



# *Developing the Global Geodetic Observing System into a Monitoring System for the Global Water Cycle*

## Towards the Final Workshop

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## **Origin and Intent:**

- Initiated as an outreach from geodesy to hydrology;
- Intended as a framework for the dialogue between hydrology and geodesy.

## **Goals:**

- Explore and develop components of the geodetic infrastructure most relevant for the monitoring of the water cycle
- Make observations and products available for assimilation in predictive models of the global water cycle.
- Develop products and algorithms that will allow regional water management to fully utilize the potential of the geodetic techniques for monitoring the regional terrestrial hydrosphere.

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## IGCP 565 Workshops

- Workshop 1: December 11, 2008, San Francisco: Science of geodetic monitoring of the hydrological cycle
- Workshop 2: September 30-October 2, 2009, Graz, Austria: Toward a Roadmap for Future Satellite Gravity Missions
- Workshop 2b: December 12-13, 2009, San Francisco, USA: From Satellite Gravity Observations to Products
- Workshop 3: October 11-13, 2010, Reno, USA: Separating Hydrological and Tectonic Signals in Geodetic Observations
- Workshop 4: 2011, Johannesburg, South Africa: Integration of geodetic observations and products in models of the hydrological cycle
- Workshop 5: 2012, Africa: *Originally proposed title: Improving regional water management in Africa on the basis of geodetic water cycle monitoring*

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## IGCP 565 Workshops

Workshop 1: December 11, 2008, San Francisco: Science of geodetic monitoring of the hydrological cycle

### Conclusions and Recommendations:

- main gaps in the hydrological budget are the deep groundwater and evaporation;
- Seasonal predictions are an important problem in water management, emphasizing the need for models with predictive capability.
- Assimilation of geodetic observations into hydrological models is preferred approach to utilize geodetic observations.
- Hybrid approach of local implementation and global observations and models is considered necessary.
- Geodetic observations are valuable on all scales, and
- The best way to get the products to the users is to demonstrate to operational agencies what can be done with geodesy.
- It was agreed that the IGCP 565 Project would focus on regional applications in Africa.

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## IGCP 565 Workshops

Workshop 2: September 30-October 2, 2009, Graz, Austria: Toward  
a Roadmap for Future Satellite Gravity Mission

### **Conclusions and Recommendations:**

- produced a roadmap towards future gravity satellite missions.
- emphasized the importance of these missions for addressing major challenges in our understanding and quantitative knowledge of the water cycle and for the monitoring of the water cycle as it changes under global warming.
- This roadmap was later distributed to decision makers and may well have contributed to decisions in the USA and Germany to implement a GRACE follow-on mission much earlier than originally planned.

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## IGCP 565 Workshops

Workshop 3: October 11-13, 2010, Reno, USA: Separating  
Hydrological and Tectonic Signals in Geodetic Observations

Objective:

Make progress towards improved applicability of geodetic  
observations for hydrological and global change studies

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## IGCP 565 Workshops

Workshop 3: October 11-13, 2010, Reno, USA: Separating  
Hydrological and Tectonic Signals in Geodetic Observations

The two primary recommendations of the 3rd workshop are:

- (1) Capacity building with application of geodetic products that water resource decision makers are able to readily access and easily use, and
- (2) development of a demonstration project in California that merges geodetic information with hydrologic modeling via assimilation and leads to realistic technology transfer to African nations through a similar project in the Nile Basin.

Many other conclusions and recommendations

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## IGCP 565 Workshops

### Post Workshop 3:

(1) Capacity building with application of geodetic products that water resource decision makers are able to readily access and easily use:

*Progress towards a workbench(es) for hydro-geodesy/geodesy/river basin hydrology: One RCN proposal submitted; another one in preparation*

(2) development of a demonstration project in California that merges geodetic information with hydrologic modeling via assimilation and leads to realistic technology transfer to African nations through a similar project in the Nile Basin.

*Pilot project in California; discussion about pilot projects in Africa; RCN proposal submitted (in cooperation with AfricaArray and other organizations)*



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## IGCP 565 Workshops

Workshop 4: November 21-22, 2011, Johannesburg, South Africa:  
Integration of geodetic observations and products in models of the  
hydrological cycle

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Workshop 4: November 21-22, Johannesburg, South Africa:



## Main Findings:

Africa is a “hot spot” in terms of water issues, due to large climate variability and high sensitivity to change, impact of limited water availability on all socioeconomic sectors, health, and food security, and the highly sensitive interaction between climate and the socio-economic systems.

Research to understand the effects of climate variability on key reservoirs is limited.

Research is hampered by the lack of long enough observed time series for fundamental variables and trends.

Hydrogeodesy represents a new and fundamental approach for monitoring land water storage changes.

Predictive terrestrial water storage models for sub-regions of Africa are under development, but the full integration and validation of geodetic observations into these models is still pending.

Application of hydrogeodesy to regional water management is hampered by data access, challenges in use of products, and the absence of a workbench.

There are many water-related initiatives, but synergies between the activities are not fully exploited.

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Workshop 4: November 21-22, Johannesburg, South Africa:



## Recommendations

**Coordination:** Improve coordination and exploitation of synergies between on-going activities (*Workshop 5*)

**Access to Data:** Improve access to data through cooperation between agencies and researchers (*RCN Proposal*)

**Access to Tools:** Improve access to tools through the development of workbenches (*RCN Proposal*)

**Demonstration:** Demonstrate the relevance of hydrogeodesy and predictive models through demonstration projects on river basin-scale (*Demonstration pilots*)

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## IGCP 565 Workshops

Workshop 5: October 29-31, 2012, Cape Town, South Africa:  
*Original: Improving regional water management in Africa on the  
basis of geodetic water cycle monitoring*

New Title: Water Security for Africa: Bringing Together Research,  
Monitoring, and Managing

Joint meeting with the goal to bring together representatives of the  
different initiatives (research, monitoring, managing, education,  
capacity building, social, political)

- Understand cross-sector needs;
- Identify and address obstacles;
- Identify and explore synergies;
- Initiate linkages across the sectors.

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Question:

- How will IGWCO, Water CoP, Africa Water Cycle Symposium participate?

Options:

- Coorganizers
- Invited Speakers
- Coauthor(s) of white paper(s)