TOWARDS CONVERGENCE:
PRINCIPLES AND PRACTICES BASED ON GEWEX AND IGWCO EXPERIENCES

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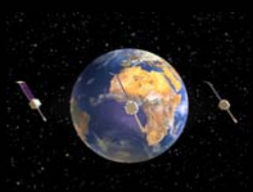
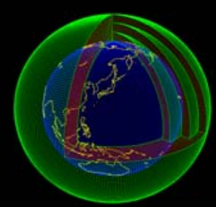
December 4, 2007

THE GEWEX MISSION CAN BE DESCRIBED AS "THE DEVELOPMENT AND APPLICATION OF PLANETARY EARTH SCIENCE, OBSERVATIONS AND MODELS TO THE PROBLEMS OF CLIMATE AND WATER RESOURCES"





THE PROGRAM ENTAILS:

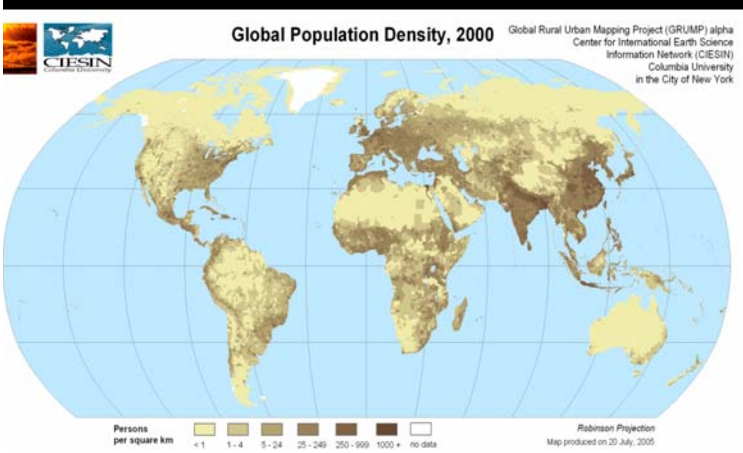
- GLOBAL DATA SETS DERIVED FROM SATELLITE DATA, *IN SITU* DATA AND DATA ASSIMILATION CAPABILITIES,
- MODEL DEVELOPMENT AND PREDICTABILITY STUDIES
- FIELD AND PROCESS STUDIES
- APPLICATIONS

THE INTEGRATED GLOBAL WATER CYCLE OBSERVATIONS THEME (IGWCO) WAS DEVELOPED UNDER IGOS-P TO SERVE 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

Why Converge when diversity is so beautiful?

- Economies of scale to derive maximum benefit from expensive observational platforms and networks.



- Equity for all nations in using the Earth observations for decision making.

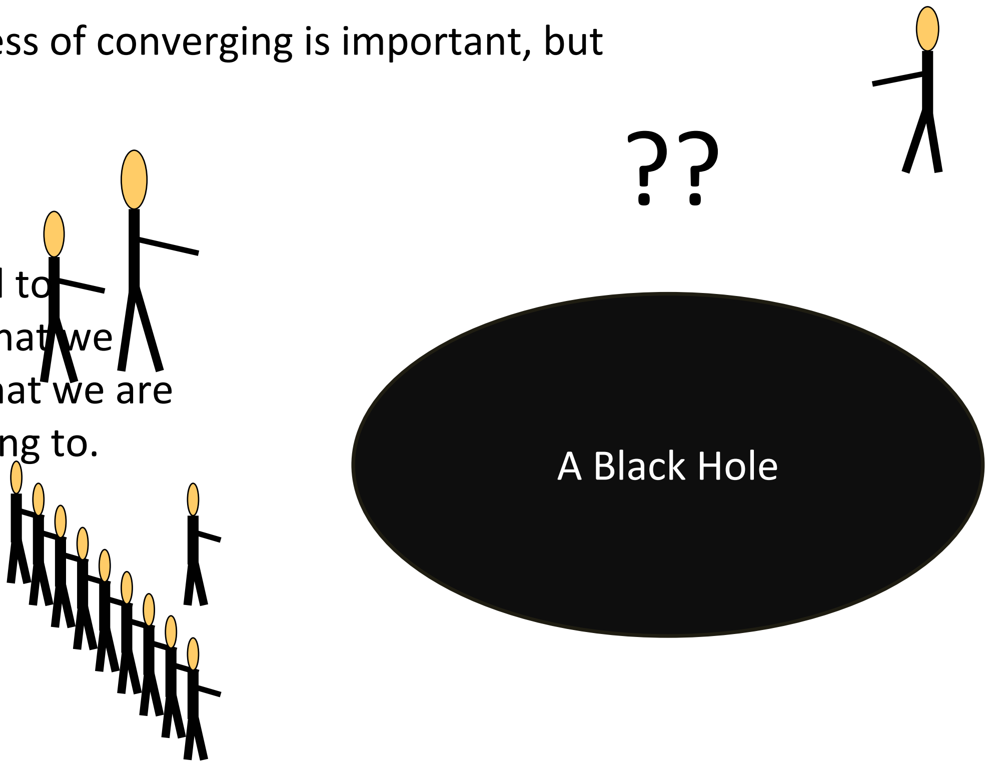
To achieve the GEO goals related to convergence we need convergence:

- in observational systems
- in data systems (management, dissemination)
- across scales
- across functions
- across user requirements (SBAs)
- across programs

We also need to remember an important observation about convergence:

The process of converging is important, but

We need to ensure that we know what we are converging to.

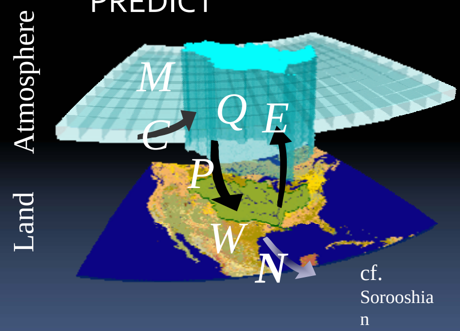


WHAT WE WANT TO CONVERGE TOWARDS

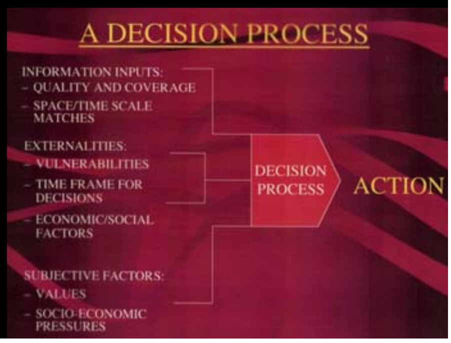
A NEW EPOCH OF WATER MANAGEMENT IN OUR LIFETIMES THAT RELIES ON SUSTAINABLE EARTH OBSERVATIONS FOR BETTER WATER MANAGEMENT DECISIONS.

OBSERVATIONS

IMPROVED CAPABILITY TO ASSIMILATE AND PREDICT

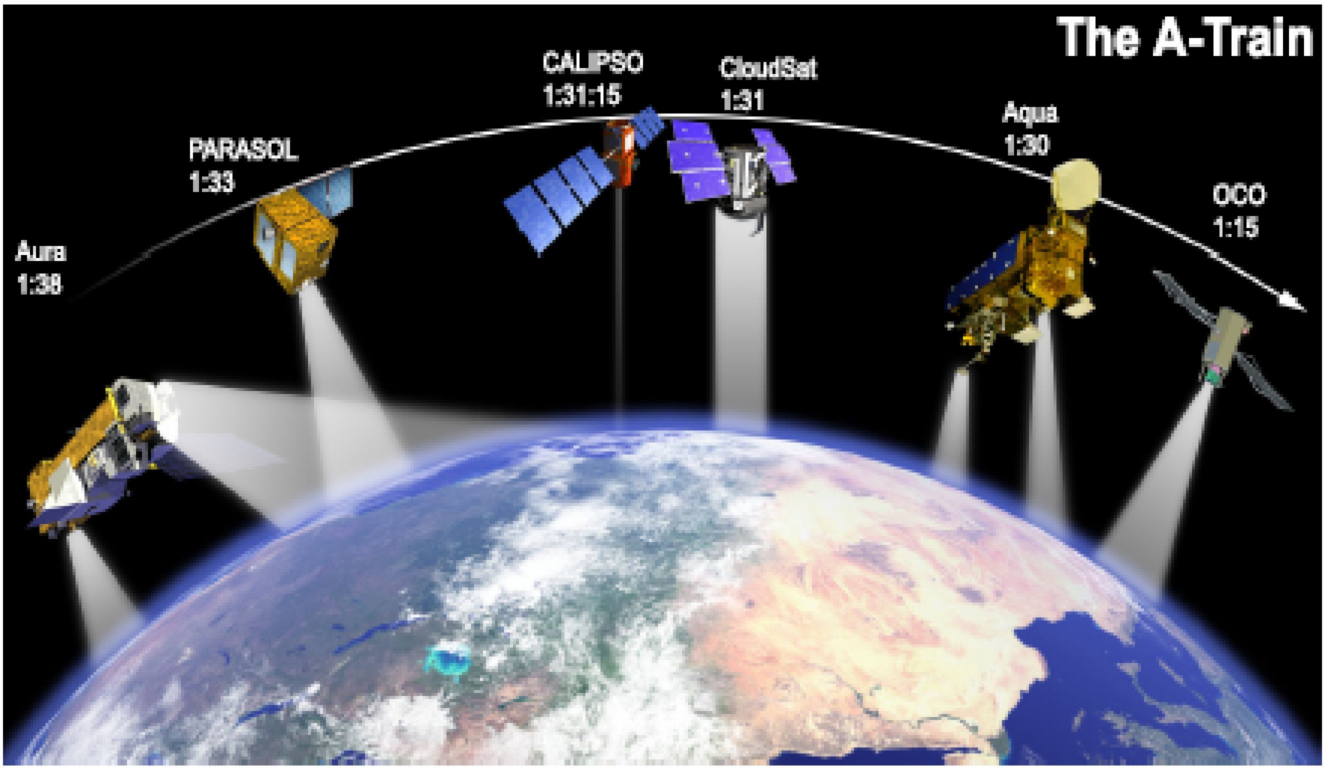


INTEGRATED DECISION SUPPORT SYSTEMS



CONVERGENCE IN OBSERVATIONAL SYSTEMS

GEWEX Cloud and precipitation studies have been advanced through the A-Train Constellation



The present status of national in-situ groundwater monitoring programmes shows a need for convergence

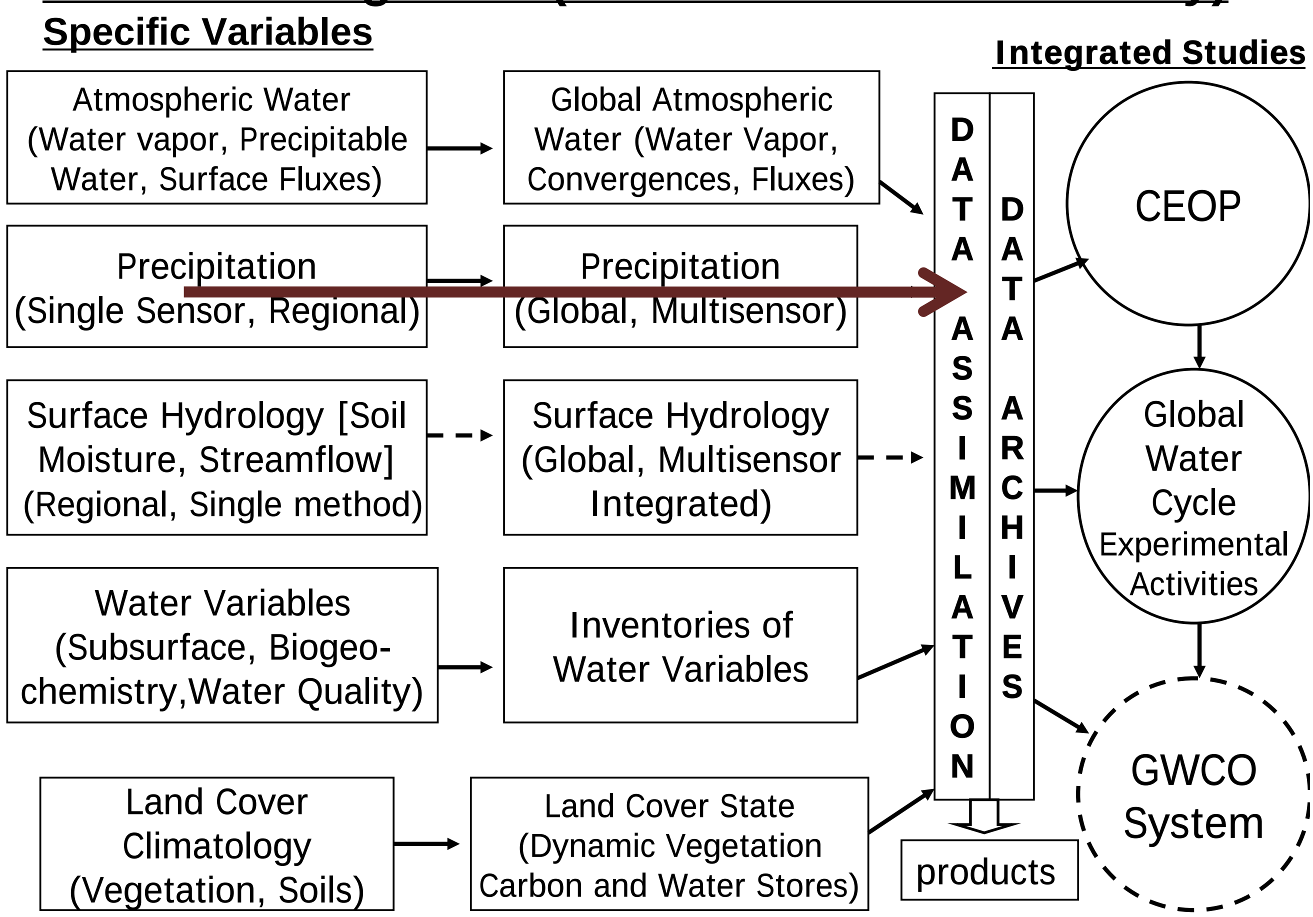
Country	GW monitor. QN Quantity QU Quality	W Wells S Springs Q Qanats	S Special wells O Other wells	O One aquifer-well M More aquifers - well	GW table measure ments M Manual S Sensor	Water table frequency measurem ents per year	GW sampling per year	GW analysis DWS- Drink. Wat.Stan. MI Major Ions S Spec. Variables	GIS	Data accessi bility CH Charge N-CH No charge	Data collec tion C Centr al V Variou s
India	QN QU	W	S mostly	O mostly	M 80%	4	1	DWS S	yes	N CH	C
China	QN QU	W S	S O	O M	S mostly	52	2	MI	yes	CH	V
Iran	QN QU	W S Q	S O	O mostly	M	12	2	MI	no	N CH	C V
South Africa	QN QU	W S	S O	O mostly	M S	4 - 12 - 52	2	MI S	no	N CH	C V
Australia	QN QU	W S	S O	O	M S	4	1 mostly	MI S	yes	N CH	C
Brazil - Sao Paulo	QU	W	O	O	-	-	1	DWS S	no	CH	C
Russia	QN QU	W S	S O	O mostly	S mostly	12 - 36	4 - 12	DWS S	yes	N CH	C V
USA	QN QU	W S	S O	O M	S M	variable	1 or more	DWS S	yes	N CH	C V
Poland	QN QU	W S	S O	O	M mainly	1 - 12 - 52	1- 2 or less	DWS S	yes	CH	C
Czech Republic	QN QU	W S	S	O	S 80%	52	2	DWS S	yes	CH	C
England, Wales	QN QU	W S	S O	O 80%	M 80%	12	variable	DWS S	partially	CH	C V

(After Vrba)

While standards are maintained for a number of water cycle variables by WMO there are a number of gaps for groundwater and water quality.

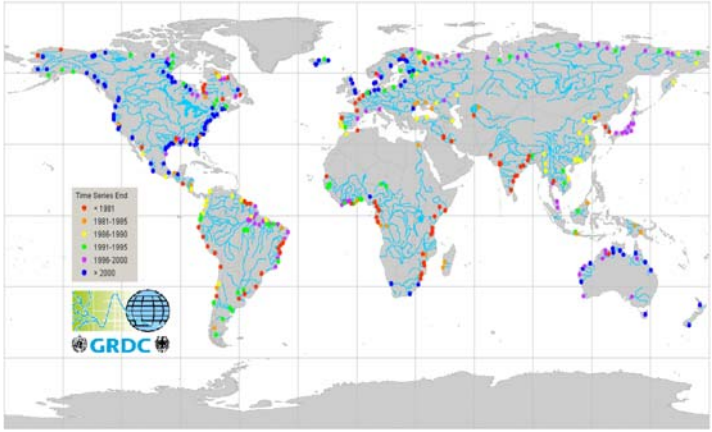
CONVERGENCE BASED ON DATA PROCESSING AND DATA MANAGEMENT

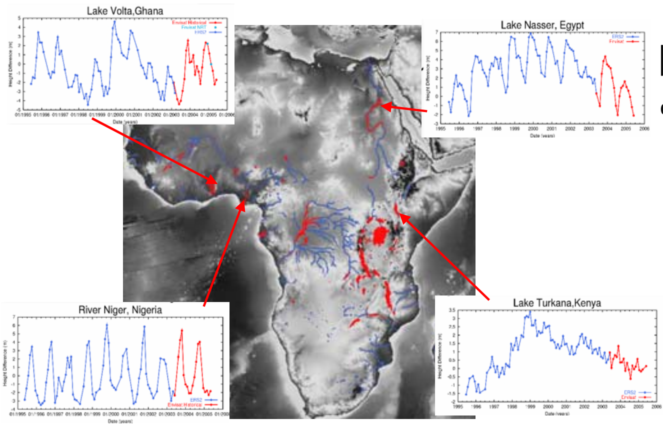
Towards Integration (Possible IGWCO Pathway)



Hydrological **A**pplications and **R**un–**O**ff **N**etwork (**HARON**)

First Phase dedicated to upgrade and (re-) connect 380 major global river discharge stations.





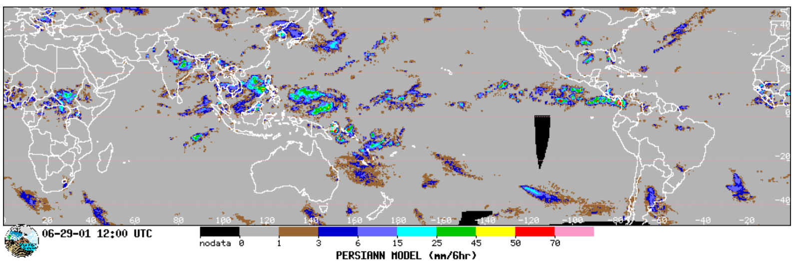
Phase 2:

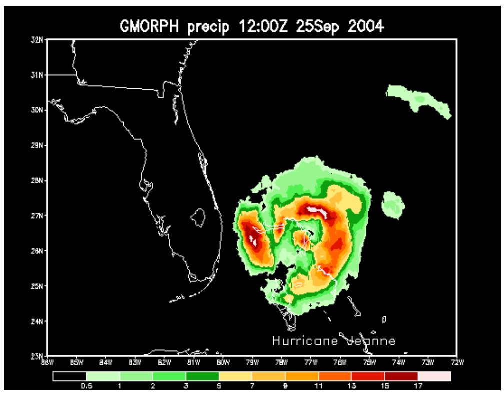
- Link global network to basin-wide hydrological information systems (including satellite products from radar altimetry and gravimetric measurements)

Partially expanded runoff products then made available for various applications.

IGWCO, GEWEX and IWGP developed the program for the Evaluation of High Resolution Precipitation Products (PEHRPP)

- A collaborative effort to understand the capabilities and characteristics of these HRPP (High Resolution Precipitation Products)

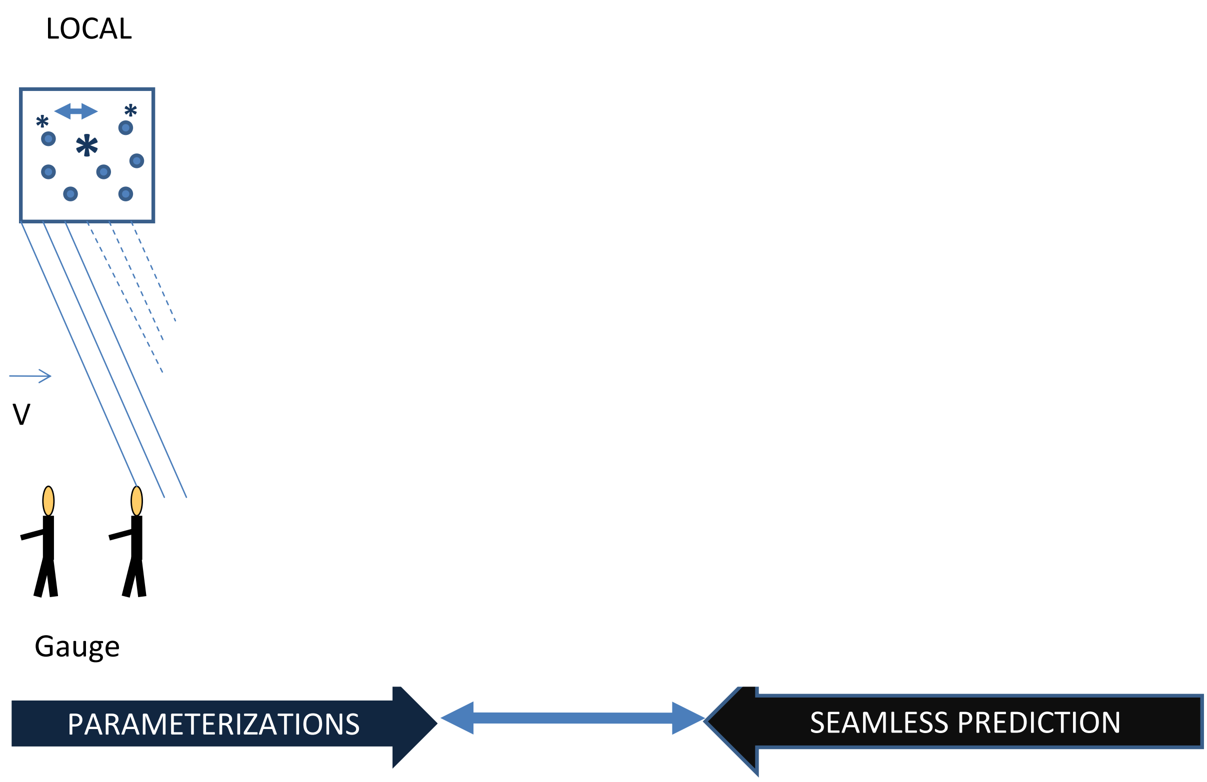




- Implemented specifically to recommend an Integrated Precipitation Product to the IGOS-P Global Water Cycle Observations Theme (IGWCO)
- Providing a link between the observational and application communities

CONVERGENCE ACROSS SCALES

The role of scale is important when considering information requirements. We can only meet those needs by ensuring convergence occurs at all scales and between scales.



Capacity Building needs and proposals (from Ishida et al)

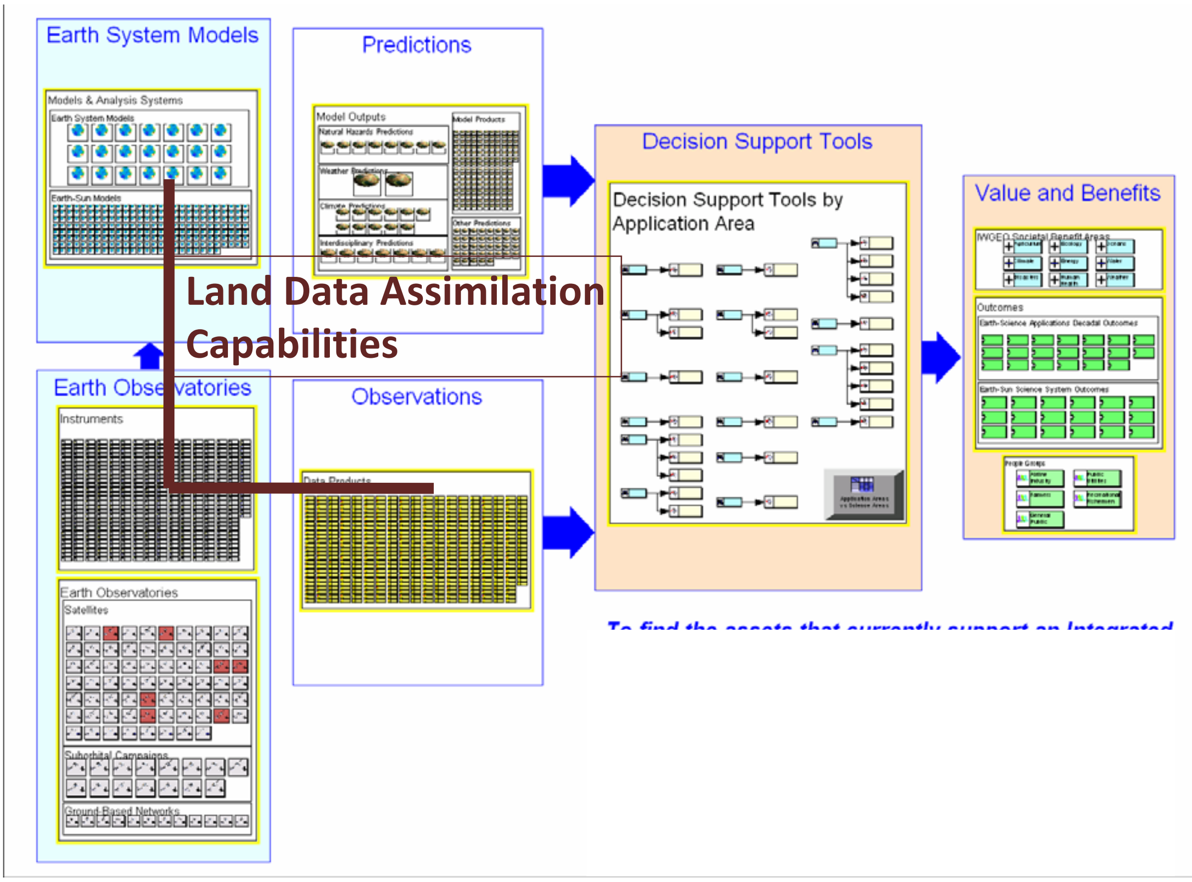
Country	Areas			Capacity Building needs	Capacity Building proposals
	Flood	Drought	WQ		
Bangladesh	X		X	RS data, On-site monitoring sys, Software, Training, Info dissemination sys	
Bhutan	X			Flood Forecasting and Early Warning Systems at regional, national and local levels	
Cambodia	X	X	X	Training and skill development on Flood forecasting and warning	
China	X	X	X	Flood and drought forecasting	
Indonesia	X	X			... map generation
Lao PDR	X				...ion for flooding in
Mongolia		X			
Myanmar	X				... in Shwegyin Basin
Philippines	X			... Access to output of GCMs Integration of in-situ and satellite data in flood and drought monitoring Flood hazard mapping Climate change scenario building	
Sri Lanka				CB for policy makers, professionals and implementation officers, technical support staff, end users of water resources	
Thailand	X	X		Data assimilation Climatic model for long range forecast Radar interpretation Meteorological early warning system	
Vietnam	X	X	X	Technical transfer of forecasting models and methods Transform satellite data into information Training of GIS and mapping	Proposal of demonstration projects -Flood forecasting: Huong river basin -Water quality: Huong river basin -Drought forecasting: Sough-Central region

FLOODS PROVIDE A GOOD BASIS FOR THE CONVERGENCE OF DATA SYSTEMS AT SCALES UP TO REGIONAL.

Source: GEOSS/AWCI AP Symposium, Jan 2007

CONVERGENCE ACROSS FUNCTIONS

How can we effectively integrate across the various functions required to deliver “data to knowledge” services?



South American Land Data Assimilation System (SALDAS): An example of bringing diverse data sets together.

Goal: combine local observations and parameters with NASA advanced hydrological modeling expertise and capabilities to improve Global and SA NWP, climate and water management through collaboration with various centers (government, universities and research institutes). SALDAS is seeks to enhance regionally GLDAS by using local capabilities.

	Current Specifications	Planned Specifications
Spatial Extent	South America (12N/60S - 85W/30W)	*Same*
Spatial Resolution	1/8 Degrees	*Same*
Time Period	Retrospective (2000-2004)	Near real time (2002-present)
Temporal Resolution	15 minute time steps, 3-hourly output fields	*Same*
Land Surface Models	NOAH, SSiB	NOAH, SSiB, CLM, SiB3
Output Format	BIN, GRIB	*Same*
Elevation Definition	GTOPO30	*Same*
Vegetation Definition	University of Maryland, 1 km	UMD, CPTEC/INPE, MODIS maps
Soils Definition	Reynolds, Jackson, and Rawls [1999]	CPTEC/INPE soils maps

CONVERGENCE ACROSS USER NEEDS

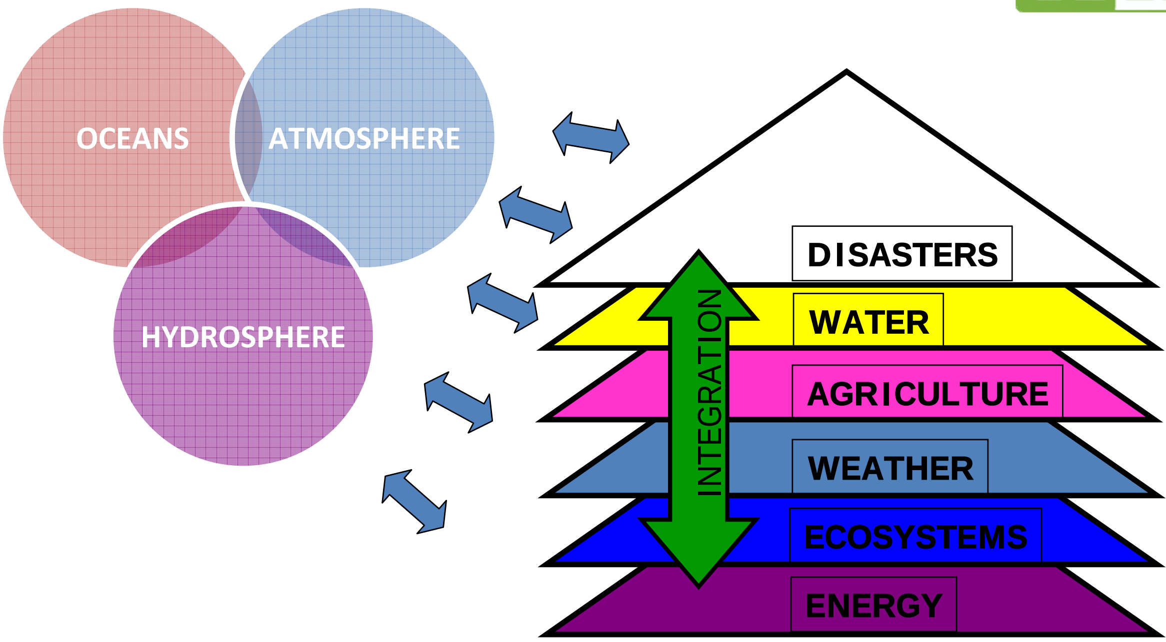
ANALYSIS OF CAPACITY BUILDING REQUIREMENTS

(BASED ON INPUTS FROM PARTICIPANTS AT AN IGWCO MEETING IN EARLY 2005)

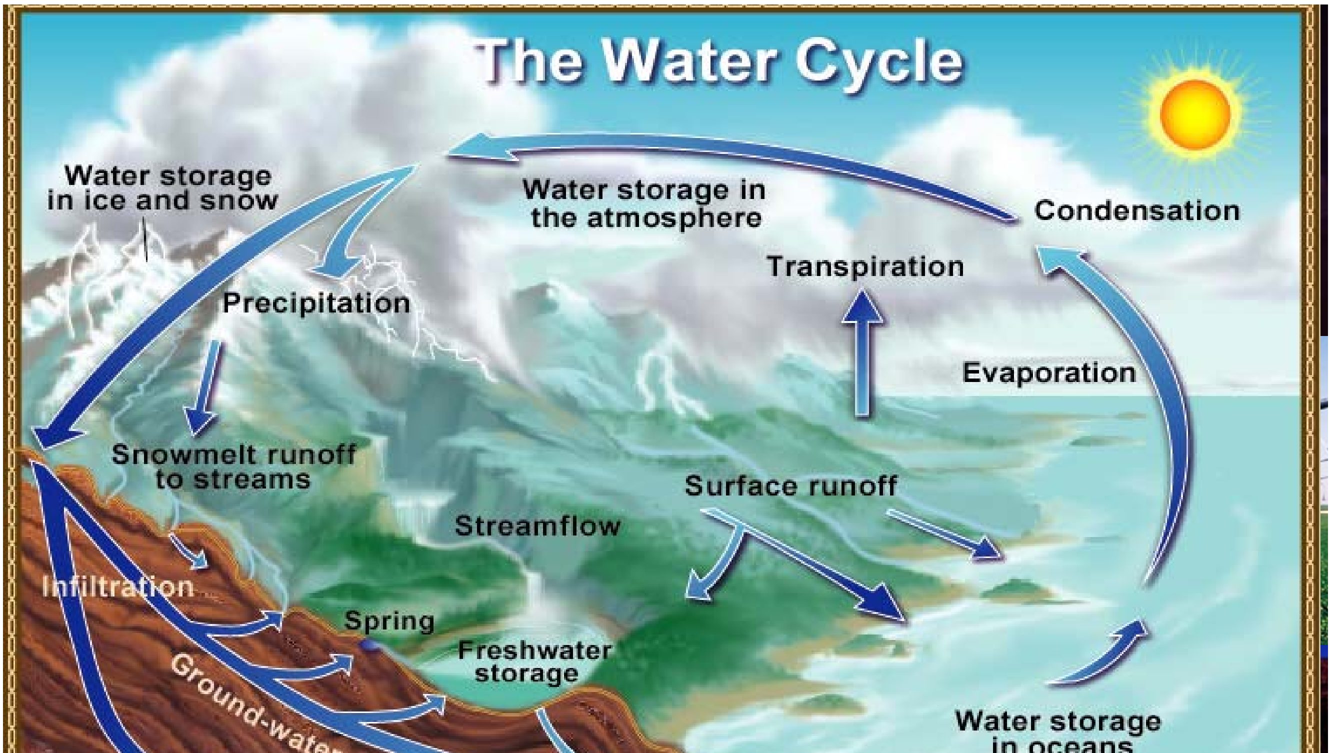
	Data access	Meas. Of var.	In-situ networks	Sat Data Process.	Tech/info For WRM	Prediction System	Applic./ Training
China							
Ecuador							
India							
Indonesi							
Mongolia							
Panama							
Philippines							
Viet Nam							

Based on the information on capacity building needs given at this workshop it is evident that a great deal of progress has been achieved in the past 2 ½ years.

INTEGRATION ACROSS OBSERVATION / DATA USE **COMMUNITIES**



EACH **COMMUNITY** HAS ITS OWN POLICIES, OBSERVATIONS (IN SITU AND SPACE), TOOLS & CULTURES

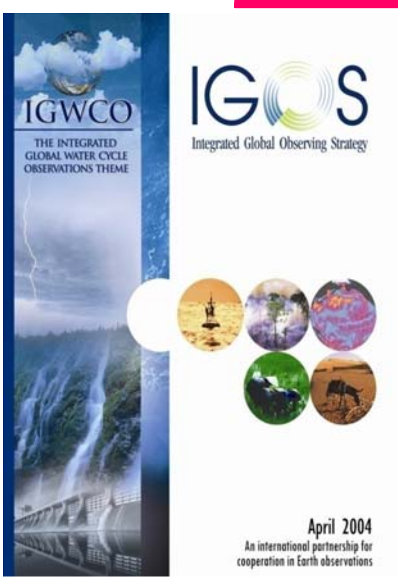


The Global Water Cycle affects every GEO Societal Benefit Area and represents a natural convergence focus for addressing all the information challenges of GEO SBAs.

CONVERGENCE ACROSS PROGRAMS

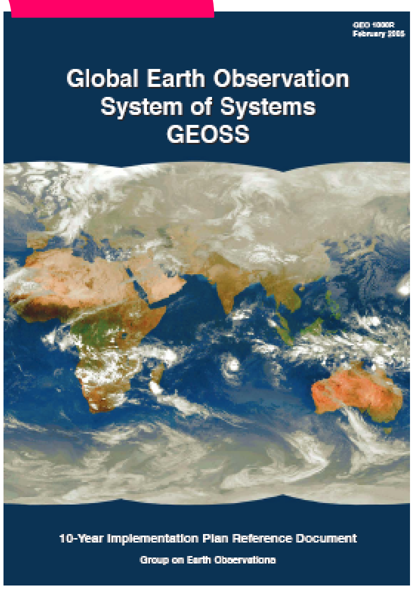
2007

IDEAS TRANSFERRED INTO GEO
TYIPP AS TARGETS AND NOW INTO 2006
AND 2007-2009 WORK PLAN ITEMS



SOME GWC TARGETS IN THE GEO TYIPP:
- PRECIPITATION
- NETWORKS OF SUPERSITES
- NETWORK PLANNING
- DATA SHARING
- CAPACITY BUILDING

CEOP AND IGWCO DELIVERED ON A NUMBER OF WATER CYCLE TASKS



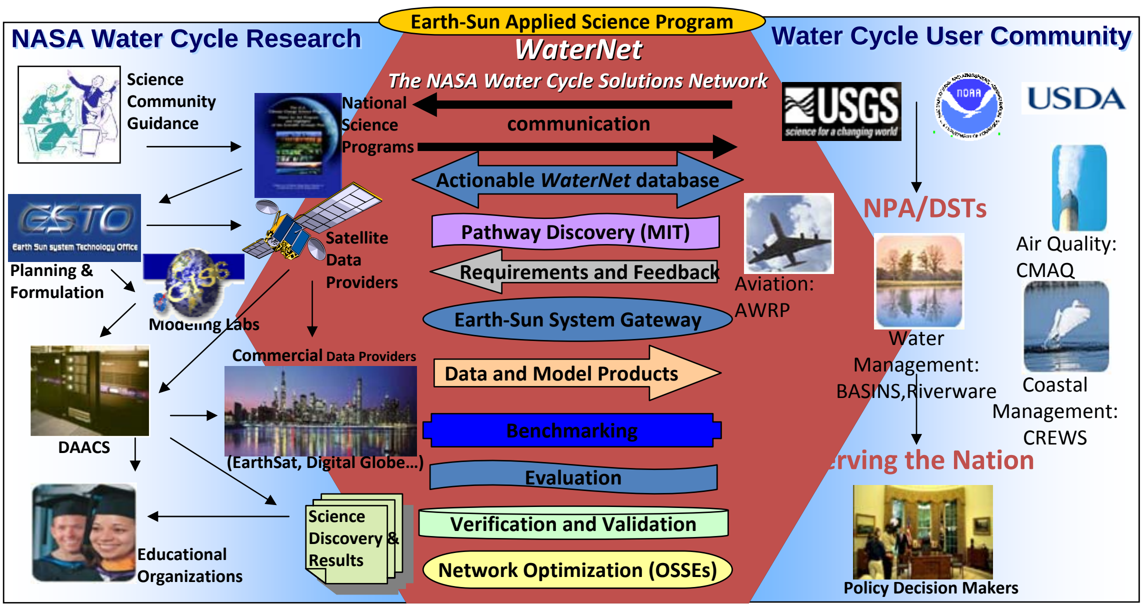
WATER CYCLE COMMUNITY OF PRACTICE

Under the GEO User Interface Committee a Water Cycle Community of Practice is being developed. It will provide:

1) Definition of the needs of information on best practices
2) Definition of the needs for Earth Observations and analysis tools
3) Sharing of experiences on the use of Earth Observations
4) Consensus on best practices

WaterNet

WaterNet GOAL: **improve and optimize the sustained ability of water cycle researchers, stakeholders, organizations and networks to interact, identify, harness, and extend NASA research results to augment decision support tools and meet national needs.**



WATER CYCLE COMMUNITY OF PRACTICE

Definition of the needs of information on best practices
Definition of the needs for Earth Observations and analysis tools
Sharing of experiences on the use of Earth Observations
Development of a consensus on best practices

Regional initiatives can provide convergence to a Global Community of Practice.

Strategies for encouraging convergence:

- Standards for observations
- Shared data in a centralized or an interoperable distributed data system
- Common data analysis and visualization tools
- Interoperable web sites and information distribution
- Best practices for the use of Earth Observations
- Programs that promote solutions through convergence

The Asian Water Cycle Initiative science community shows remarkable coherence, commitment and capability in achieving convergence. The global water cycle community is looking to Asia for examples of how to converge and integrate through capacity building, demonstration projects and data systems.