

# **IGWCO AND POTENTIAL CLIMATE CHANGE IMPACTS ON WATER RESOURCES**

Second GEOSS A-P Symposium  
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Rick Lawford

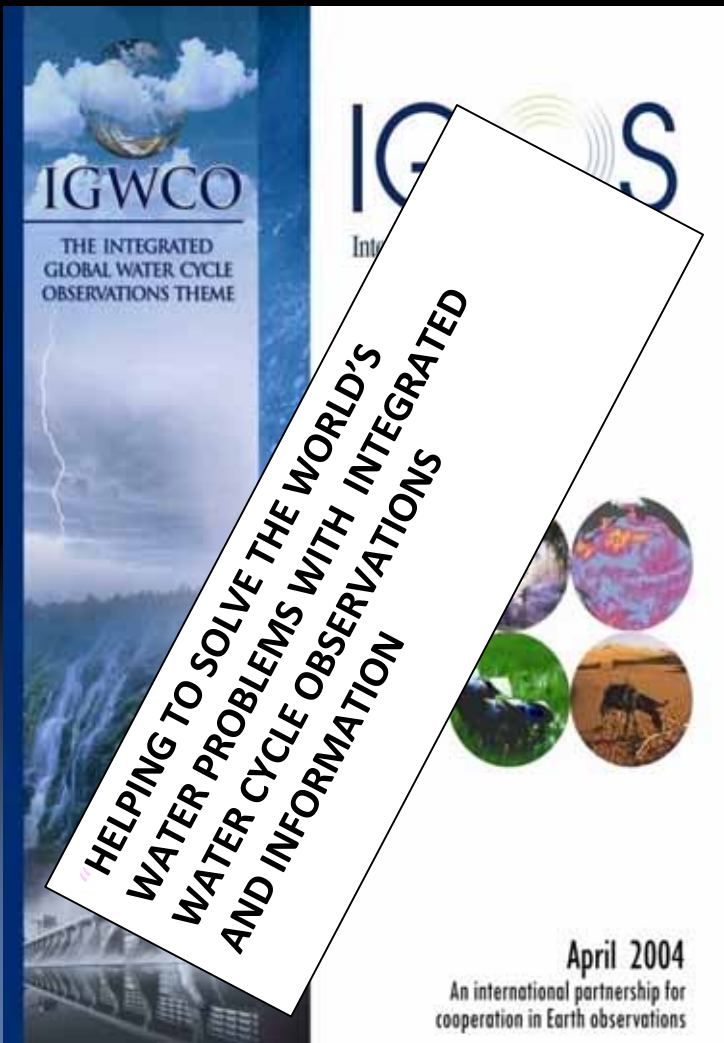
IGWCO arose from CEOP approaching CEOS for endorsement. As a result WCRP was invited to take the lead in developing an IGOS-P water cycle theme.

The theme was approved in 2003 and led by WCRP (GEWEX), CEOS (JAXA) and WMO (GTN-H).

IGWCO has progressed by coordinating activities in areas which were not well-coordinated and by initiating specific activities that promote the integration of water cycle activities.

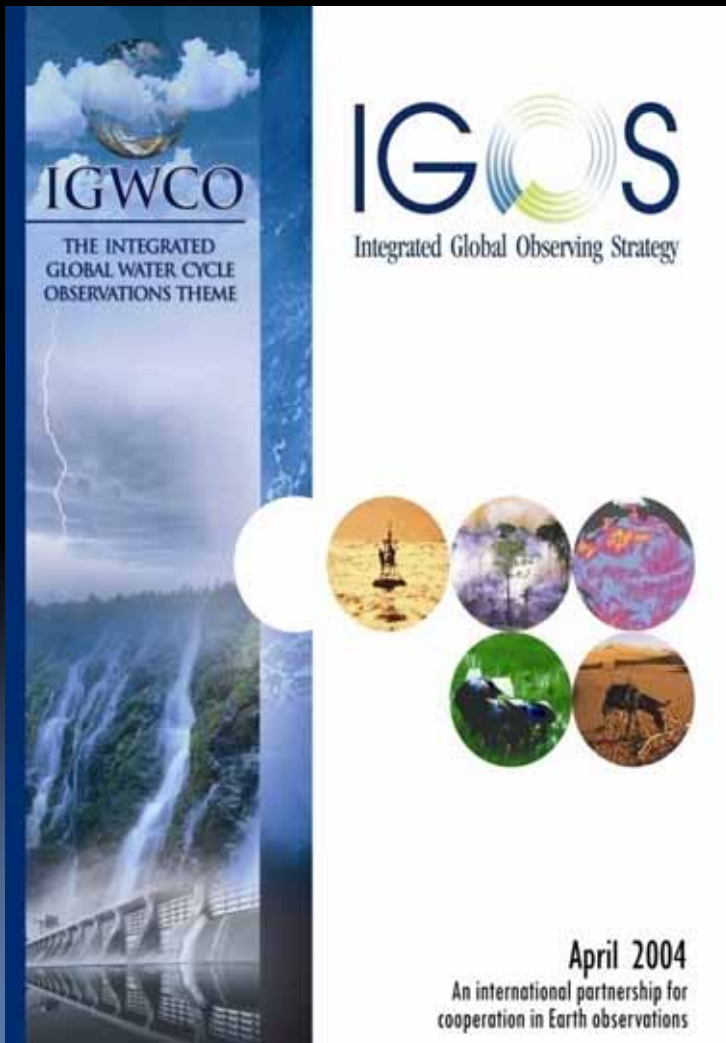
With the passing of IGOS-P, IGWCO activities will be assimilated into the GEO water efforts.

# THE INTEGRATED GLOBAL WATER CYCLE OBSERVING THEME (IGWCO) IS A “BEST EFFORTS” ACTIVITY WITH THE FOLLOWING OBJECTIVES:



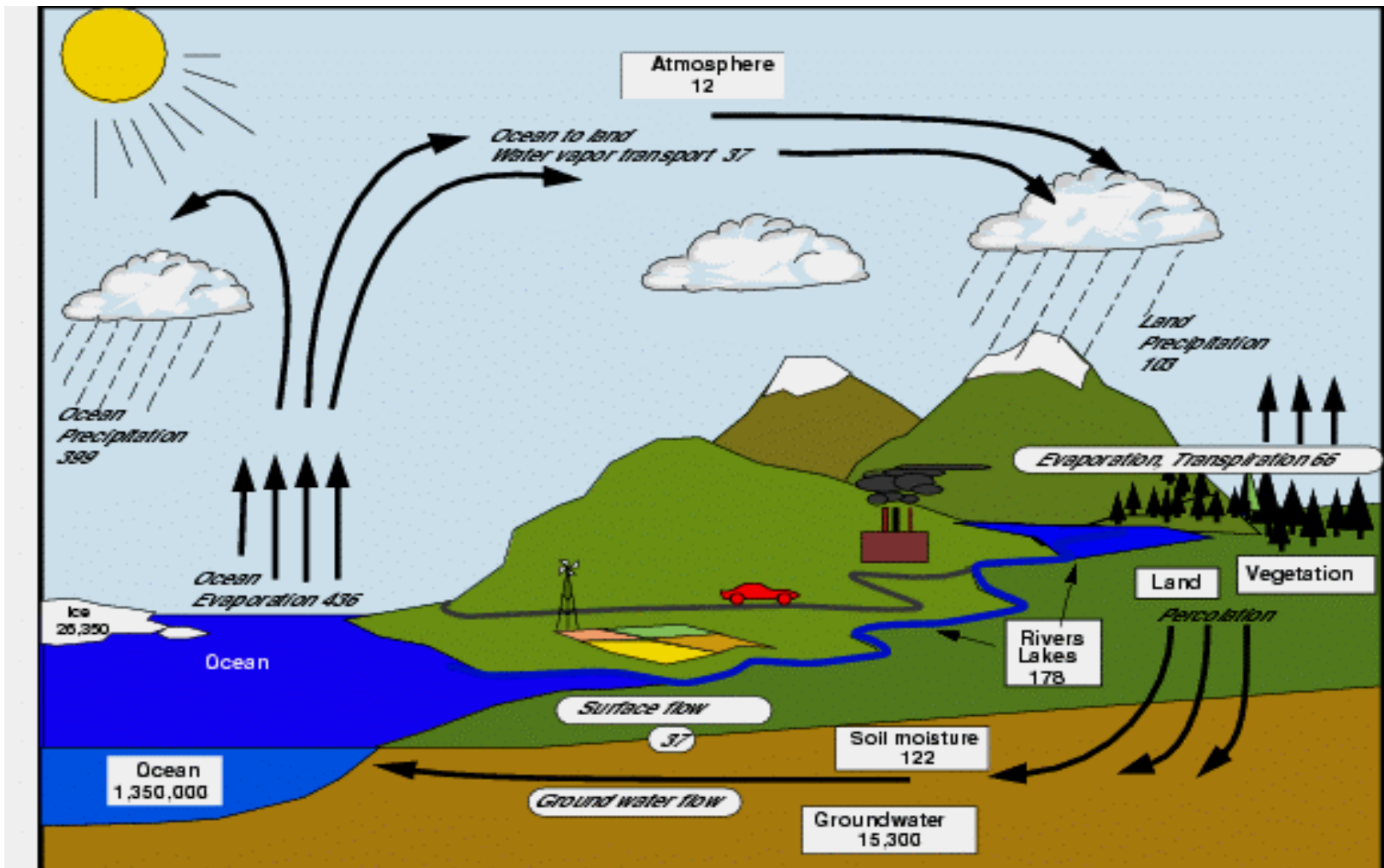
1. Provide a framework for guiding decisions on priorities and strategies regarding water cycle observations for:
  - Monitoring climate variability and change,
  - Effective water management and sustainable development of the world's water resources,
  - Societal applications for resource development and environmental management,
  - Specification of initial conditions for weather and climate forecasts,
  - Research directed at priority water cycle questions
2. Promote strategies that facilitate the processing, archiving and distribution of water cycle data products

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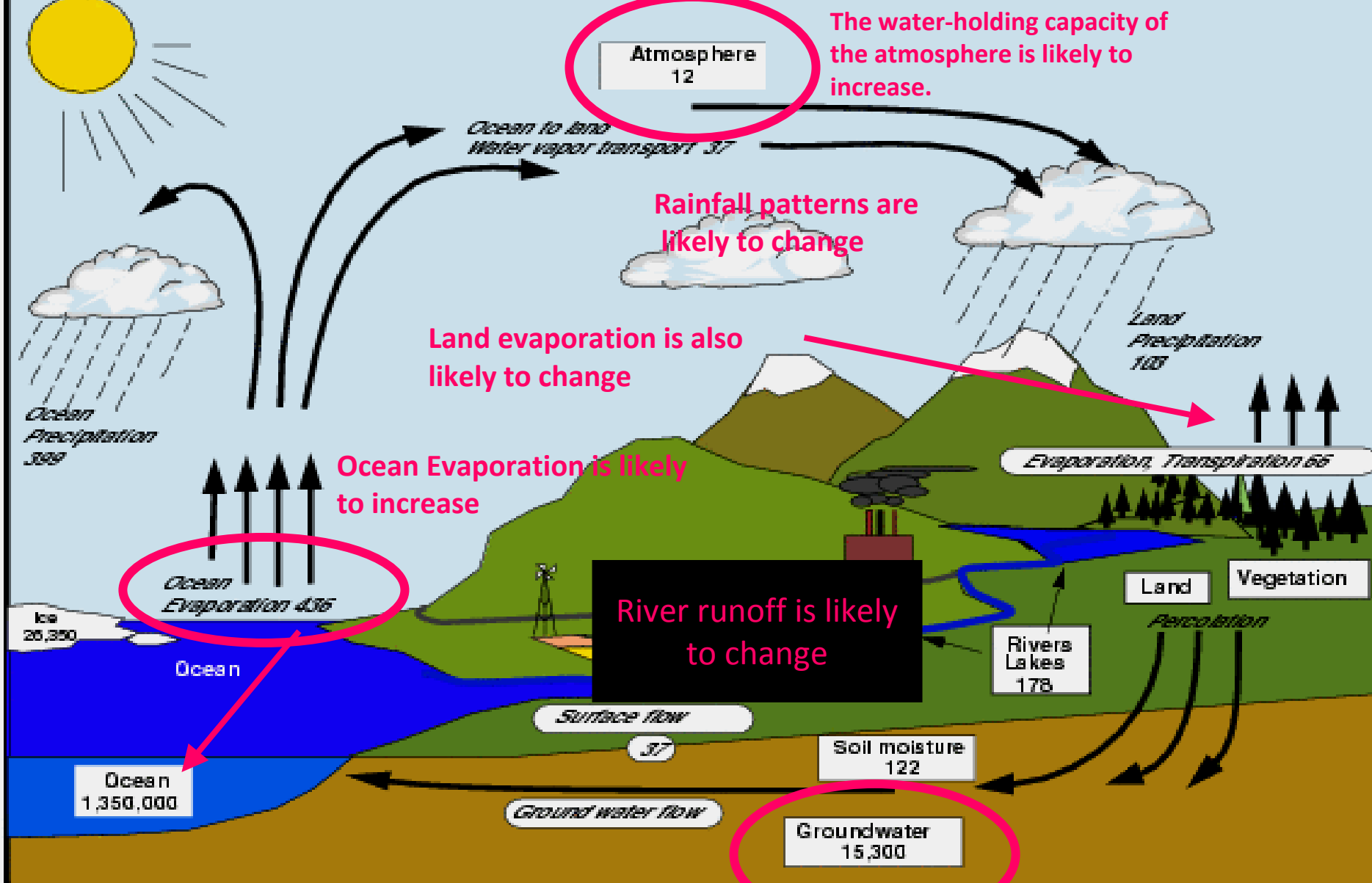
# WHAT IS LIKELY TO HAPPEN IF THE GLOBAL WATER CYCLE “ACCELERATES” OR INTENSIFIES DUE TO CLIMATE CHANGE?



## *Hydrological cycle.*

(After Trenberth)

*Units are thousand cubic km for storage and thousand cubic km/year for exchanges*

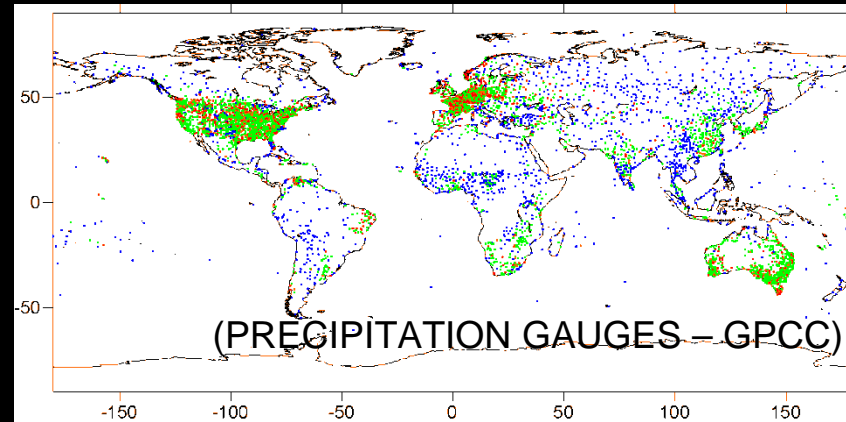


## Hydrological cycle.

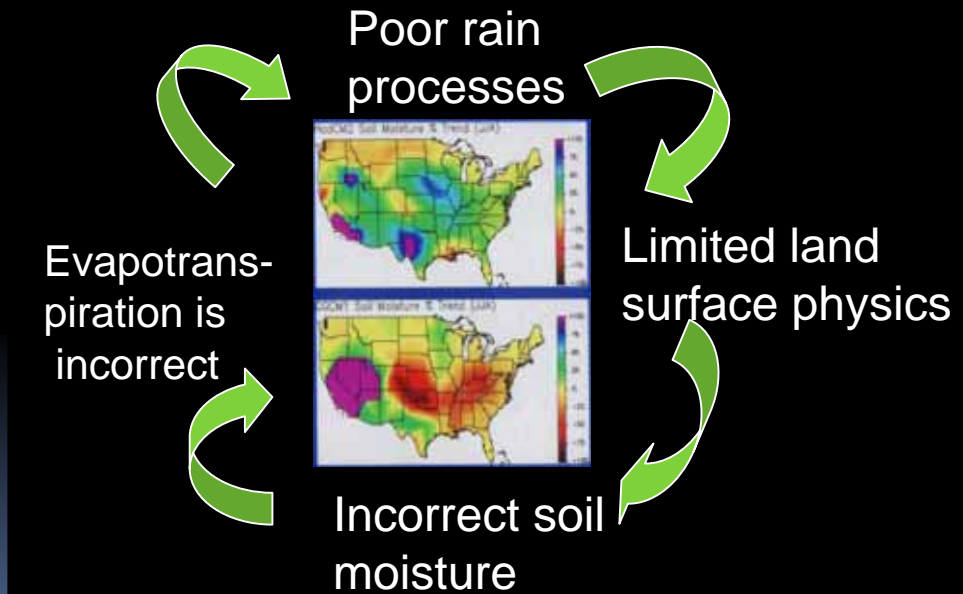
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# CLIMATE AND WATER ISSUES INVOLVING SCIENCE AND TECHNOLOGY

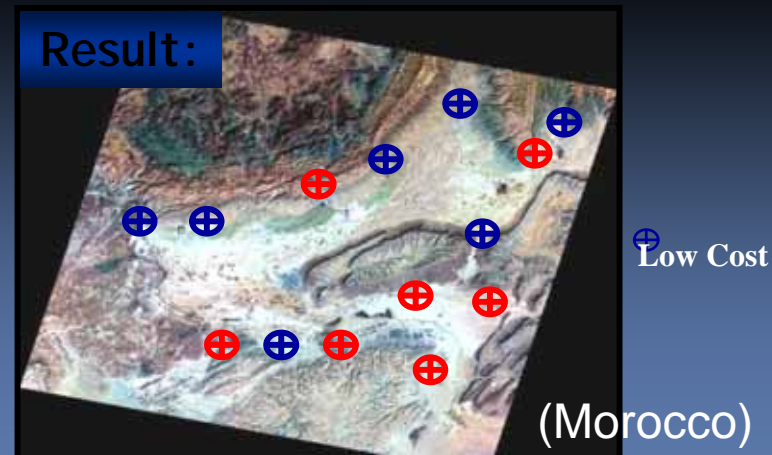
IMPROVED PLANNING CAN RESULT FROM BETTER INFORMATION ON CURRENT AND FUTURE CONDITIONS. (HOW CAN EQUAL ACCESS TO INFORMATION BE SECURED?)



PREDICTIONS OF CHANGES IN THE WATER CYCLE ON THE TIME SCALES MOST IMPORTANT FOR PLANNING HAVE LIMITED SKILL AT PRESENT.

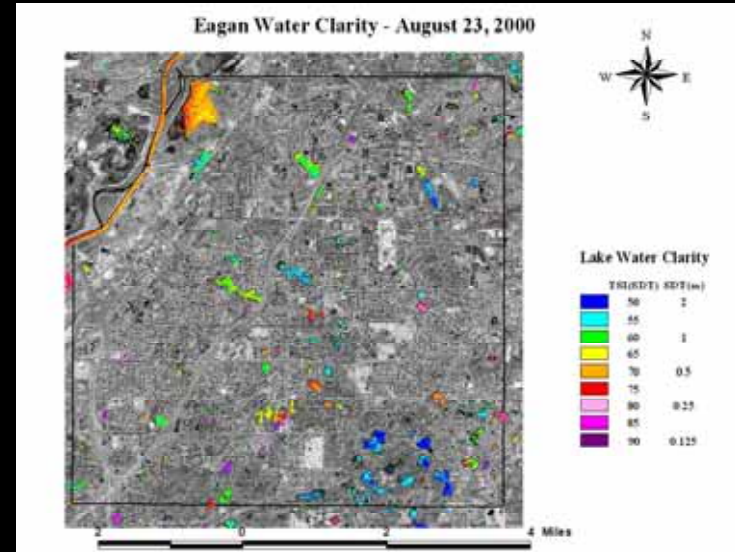


NEW TECHNOLOGIES TO OVERCOME WATER LIMITATIONS ARE EXPENSIVE. HOW CAN THEY BE MADE MORE COST-EFFECTIVE?



# SOME KNOWLEDGE GAPS THAT PREVENT IMPLEMENTATION OF AN INTEGRATED WATER CYCLE APPROACH TO ADAPTATION

WE HAVE ONLY LIMITED ABILITY TO MEASURE INLAND WATER QUALITY ON A GLOBAL BASIS.



**GRACE Mission**

**Science Goals**  
High resolution, mean & time variable gravity field mapping for Earth System Science applications.

**Mission Systems**

**Instruments**

- KBR (JPL/SSL)
- ACC (ONERA)
- SCA (DTU)
- GPS (JPL)

**Satellite (JPL/DSS)**  
**Launcher (DLR/Eurocot)**  
**Operations (DLR/GSOC)**  
**Science (CSR/JPL/GFZ)**

**Orbit**

- Launch: November 2001
- Altitude: 485 km
- Inclination: 89 deg
- Eccentricity: ~0.001
- Lifetime: 5 years
- Non-Repeat Ground Track
- Earth Pointed, 3-Axis Stable

GROUNDWATER DATA ARE INADEQUATE FOR AS WA CE

WATER AND LAND MANAGEMENT ARE NOT CONSIDERED JOINTLY ALTHOUGH THEY ARE STRONGLY LINKED THROUGH THE WATER CYCLE



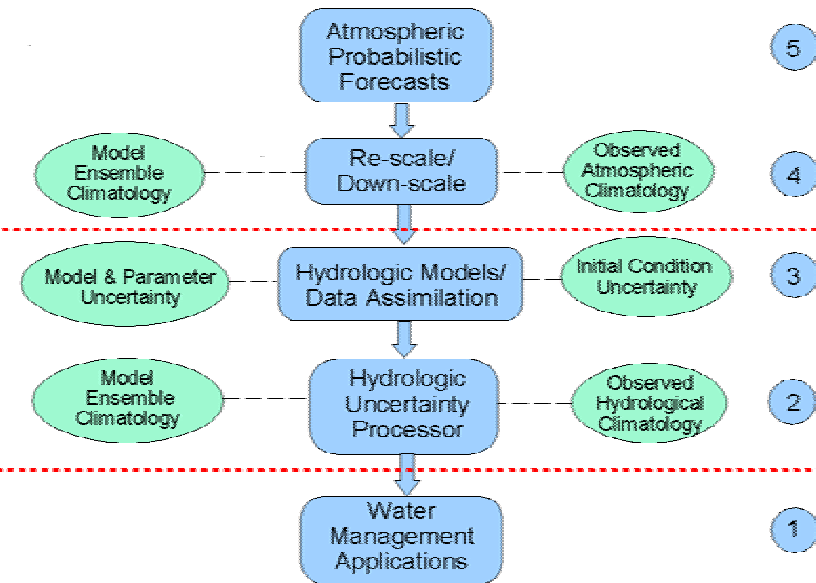


# MORE KNOWLEDGE GAPS THAT PREVENT IMPLEMENTATION OF AN INTEGRATED WATER CYCLE APPROACH TO MANAGEMENT

THE ENSEMBLE APPROACH HAS NOT REACHED THE LEVEL OF SOPHISTICATION REQUIRED TO GIVE USERS THE UNDERSTANDING AND CONFIDENCE TO FULLY UTILIZE THIS TOOL.



## Ensemble Forecast Strategy for Water Management



THE ROLE OF SPECIAL AREAS (E.G., MOUNTAINS, SEMI-ARID REGIONS) AND THEIR RESPONSE TO CLIMATE CHANGE ARE NOT FULLY KNOWN.

IGWCO ACTIVITY	CLIMATE IMPACT	EXISTING
PRECIPITATION	YES – FOR EXTREMES AND PATTERN SHIFTS	INTEGRATED PRODUCT DEVELOPMENT
SOIL MOSITURE	YES – SHIFTS OF PATTERNS AND SEASONALITY	NETWORK DESIGN CONSIDERATION
RUNOFF	YES – SEASONALITY AND PEAK FLOWS CHANGES	MONITOR CHANGES IN AMOUNT & SEASONALITY
GROUNDWATER	YES – RECHARGE ISSUES	MEASURE RESPONSES TO MEANS AND EXTREMES
WATER QUALITY	YES – LOW FLOWS ARE A CRITICAL ISSUE	PROJECT OPPORTUNITY FOR LOW FLOWS
INDICATORS	COMMUNICATION OF THE ISSUE	ASSESSMENT IN E2E ACTIVITY (DROUGHT)
CEOP	BETTER UNDERSTANDING AND PREDICTIONS	CEOP BRINGS DATA FOR MODEL DEVELOPMENT
CAPACITY BUILDING	MANAGEMENT AND ADAPTATION OPPORTUNITIES	CB EFFORTS FOCUS ON ABILITY TO ACCESS/ USE DATA

# **GEO TASKS WHERE IGWCO TAKES THE LEAD**

**WA-06-02: Forecast Models for Drought and Water Resource Management**

**WA-07-06: Capacity Building Program for Water Resources Management**

**WA-07-01: Global Water Quality Monitoring**

**WA-08-P1: Integration of In-situ and Satellite Data for Water Cycle Monitoring**

## **OTHERS WHERE IGWCO CAN/DOES INPUT:**

**DI-07-01: Risk Management for Floods**

**CL-06-01: Sustained Reprocessing and Reanalysis Efforts**

**US-06-02: Pilot Communities of Practice**

**DA-07-03: Virtual Constellations**

**DA-07-06: Data Integration and Analysis System**

**HE-07-02: Environment and Health Monitoring and Modelling**

**AG-07-03: Operational Agricultural Monitoring System**

## **OTHER OPPORTUNITIES/ LINKAGES:**

1. Pilot projects that could interface within the planned IEEE Study on water.
2. Pilot projects related to IGWCO discussions regarding an E2E initiative involving: a) drought, b) “State of the water cycle”, and c) water towers of the world.
3. Development as a specific Asian WC Community of Practice within a larger global water cycle community of practice.
4. We have a need to develop the ability to monitor water use changes that arise from climate change and other global change factors.