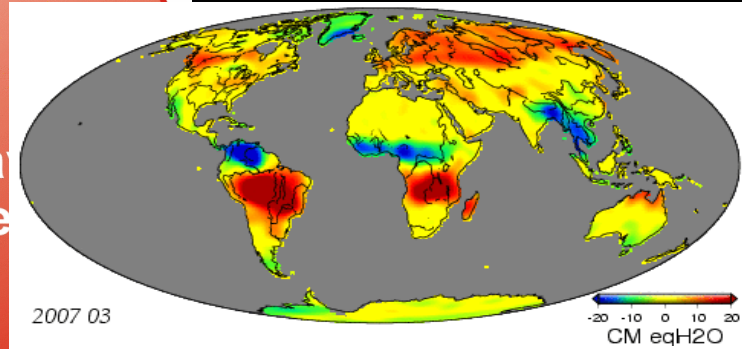
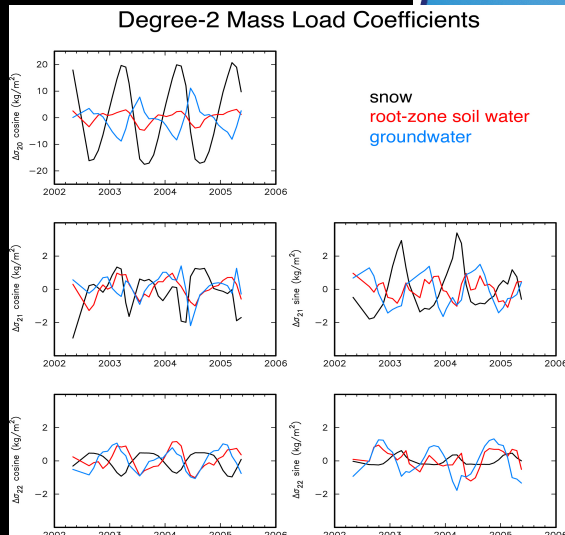


Geokinematics

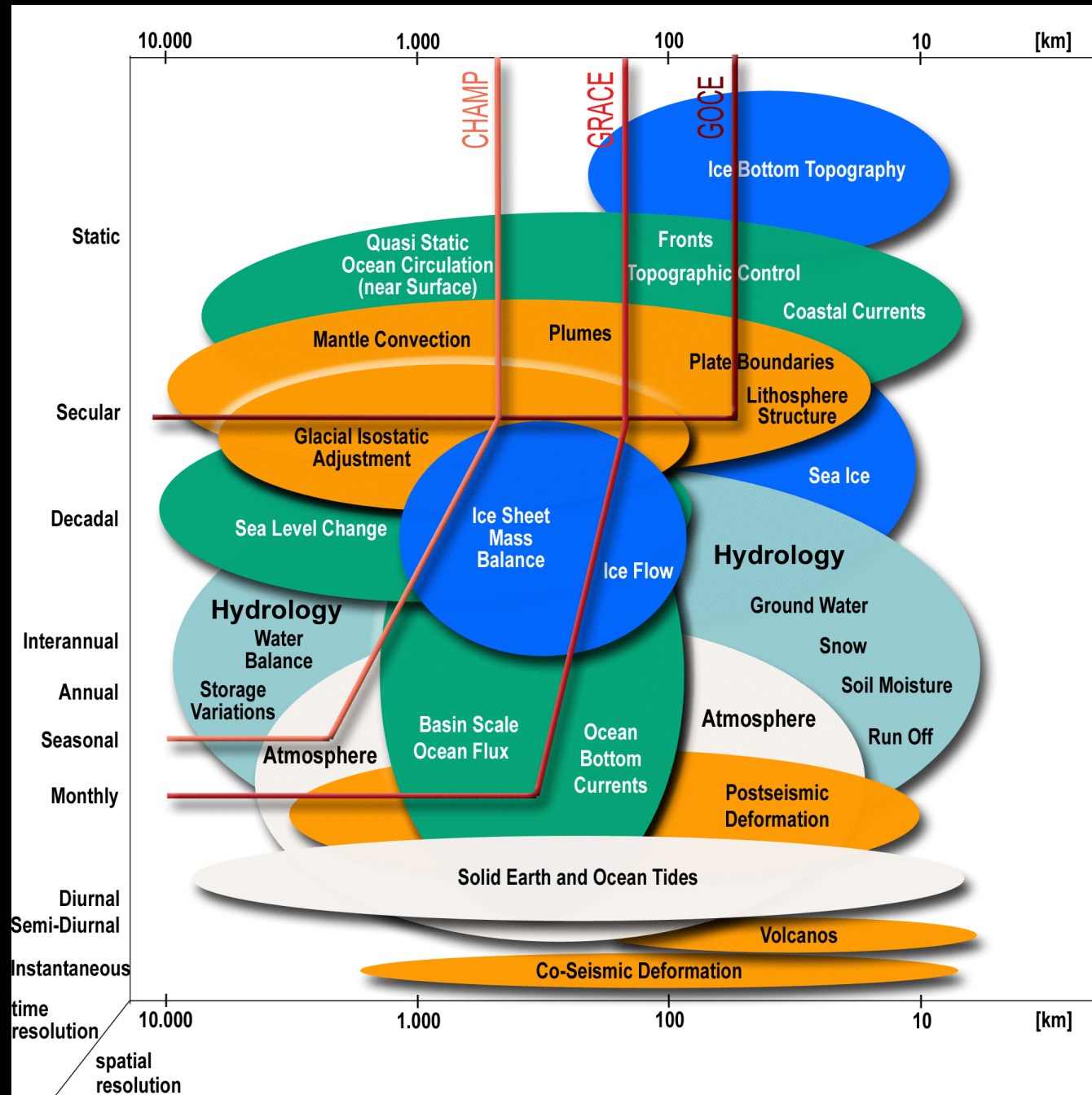
Reference
frames

Earth
rotation

Grav
field

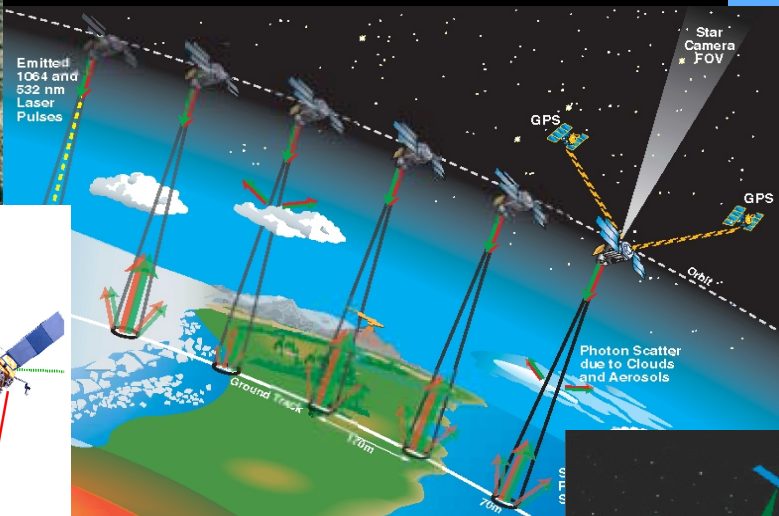


Science & Technology Motivation

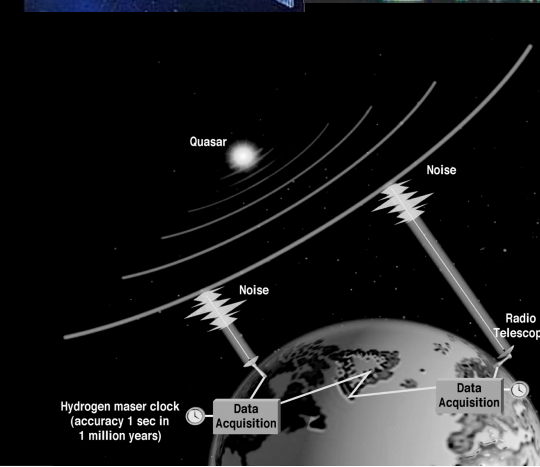
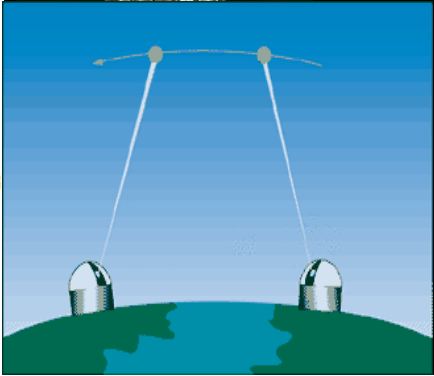
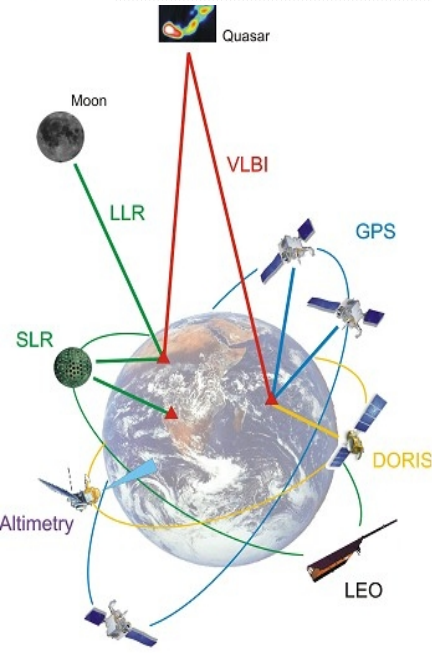
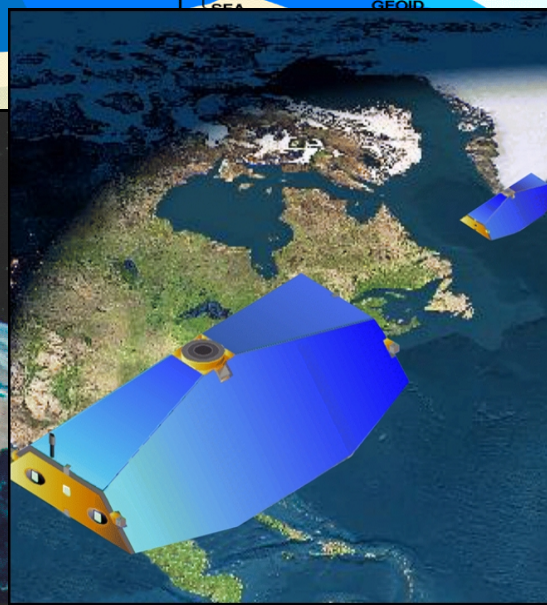
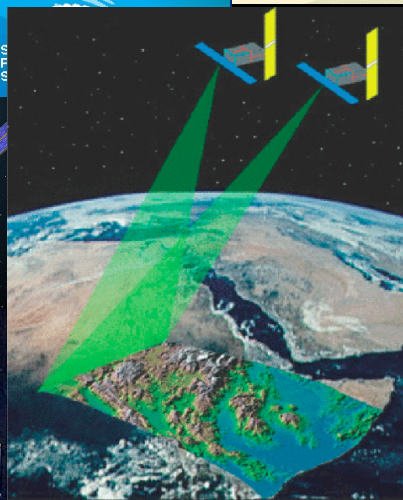
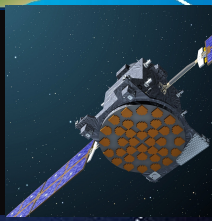
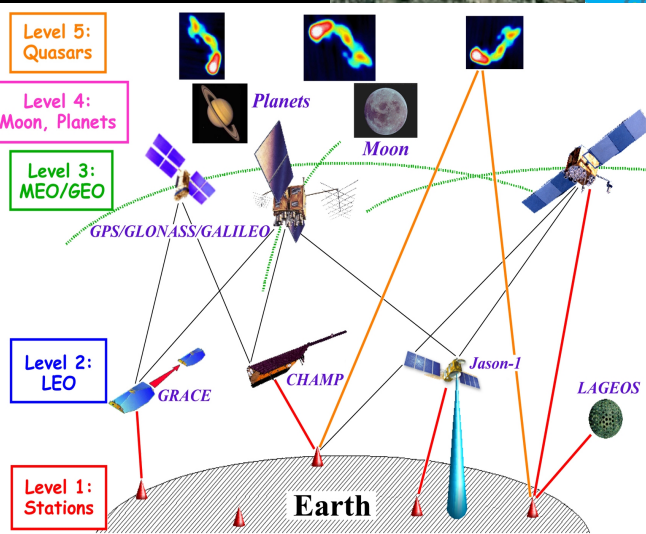
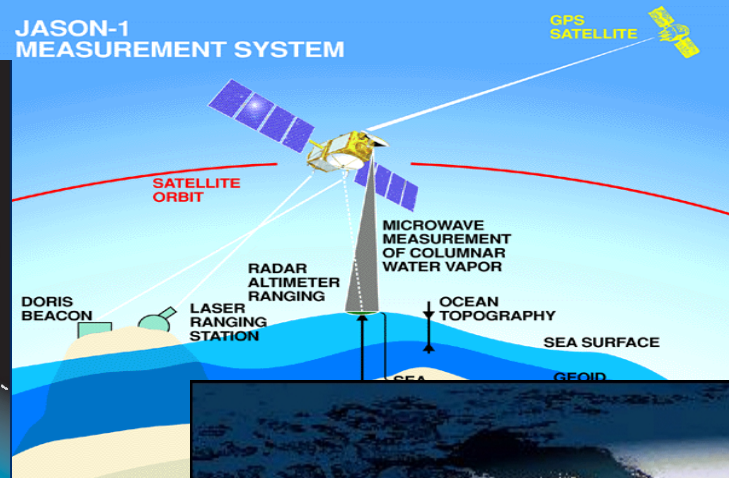




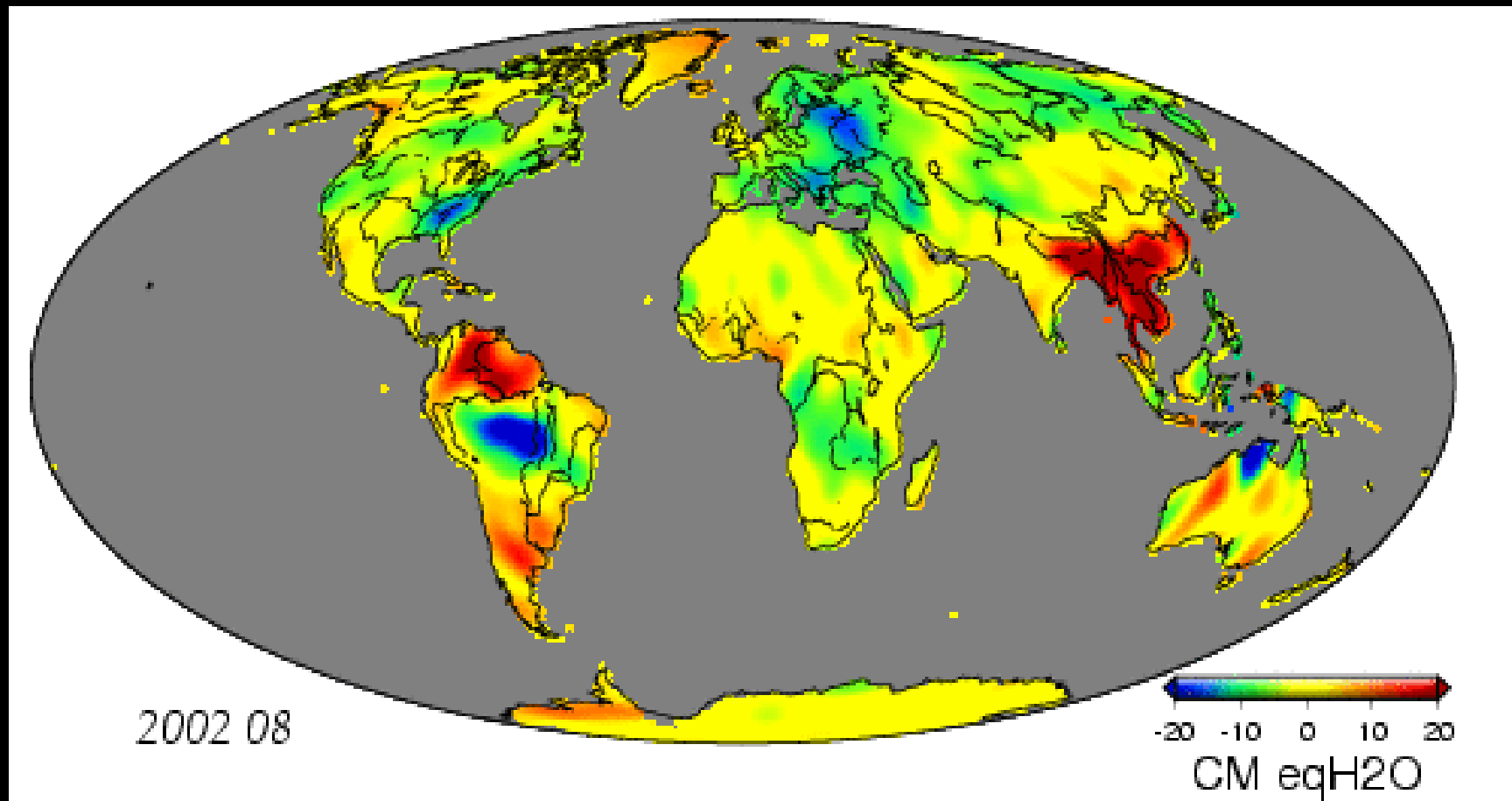
Science & Technology Motivation



JASON-1 MEASUREMENT SYSTEM

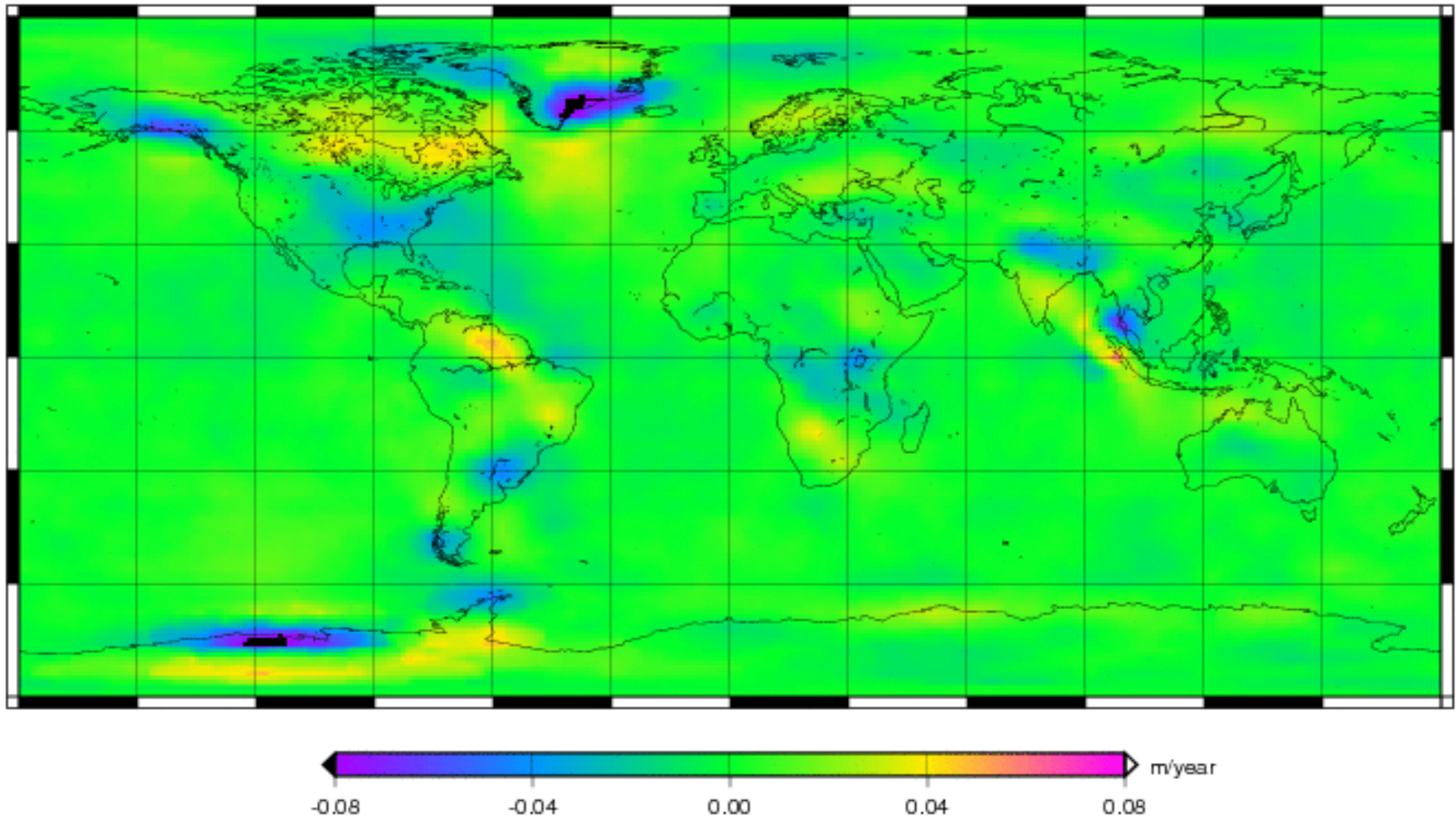


Science & Technology Motivation



<http://grace.jpl.nasa.gov/information/>

Science & Technology Motivation



JPL MASCON, secular trends 2003-2007, Watkins, 2008

IGCP 565 Project Objectives, Goals, and Approach

Objectives:

Develop GGOS into a monitoring for the global water cycle that:

- precisely records (water) mass movement through all components of the water cycle;
- detects significant changes in reservoir storage (groundwater, ice sheets, oceans, ...) and informs society about these changes;
- facilitates global and climate change science and research;
- supports regional water management.

Goals:

- Create a forum for experts from relevant disciplines to interact;
- Identify the challenges and develop a strategy to meet these;
- Develop regional products that can support societal applications, including water management;

Approach:

- Initiate, link, and coordinate relevant research projects;
- Organize a series of annual workshops;
- Interact with other relevant programs and initiatives.

Project Work Plan

A Series of Five Annual Work Shops:

2008: Science of geodetic monitoring of the hydrological cycle

2009: Ensuring continuous satellite gravity missions

2010: Determination of mass transports in the hydrological cycle from geodetic observations

2011: Integration of geodetic observations and products in models of the hydrological cycle

2012: Improving regional water management in Africa and Asia on the basis of geodetic water cycle monitoring

Achievements in 2008 and 2009

2008:

Presentation of Project at IGWCO meeting (Geneva, Spring 2008); GEO UIC Meeting (Boulder, September 2008), UNESCO/UCI Symposium: (Irvine, 1-5 December 2008), and GRACE Science Team Meeting (San Francisco, 12-13 December 2008)

December 11, 2008: Workshop “Science of geodetic monitoring of the hydrological cycle” in San Francisco, 15 Participants from 5 countries:

- High-level presentations, all available at Workshop web page;
- Key conclusions summarized in a web-report

Several proposals submitted: Reviewers' comments indicate a lack of acceptance of geodesy for hydrology

Achievements in 2008 and 2009

2009:

Project presentations at ISRSE33 (Stresa, Italy, May 2009), GRACE Science Team Meeting (Austin, November 5-6, 2009), GEO UIC Meeting (Washington, D.C., November 14, 2009).

Workshop 2: Title changed from “Ensuring continuous satellite gravity missions” to “Towards a Roadmap for Future Satellite Gravity Missions” (Graz, Austria, Sep. 30 – Oct. 2, 2009);

---> see separate presentation ...

Publications: Irvine conference proceedings (pending); Zerbini et al. (in press); ???

New projects: Lake Victoria (Miller, discussed later); ???

Links with other organizations:

- Contact to 2nd Africa Water Cycle Symposium
- UNESCO's International Hydrological Programme

Challenges

Objectives:

Develop GGOS into a monitoring for the global water cycle that:

- precisely records (water) mass movement through all components of the water cycle;

For gravity, this is happening in the geodetic community, with a few (too few?) hydrologist involved. Integration of the “three pillars” is still not well enough developing.

- detects significant changes in reservoir storage (groundwater, ice sheets, oceans, ...) and informs society about these changes;

Based on gravity, we have a number of significant discoveries (see one-page stories), but information flow to society is limited;

- facilitates global and climate change science and research;

Is happening, but problems with data and product availability hampers progress;

- supports regional water management.

Very limited, partly because geodetic products are not easy to use and no “community”-validated products are available. Integrated products based on the three pillars are purely for research. Local studies are encouraging.

Challenges

Goals:

- Create a forum for experts from relevant disciplines to interact;

Limited success: Some hydrologist are participating in Project meetings and in geodetic meetings, but very few geodesists are joining hydrologists;

- Identify the challenges and develop a strategy to meet these;

Both the first and second workshop have made progress with identification, but the strategy to meet the challenges has not be developed fully. Some work went into proposals, and for gravity, the Roadmap details necessary steps. The strategy that would lead to useful products for water management still needs to be written.

- Develop regional products that can support societal applications, including water management;

Very little progress so far; but a better understanding of what is needed is developing.

Challenges

Approach:

- Initiate, link, and coordinate relevant research projects;

Initiation of new projects is slow; links and coordination needs to be improved;

- Organize a series of annual workshops;

Here the project is successful. However, the next workshops pose some serious challenges.

- Interact with other relevant programs and initiatives.

This is still underdeveloped, but plans for 2010 aim to improve the situation. Is also a topic of this workshop.

Plan for 2010 - 2012

2010:

Workshop 3: Determination of mass transports in the hydrological cycle from geodetic observations:

- location?
- timing?
- co-location with other events?

Presentation of IGCP 565 Project theme at:

- Workshop in Cotonou, Benin
- 15th African Water Association Congress
- IGWCO planning meeting and a workshop on water cycle information and global water resources assessment in New York City
- AfricaNet Workshop
- 2nd Africa Water Cycle Symposium (?)

New Projects:

- Proposal to GEO UIC CfP (will be discussed later)
- Other proposals to GEO UIC CfP?
- Other proposals? Important for Project Success ...

Plan for 2010 - 2012

2010 (continued):

Develop/strengthen Linkages:

- UNESCO's IHP,
- IGWCO,
- GEO Water Tasks,
- 2nd Africa Water Cycle Symposium

Project Publications:

- Workshop Report
- Summary report in “Episodes”
- Special Issue on JPCE
- Research projects: Several publications; should mention IGCP

Develop Concept/Roadmap for two test regions (U.S. South-west and Africa)

- integration of “three pillars” (particularly U.S. SW)
- validation: what independent data/models can be used?
- combination of geodetic observations with models

Plan for 2010 - 2012

2011:

Workshop 4: Integration of geodetic observations and products in models of the hydrological cycle:

- location?
- timing?
- co-location with other events?

Presentation of IGCP 565 Project theme at:

- IUGG, Melbourne, Australia
- Other relevant meetings

Activities:

- Links to water management in Africa

Plan for 2010 - 2012

2012:

Workshop 5: Improving regional water management in Africa and Asia on the basis of geodetic water cycle monitoring:

- location: Africa
- timing: September-October 2012
- co-location with other events?

Activities:

- Improved products for regional water management; particularly in Africa and the U.S. South-West