Coordination Group for Meteorological Satellites

CGMS

CGMS contribution to GEO/GEOSS - GEO Water Strategy

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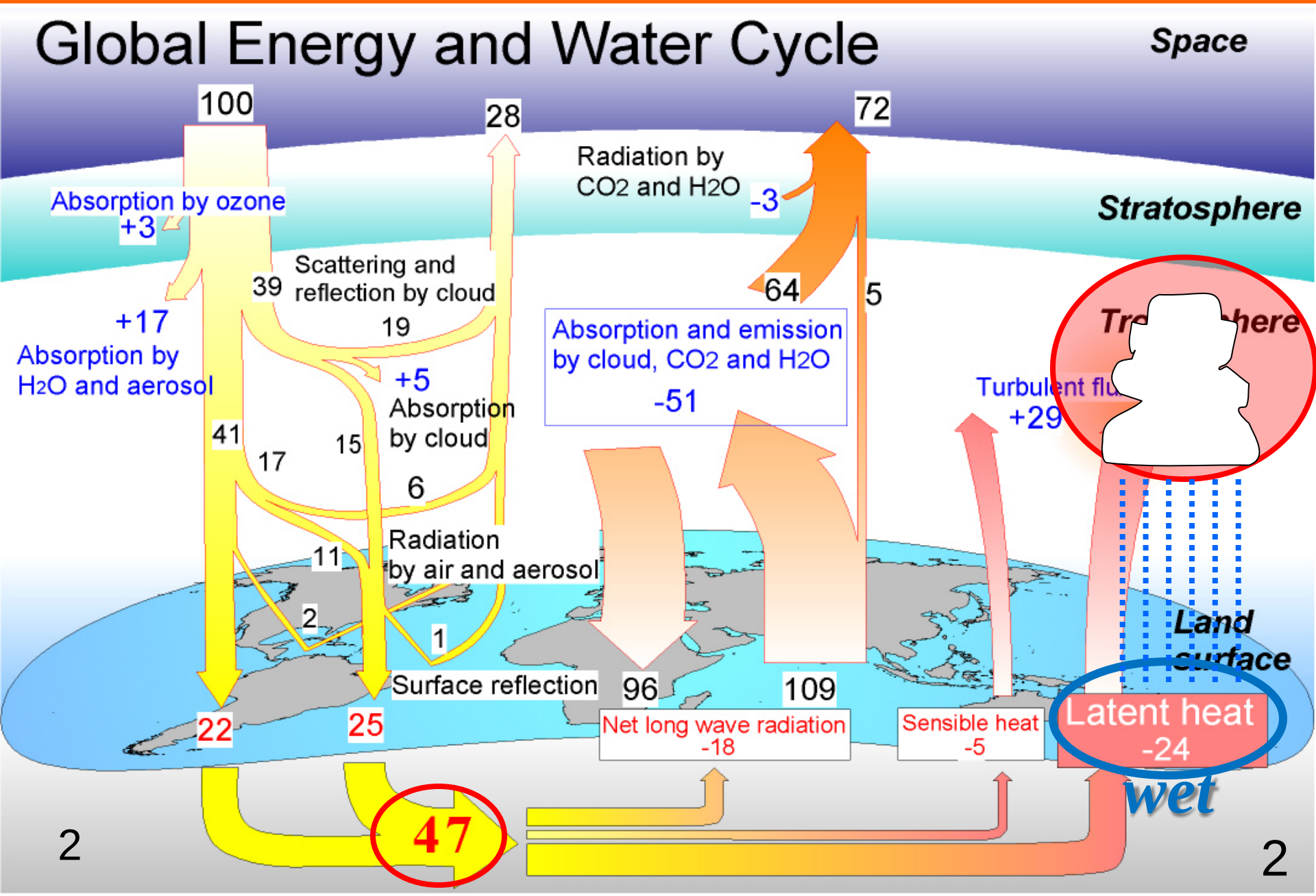
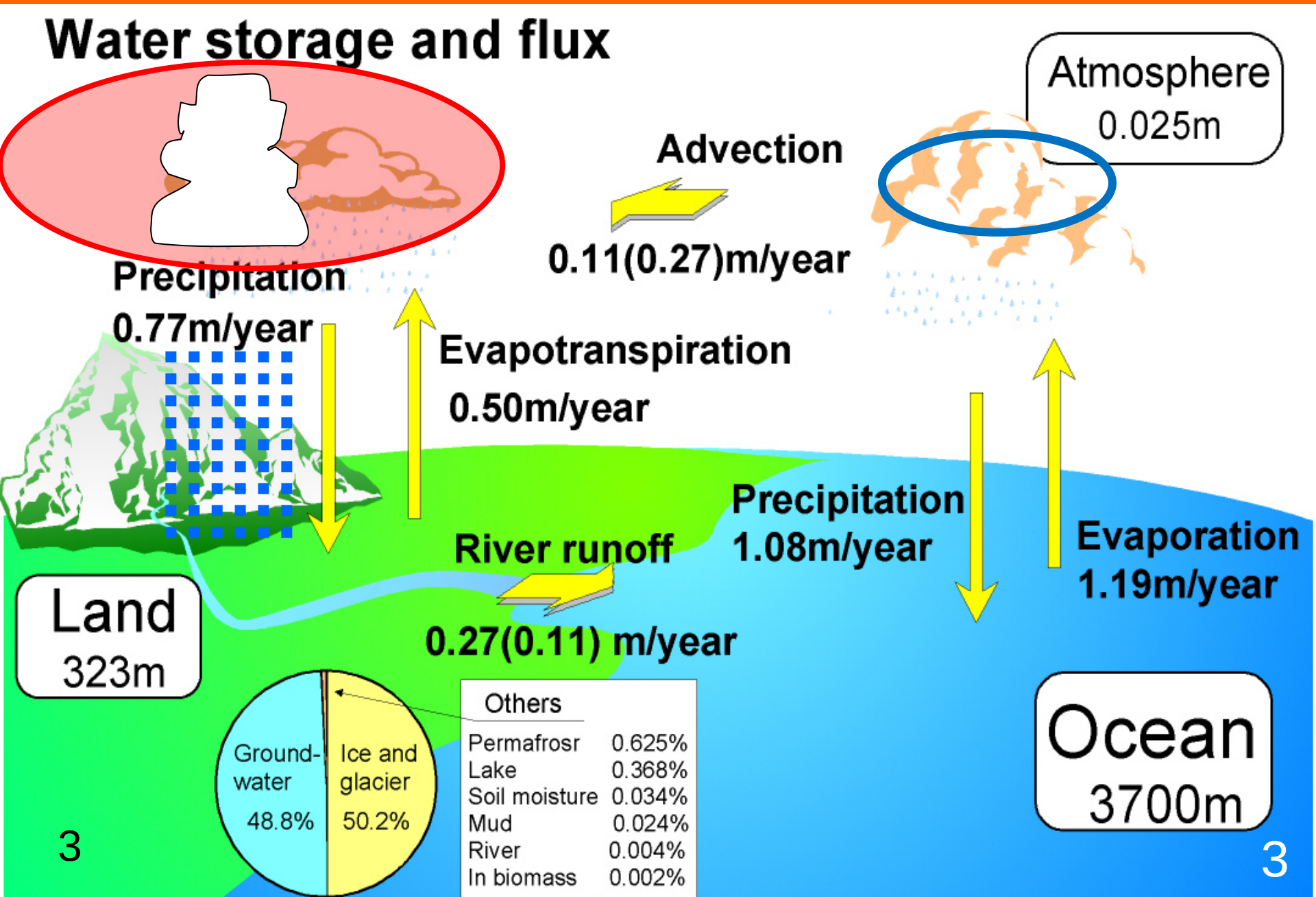

Global Energy and Water Cycle
Space
Stratosphere
100
28
72
Radiation by
CO2 and H2O
-3
Absorption by ozone
+3
39
Scattering and
reflection by cloud
19
64
5
+17
Absorption by
H2O and aerosol
Absorption and emission
by cloud, CO2 and H2O
-51
+5
Absorption
by cloud
41
17
15
6
Turbulent flu
+29
Radiation
by air and aerosol
11
2
1
Land
surface
Surface reflection
96
109
22
25
Net long wave radiation
-18
Sensible heat
-5
Latent heat
-24
wet
47
2
2

Variability of Climate and Water Cycle: Unique Roles of Water



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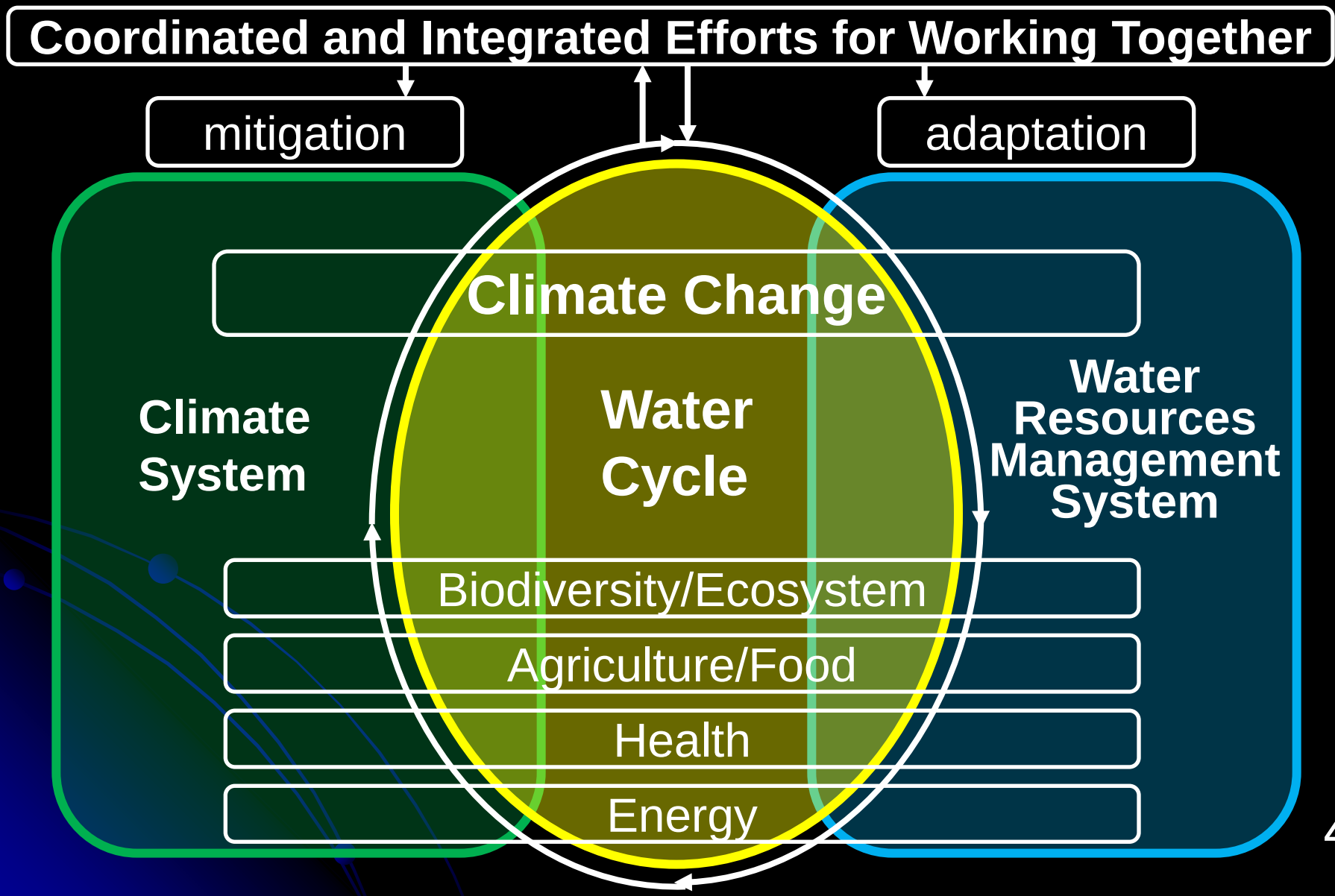
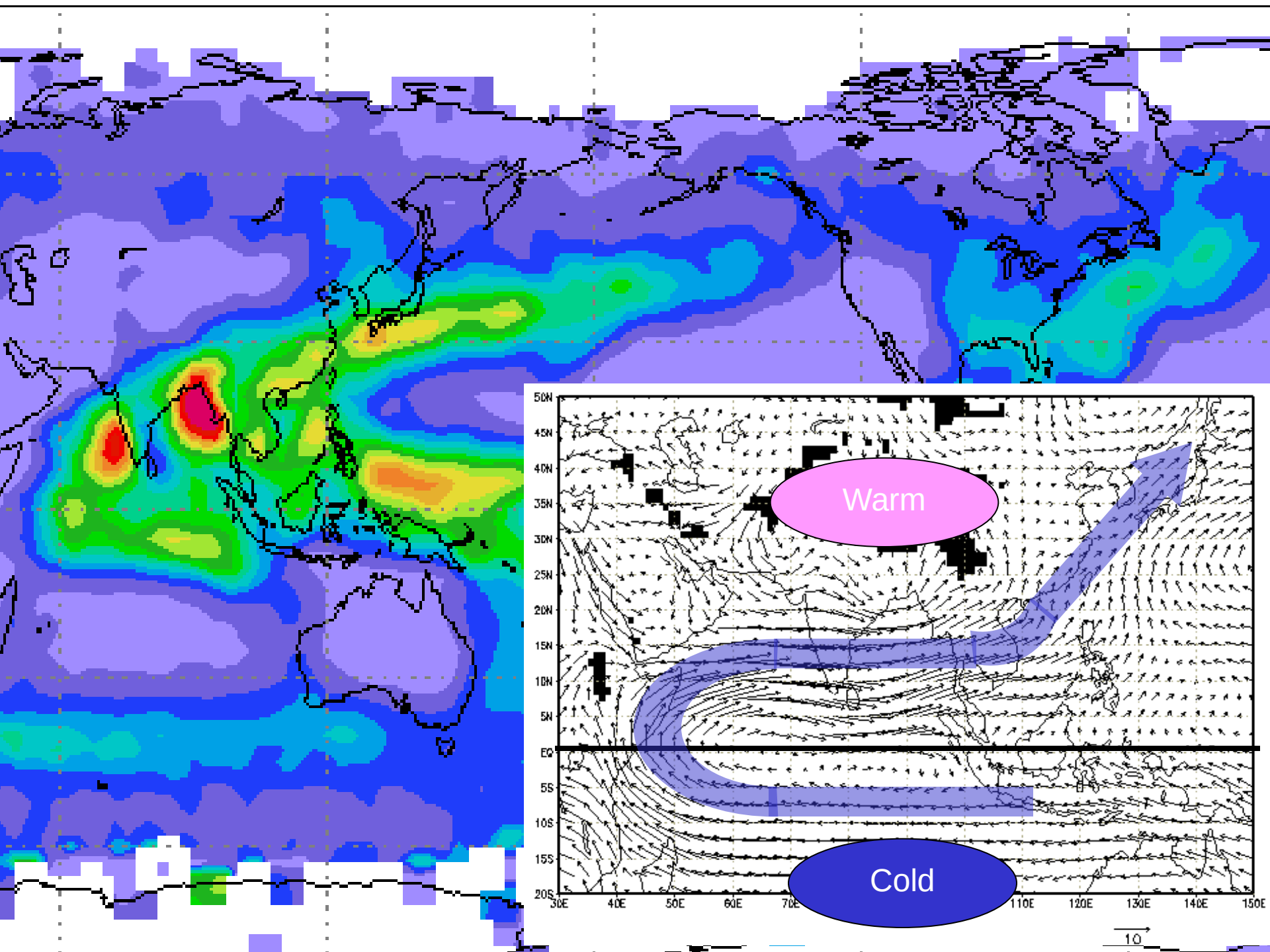
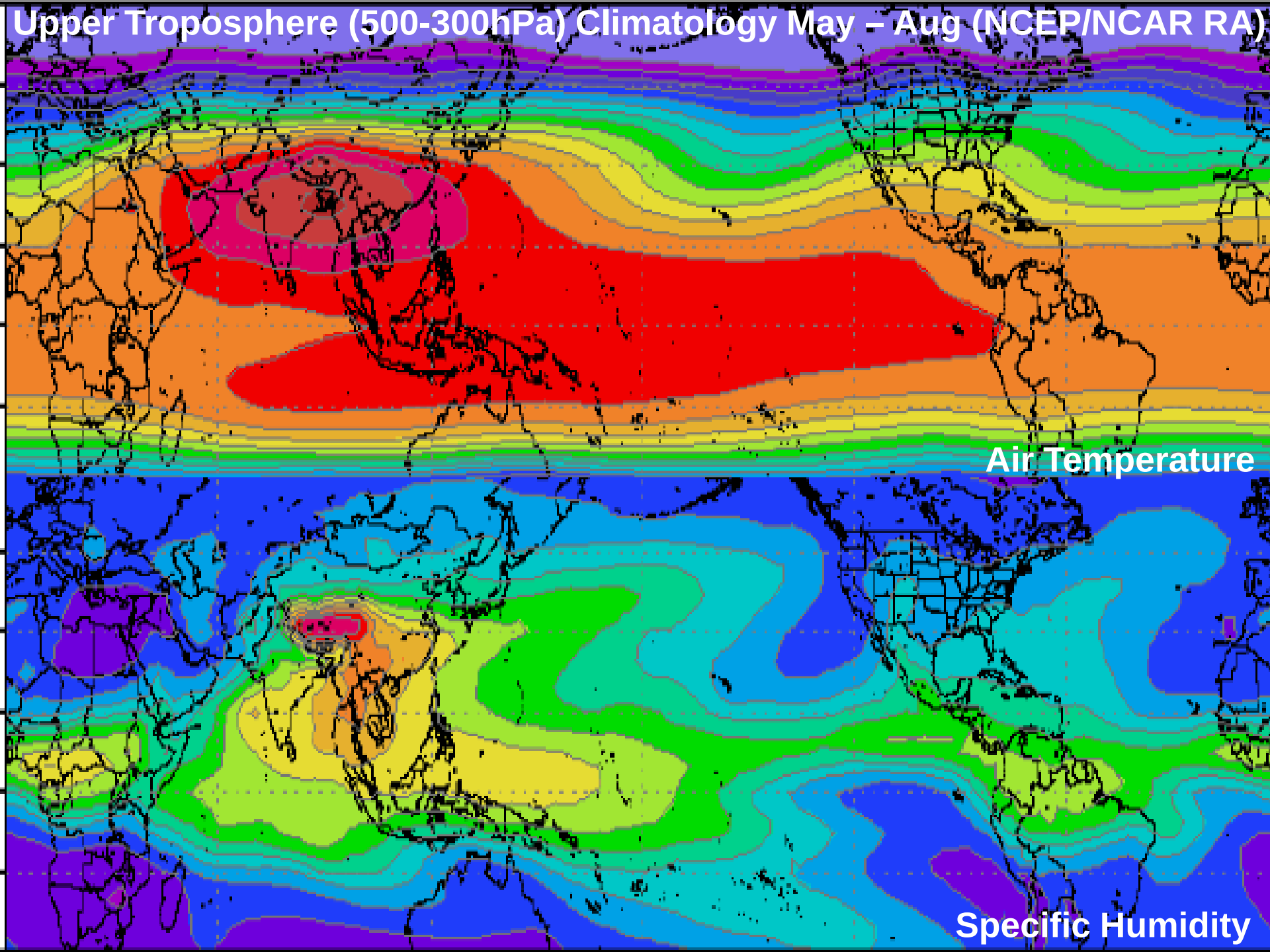
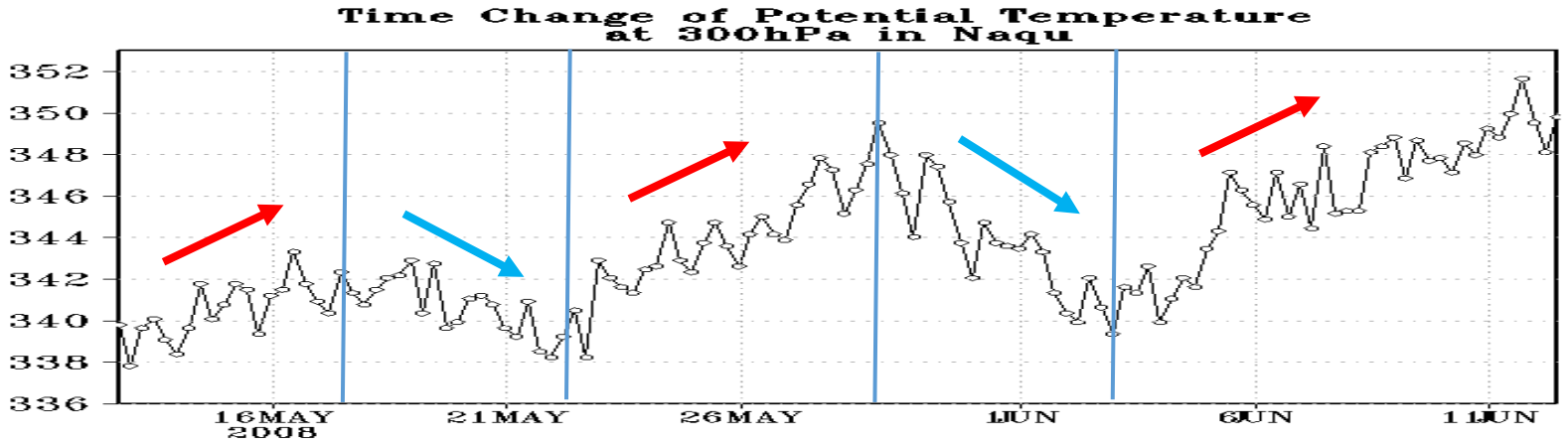
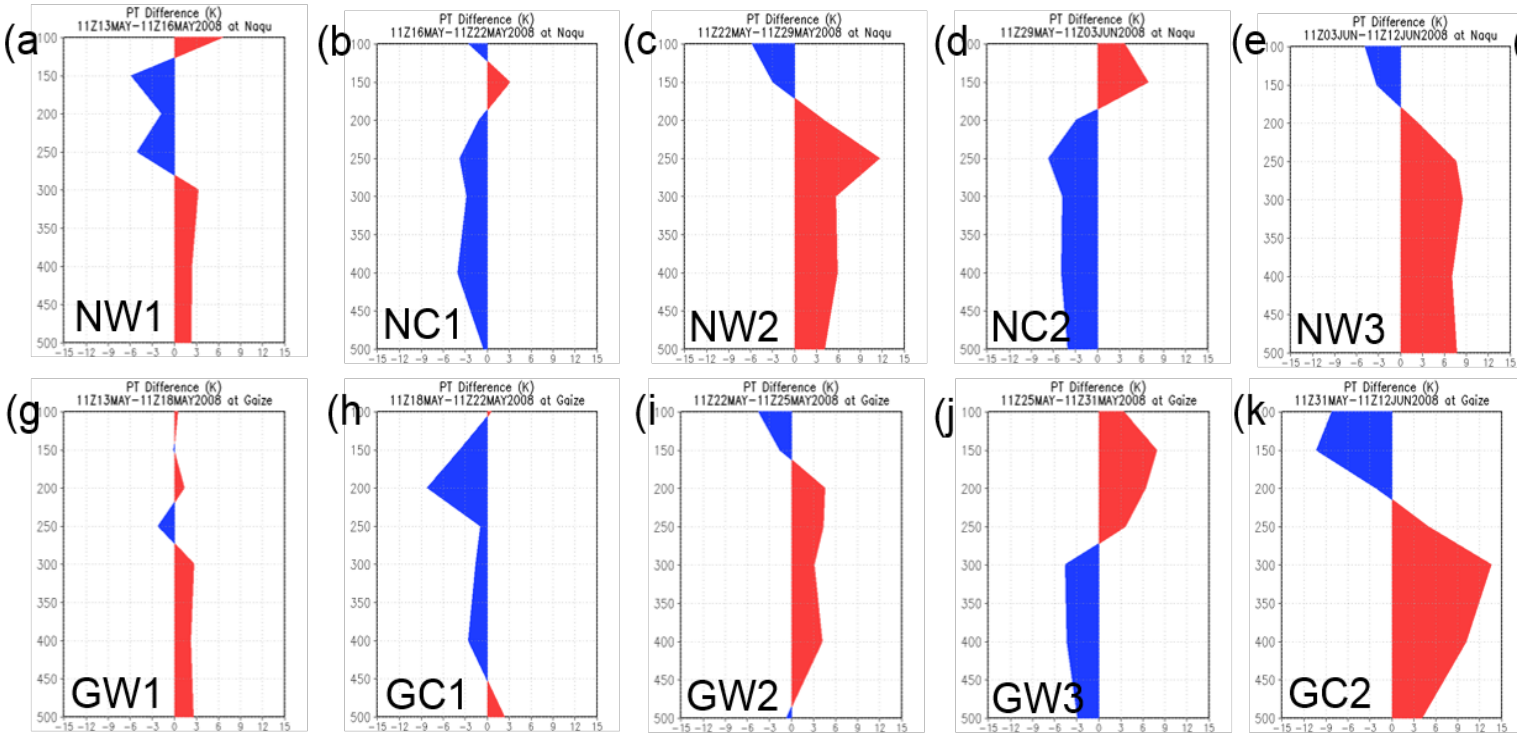

Coordinated and Integrated Efforts for Working Together
mitigation
adaptation
Climate Change
Climate System
Water Cycle
Water Resources Management System
Biodiversity/Ecosystem
Agriculture/Food
Health
Energy


50N
45N
40N
35N
30N
25N
20N
15N
10N
5N
EQ
5S
10S
15S
20S
30E
40E
50E
60E
70E
110E
120E
130E
140E
150E
Warm
Cold
10

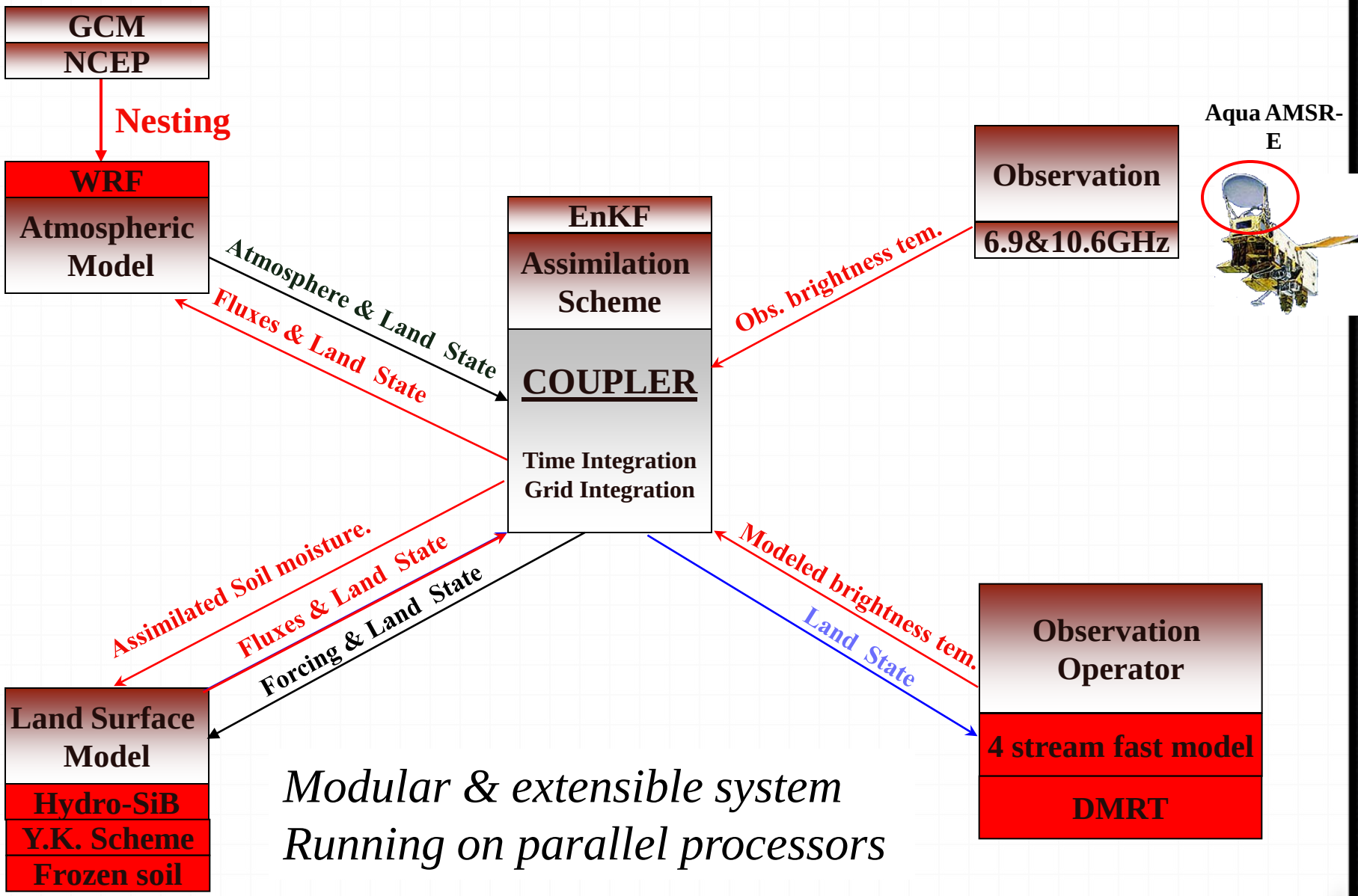

Upper Troposphere (500-300hPa) Climatology May – Aug (NCEP/NCAR RA)
Air Temperature
Specific Humidity

JICA-Tibet Intensive Radio Sonde Observation
May 13 to June 11 at Naqu and Gaize



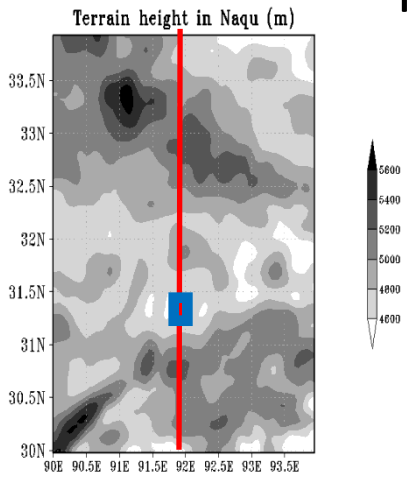


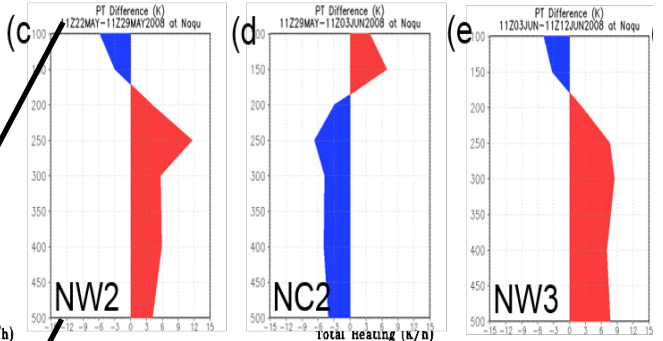
LDAS-A on COUPLER

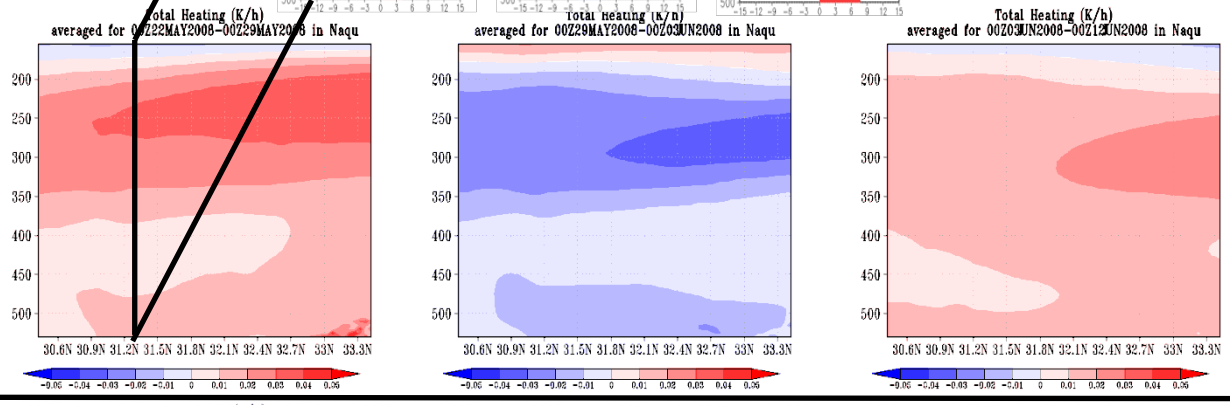


Modular & extensible system
Running on parallel processors

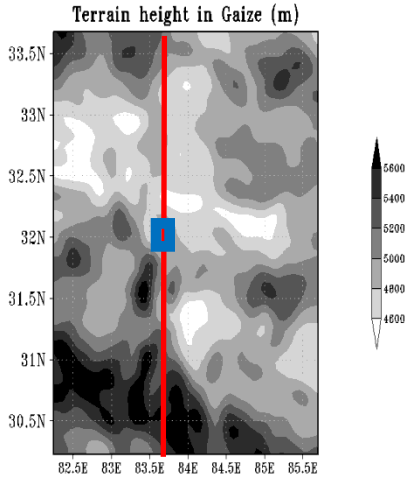
Naqu

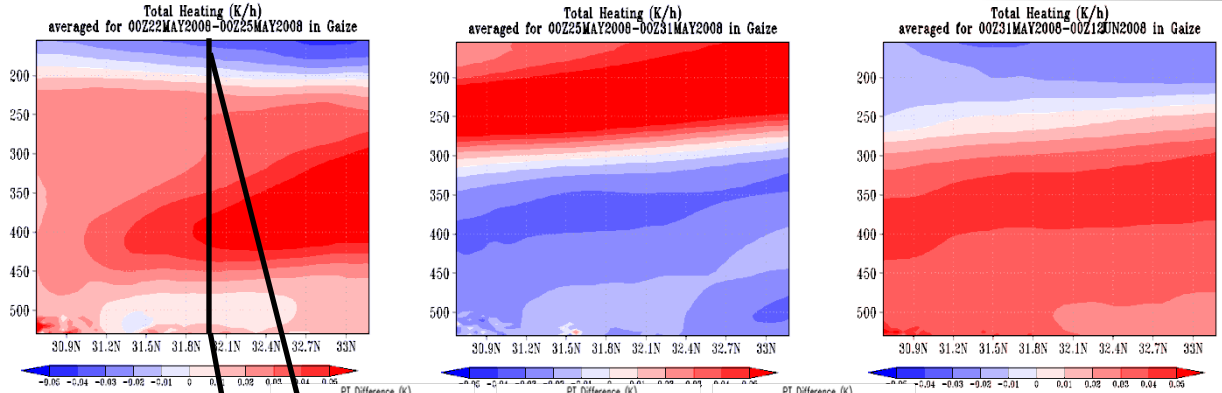

Terrain height in Naqu (m)
33.5N
33N
32.5N
32N
31.5N
31N
30.5N
30N
90E 90.5E 91E 91.5E 92E 92.5E 93E 93.5E
5600
5400
5200
5000
4800
4600

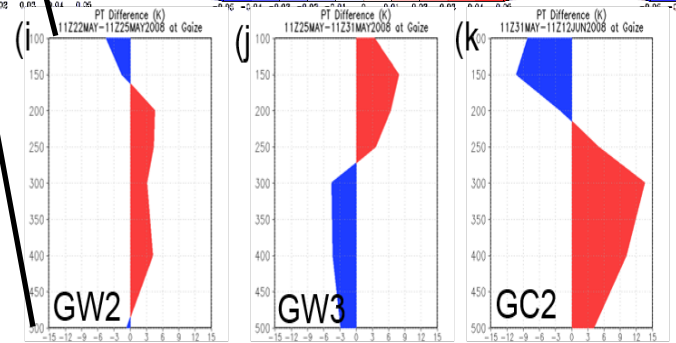

(c
PT Difference (K)
11Z22MAY-11Z29MAY2008 at Naqu
NW2
(d
PT Difference (K)
11Z29MAY-11Z03JUN2008 at Naqu
NC2
(e
PT Difference (K)
11Z03JUN-11Z12JUN2008 at Naqu
NW3


Total Heating (K/h)
averaged for 00Z22MAY2008-00Z29MAY2008 in Naqu
Total Heating (K/h)
averaged for 00Z29MAY2008-00Z03JUN2008 in Naqu
Total Heating (K/h)
averaged for 00Z03JUN2008-00Z12JUN2008 in Naqu
30.6N 30.9N 31.2N 31.5N 31.8N 32.1N 32.4N 32.7N 33N 33.3N

Gaize

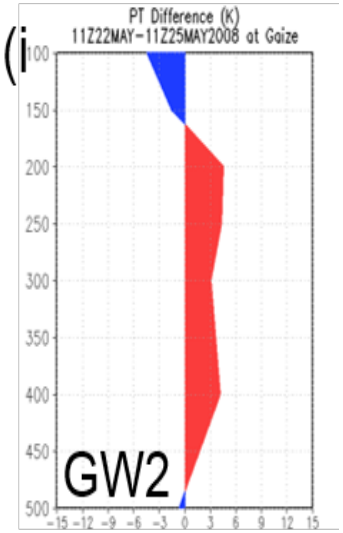

Terrain height in Gaize (m)
33.5N
33N
32.5N
32N
31.5N
31N
30.5N
82.5E 83E 83.5E 84E 84.5E 85E 85.5E
5600
5400
5200
5000
4800
4600

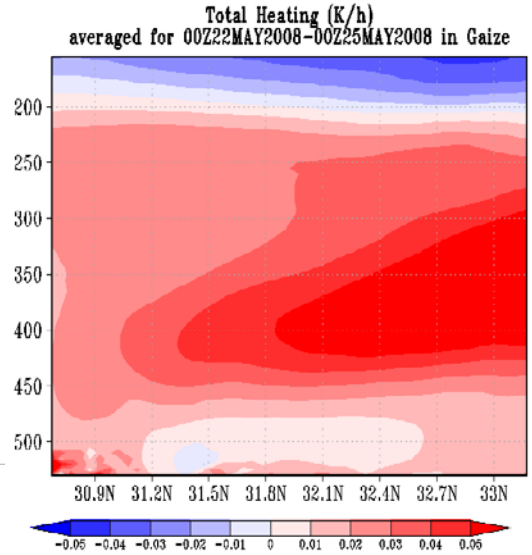

Total Heating (K/h)
averaged for 00Z22MAY2008-00Z25MAY2008 in Gaize
Total Heating (K/h)
averaged for 00Z25MAY2008-00Z31MAY2008 in Gaize
Total Heating (K/h)
averaged for 00Z31MAY2008-00Z12JUN2008 in Gaize
30.9N 31.2N 31.5N 31.8N 32.1N 32.4N 32.7N 33N


(i
PT Difference (K)
11Z22MAY-11Z25MAY2008 at Gaize
GW2
(j
PT Difference (K)
11Z25MAY-11Z31MAY2008 at Gaize
GW3
(k
PT Difference (K)
11Z31MAY-11Z12JUN2008 at Gaize
GC2

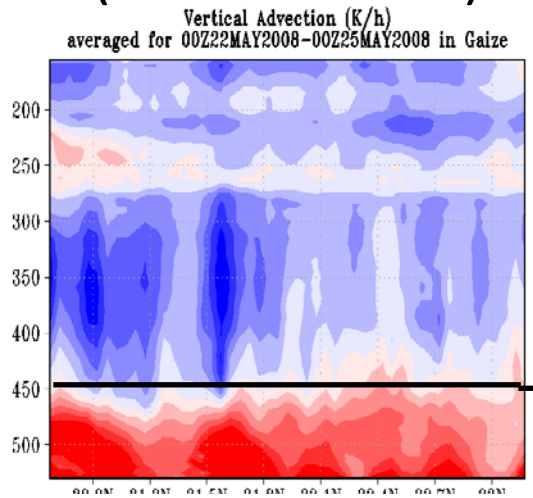
Warming Phase in Pre-monsoon Season

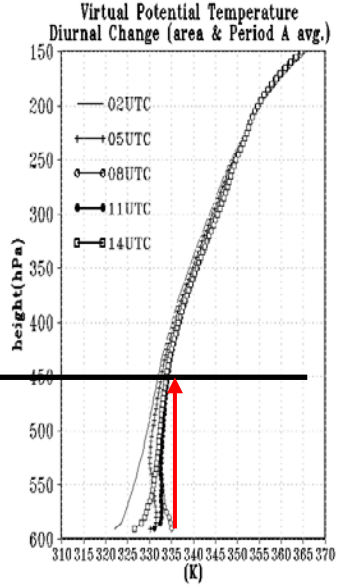
Total Heating

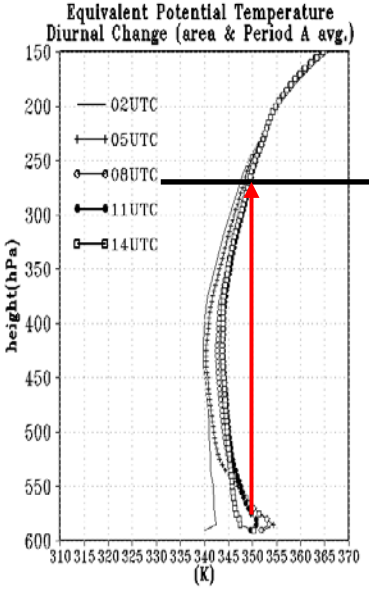


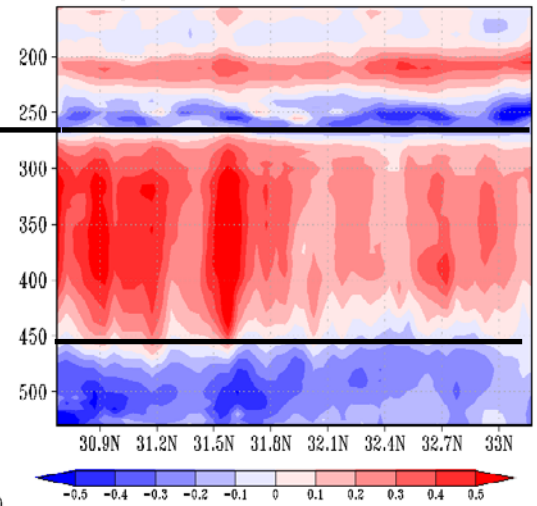


Vertical Advection (Sensible Heat)

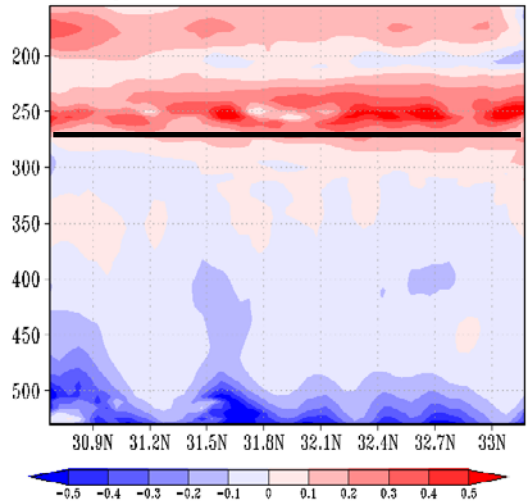


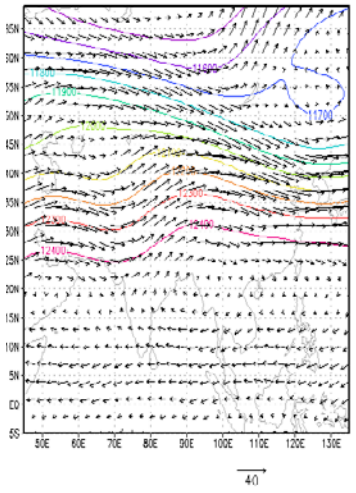






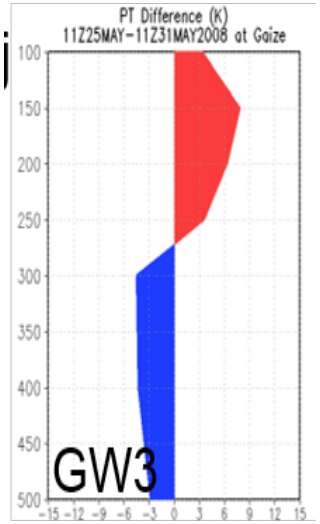
Latent Heat



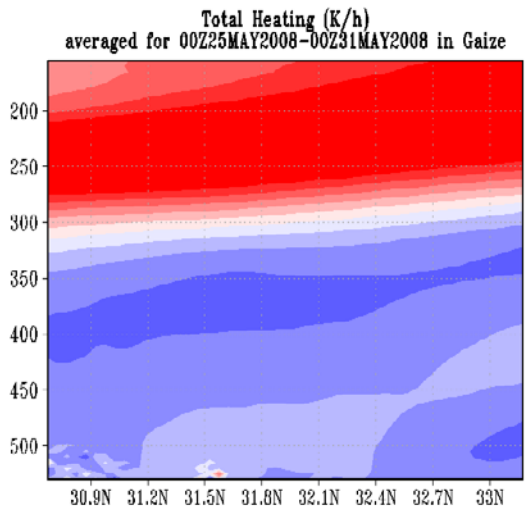


Horizontal Advection

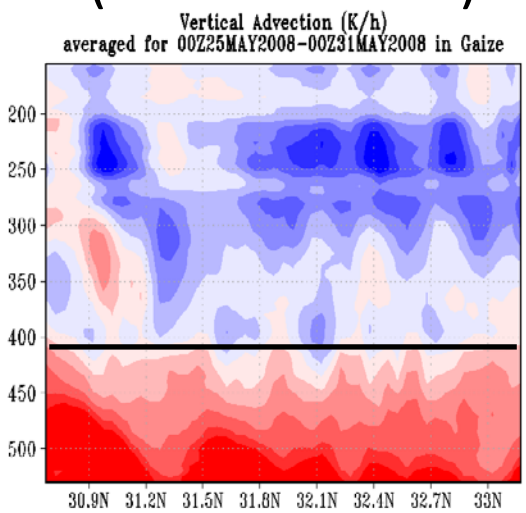
Warming Phase in Pre-monsoon Season

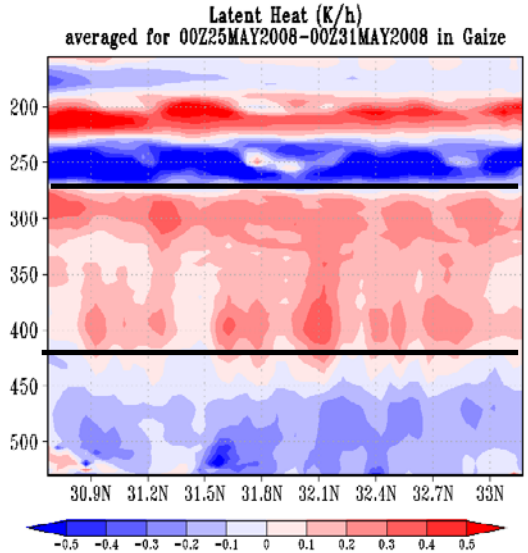


Total Heating

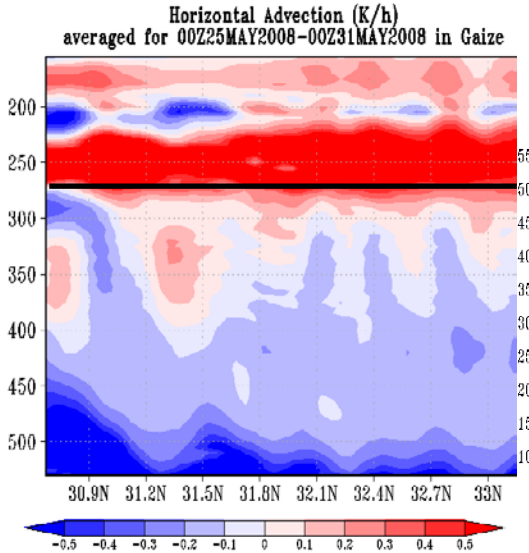


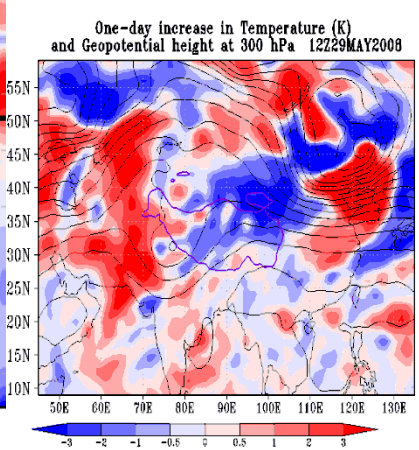
Vertical Advection (Sensible Heat)



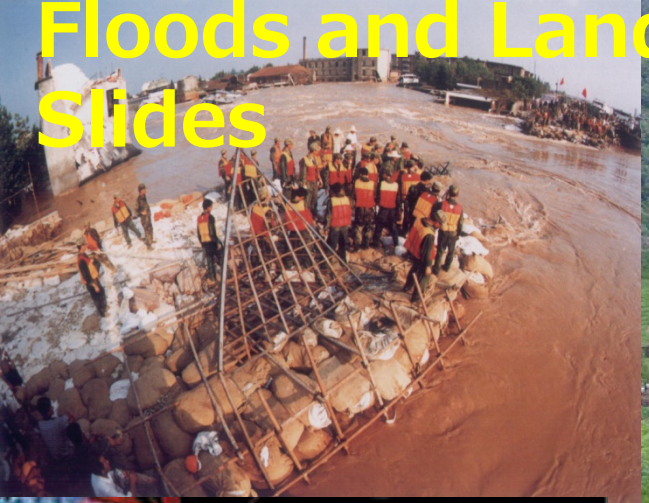


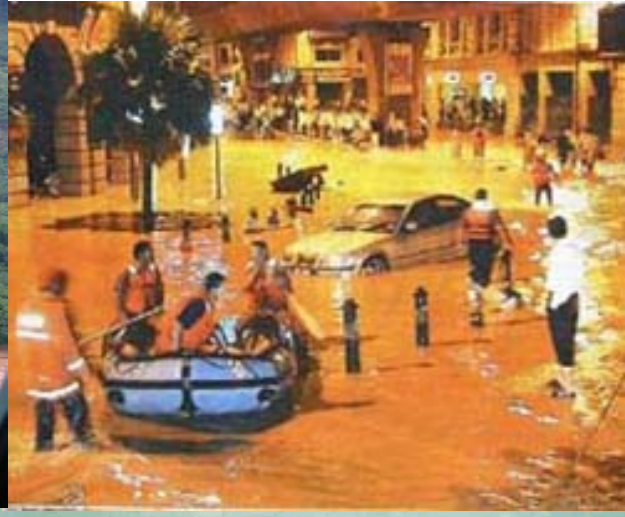
Latent Heat

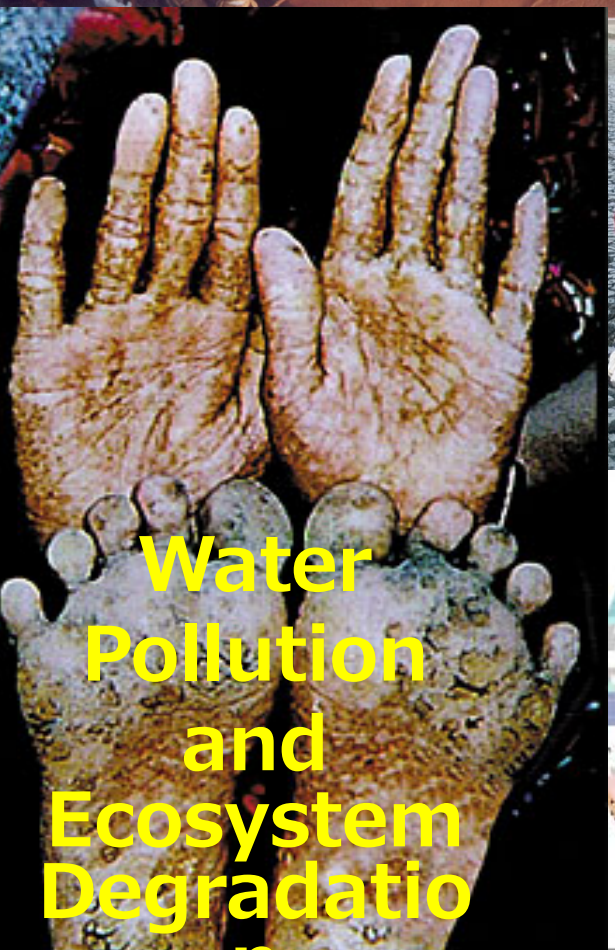




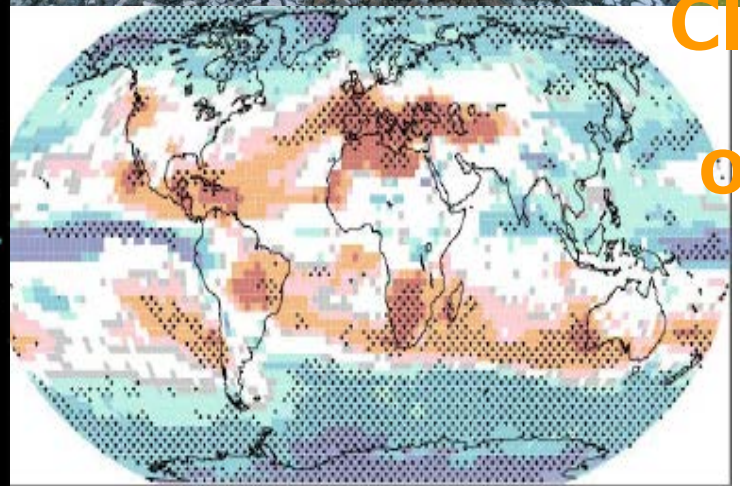
Horizontal Advection

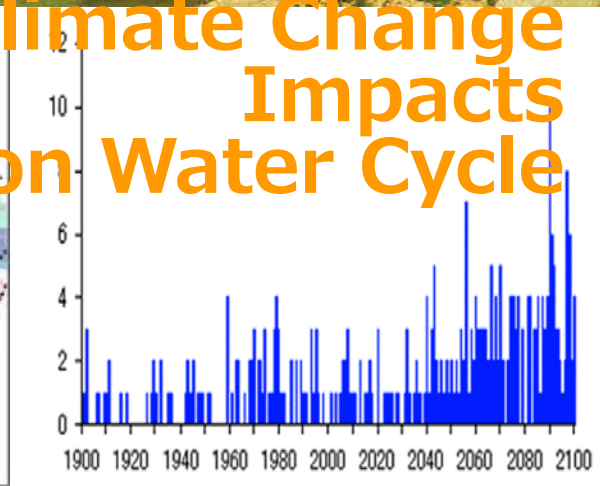

Floods and Land Slides




Water Pollution and Ecosystem Degradatio


Drought and Water




Climate Change Impacts on Water Cycle
10
6
4
2
0
1900 1920 1940 1960 1980 2000 2020 2040 2060 2080 2100


1st Asian Water Cycle Symposium, Tokyo, Nov. 2005


1st Task Team Meeting, Bangkok, Sep. 2006


1st Capacity Building Workshop, Sep. 2006


2nd Asian Water Cycle Symposium, Tokyo, Jan. 2007


1st GEOSS AP Symposium, Tokyo, Jan. 2007


1st International Coordination Group Meeting, Bali, Sep. 2007


3rd Asian Water Cycle Symposium, Beppu, Dec. 2007

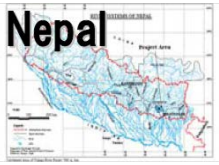
GEOSS
Asian Water Cycle Initiative (AWCI)

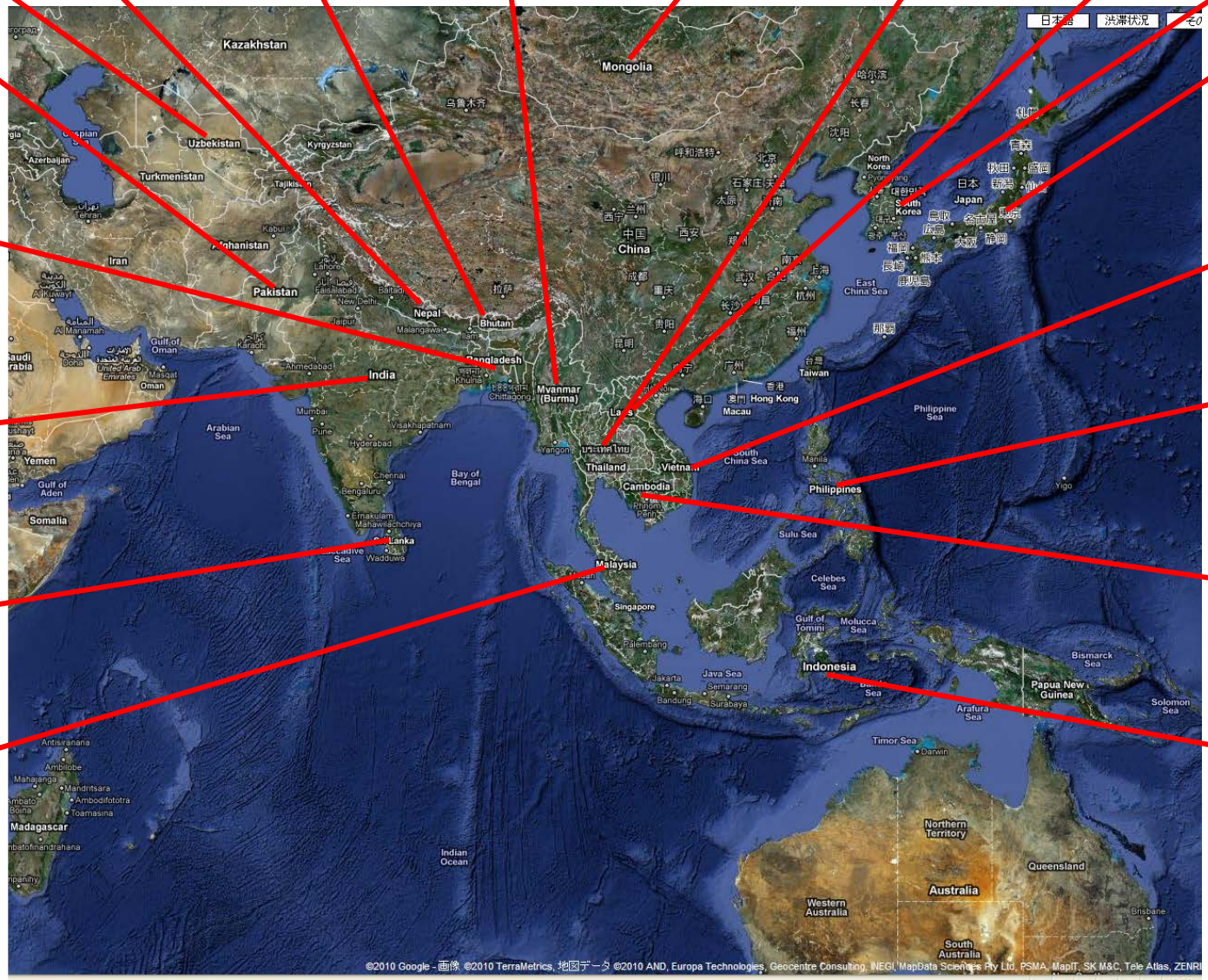
To promote integrated water resources management by making usable information from GEOSS, for addressing the common water-related problems in Asia.

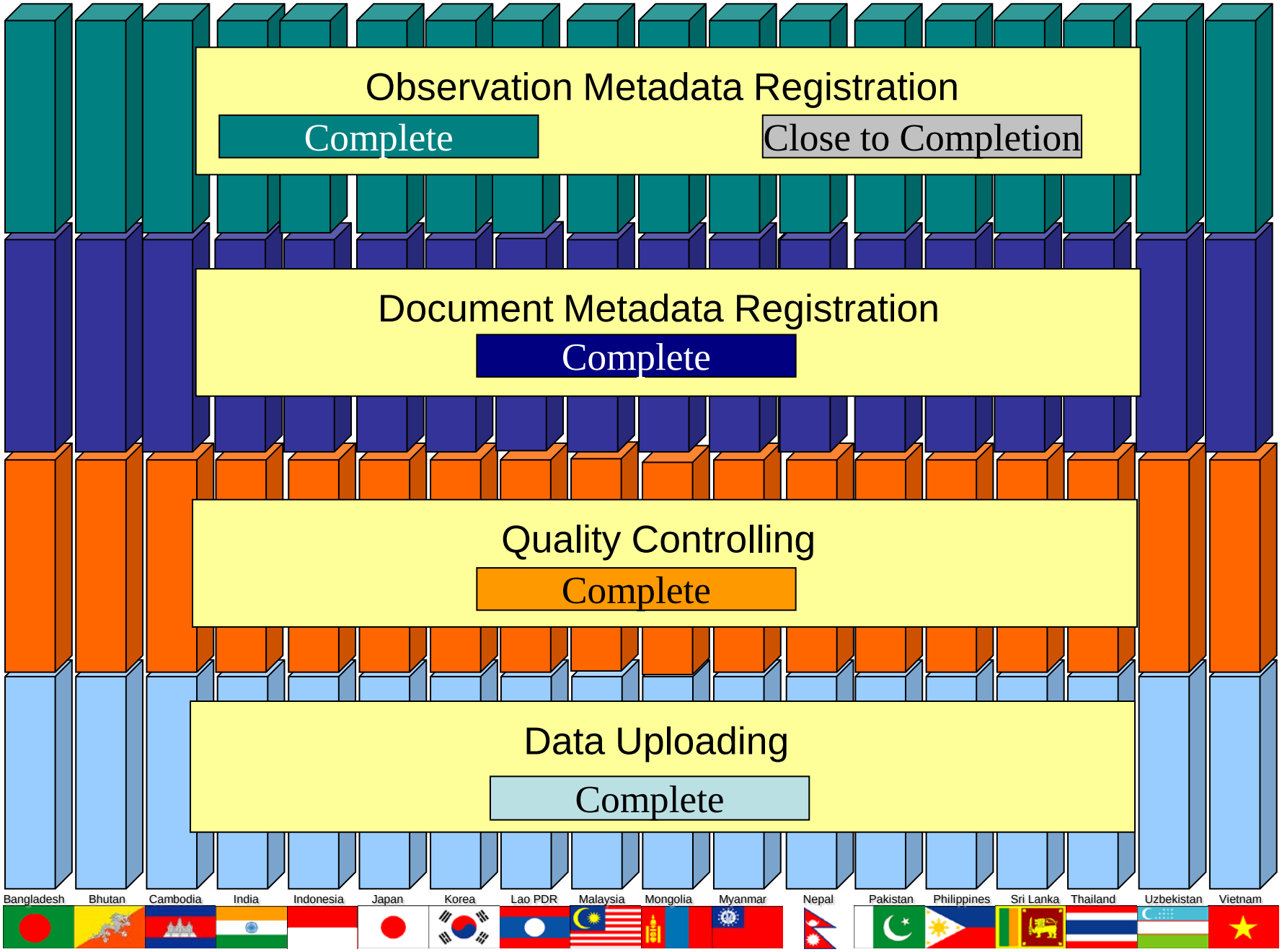
Uniqueness

- A River Basin of Each Country
- Observation Convergence
- Interoperability Arrangement
- Data Integration
- Open Data & Source Policies
- Capacity Building
- Early Achievements

Demonstration River Basins

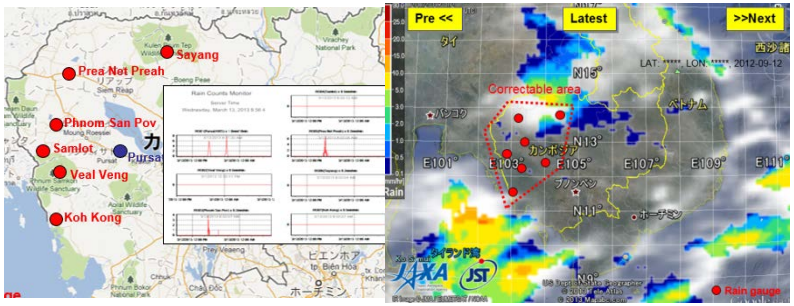





Observation Metadata Registration
Complete
Close to Completion
Document Metadata Registration
Complete
Quality Controlling
Complete
Data Uploading
Complete
Bangladesh
Bhutan
Cambodia
India
Indonesia
Japan
Korea
Lao PDR
Malaysia
Mongolia
Myanmar
Nepal
Pakistan
Philippines
Sri Lanka
Thailand
Uzbekistan
Vietnam

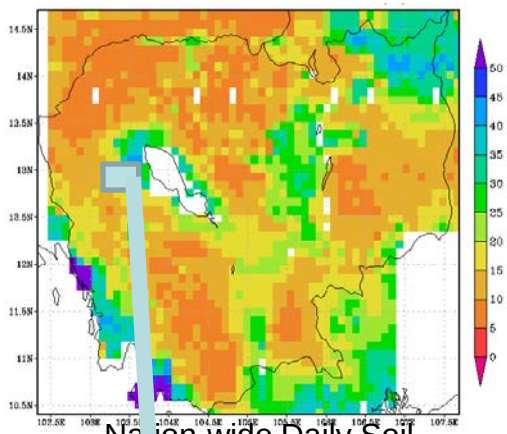
Water-Climate-Agriculture Workbench in Cambodia

Stakeholder Meeting

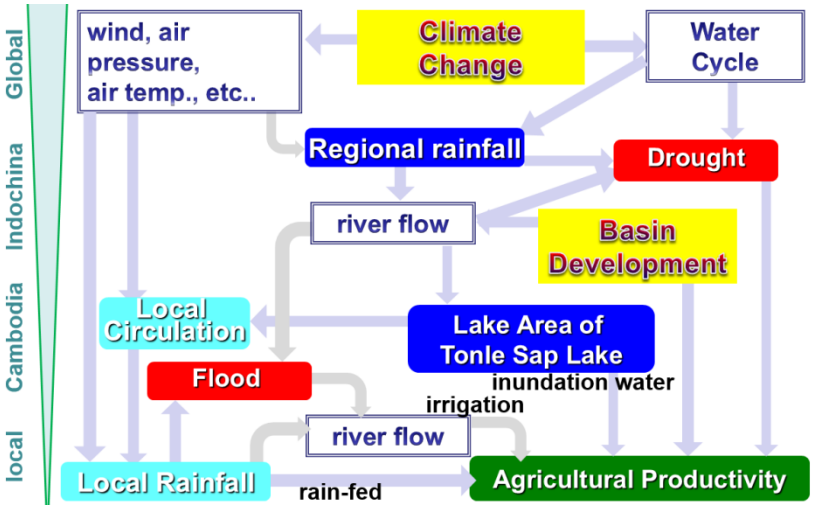


Real-time Rain Gauge → Satellite Data Correction → Wide Data Dissemination

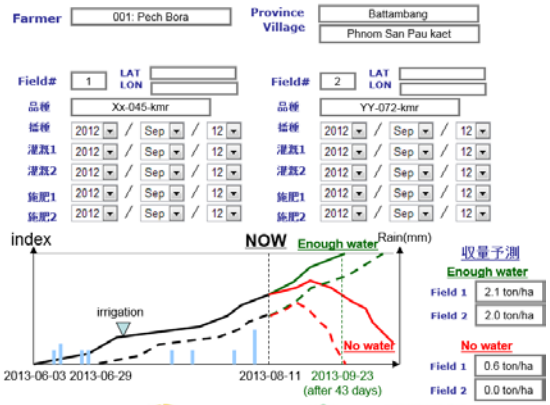
Famers' Needs & Experiences



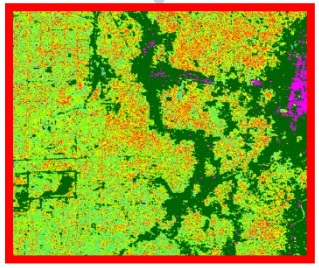
Nation-wide Daily Soil Moisture from Satellite



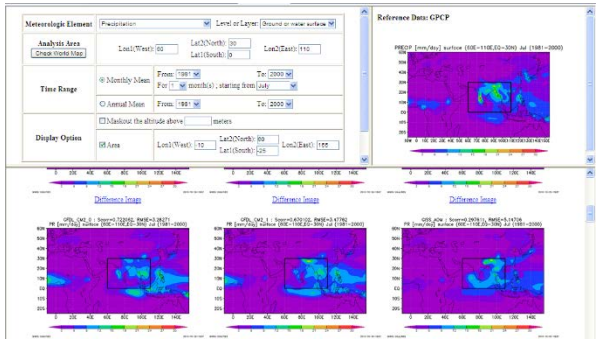
Holistic View of Water-Climate-Agriculture Problems



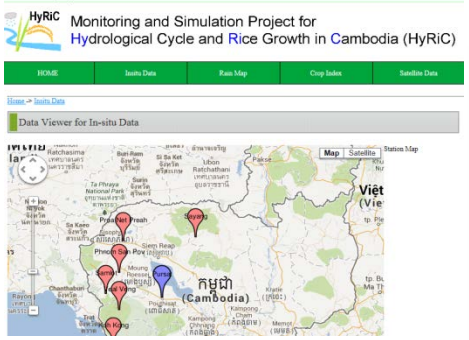
Water Cycle-Rice Production Coupled Model



Local Information

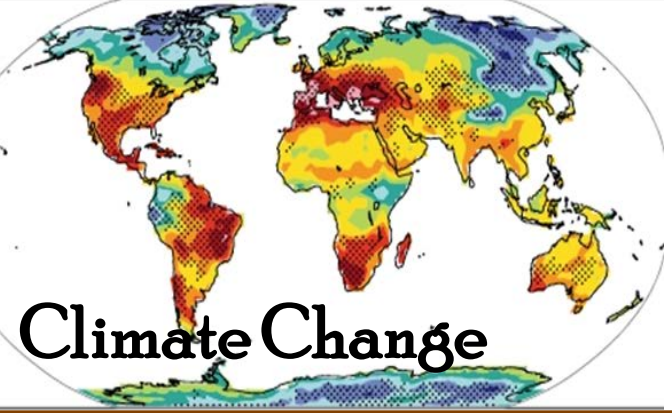


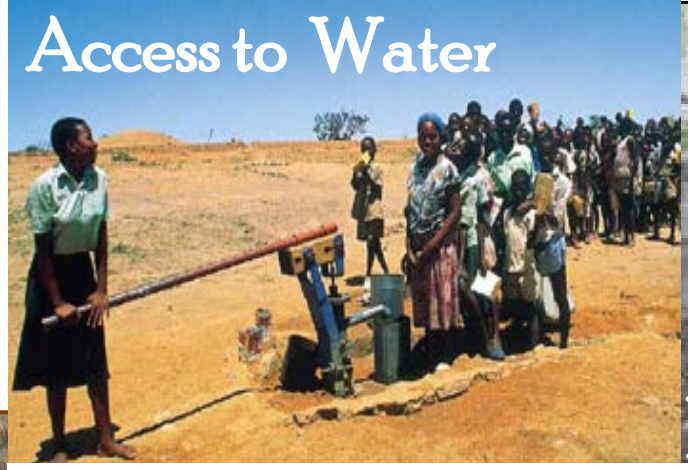
Climate Change Analysis Tools

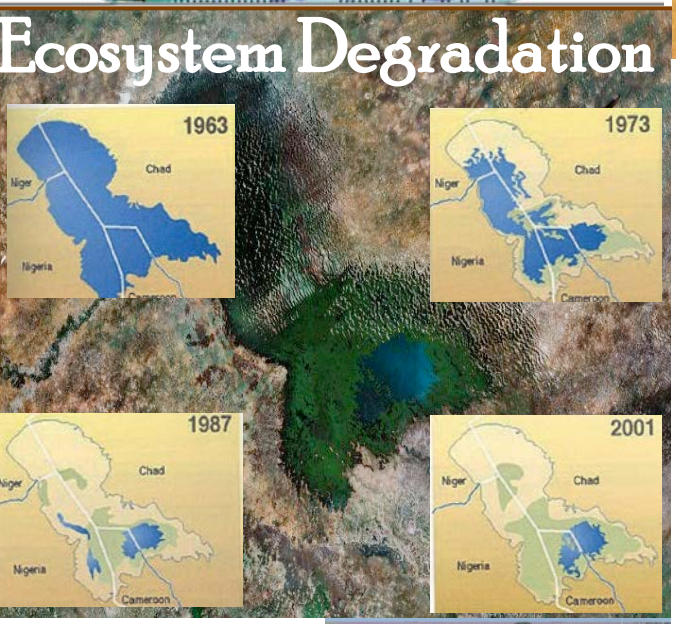


Operational Use

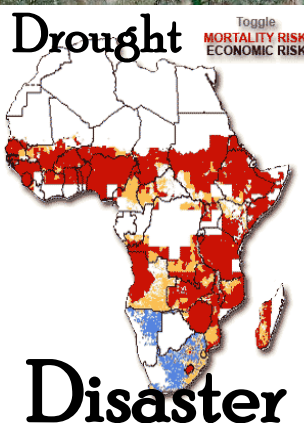
OJT for Local Practitioners

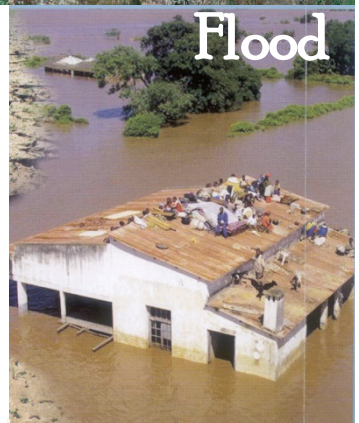


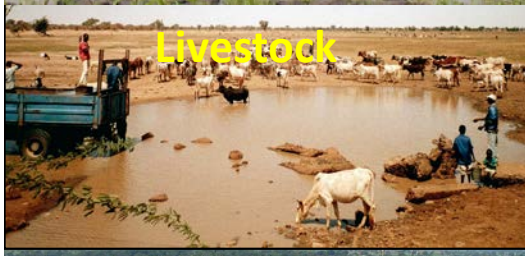




- On track to meet the MDG drinking water target: only 26 of the 53 countries
- Water related diseases: more than 80% → deaths for children under 5
- Deficient agricultural water management: e.g. only 10% of irrigable lands are actually irrigated in WA.
- Hydropower development < 7% of the potential
- 5-25% of GDP due to droughts and floods in affected countries
- Climate impacts are greatest in poor countries.







GEOSS African Water Cycle Coordination Initiative (AfWCCI)

Based on a collaboration between the **Group on Earth Observations** (GEO) and RBOs in Africa, **Global Earth Observation System of Systems** (GEOSS) supports application of coordinated, comprehensive and sustained Earth Observations and information across trans-boundary river basins in Africa, particularly focusing on:

- Observation and data management
- Capacity development on:
  - observation
  - data archiving
  - Modeling
  - Prediction
  - climate change impact assessment
  - data integration

Improvement of the water resources management capacity

Participating
Medjerda, Niger, Nile, L/Victoria, L/Chad, Okavango, Orange-Senqu, Senegal, Zambezi, Oum Er-Rabia, L'Ogooue

Goal : To facilitate better management in trans-boundary rivers in Africa

Mejerda River

Precipitation Oct – Jan (1981-2000)

GPCP

bccr_bcm 20

cccma_cg cm31

cccma_cg cm31_t63

cnrm_cm 3

csiro_mk 30

csiro_mk 35

gfdl_cm2 0

giss_mod el_eh

gfdl_cm2 1

giss_mod el_er

giss_aom

iap_fgoals 1

Miroc32_ hires

Mpi_echa m5

miroc32_ nedres

Mri_cgcm 23_2

miub_ech og

ncar_ccs m30

ncar_pcm 1

Ukmo_ha ucm3

ukmo_ha dgem1

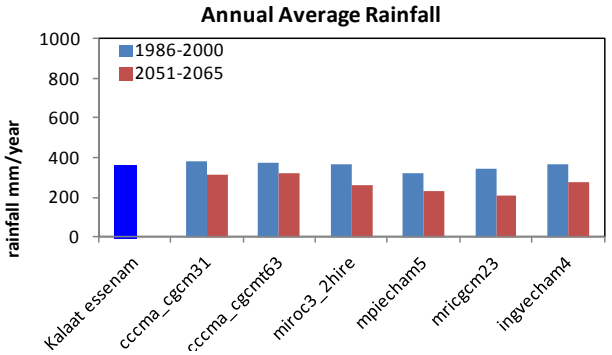
ingv_echa m4

inmcm_3 0

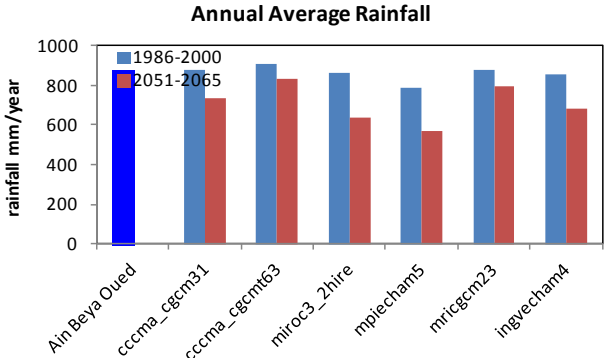
ipsl_cm4

Mejerda River

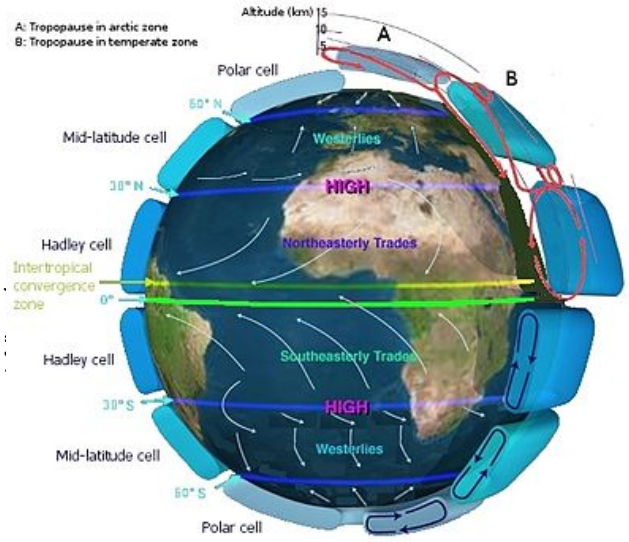
It is virtually certain that drought will become more severe.

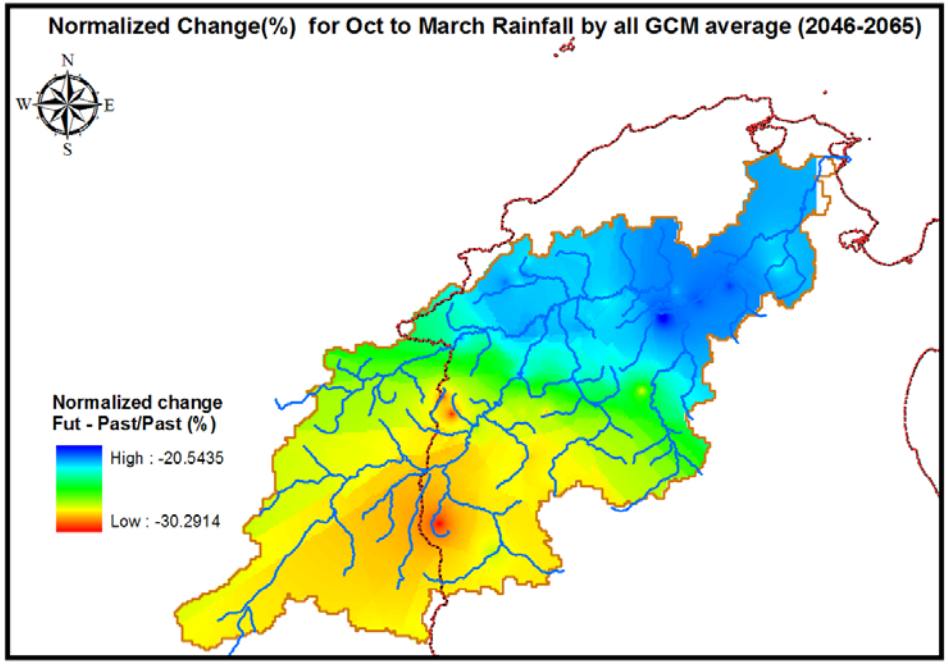


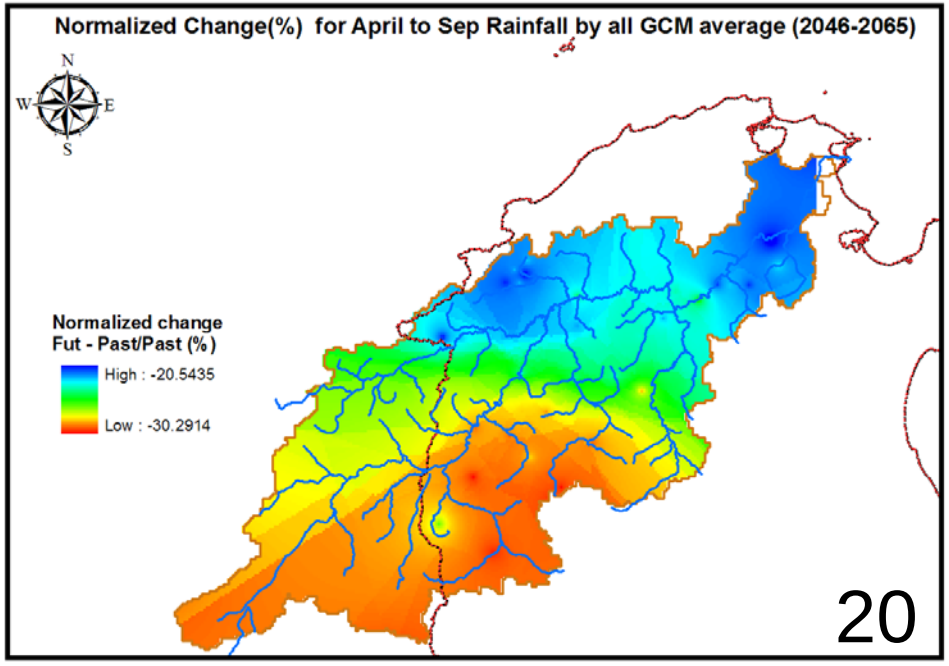
KALAAT ESSENAM

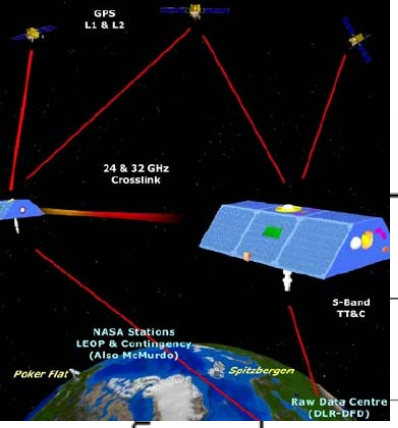


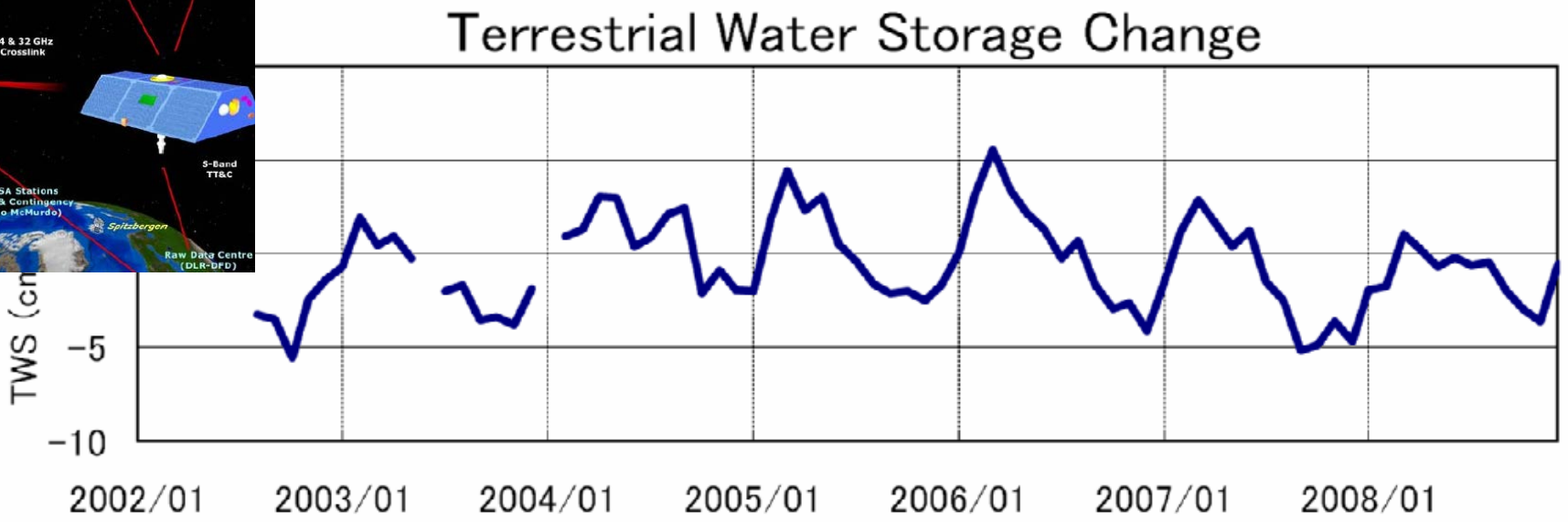
AIN BEYA OUED

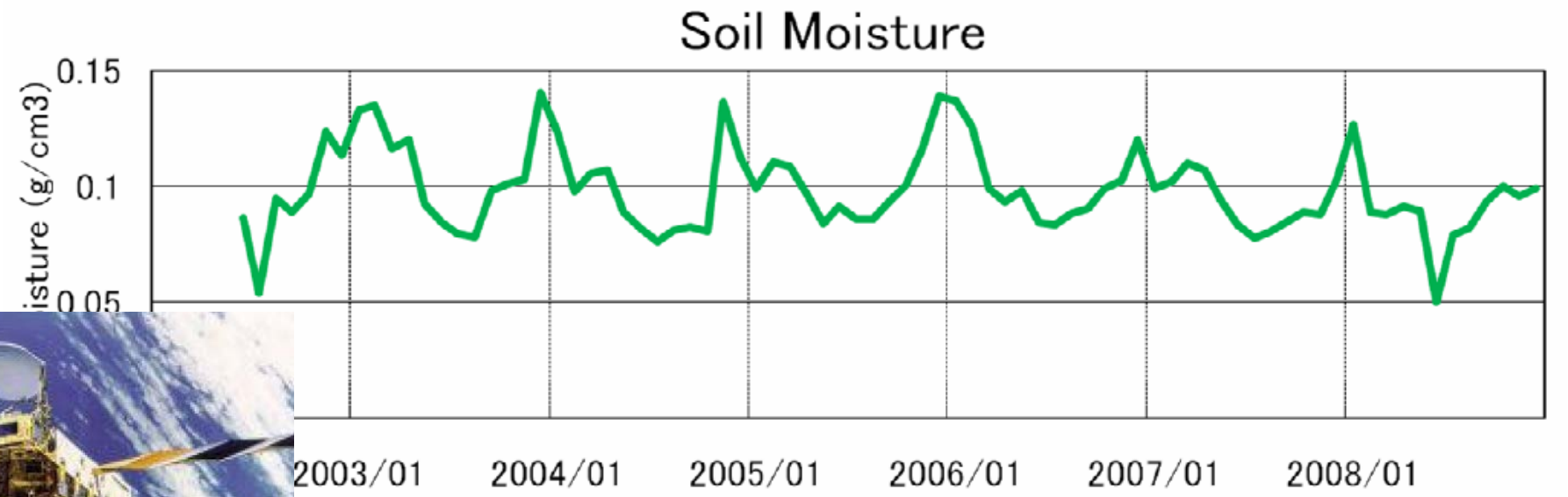


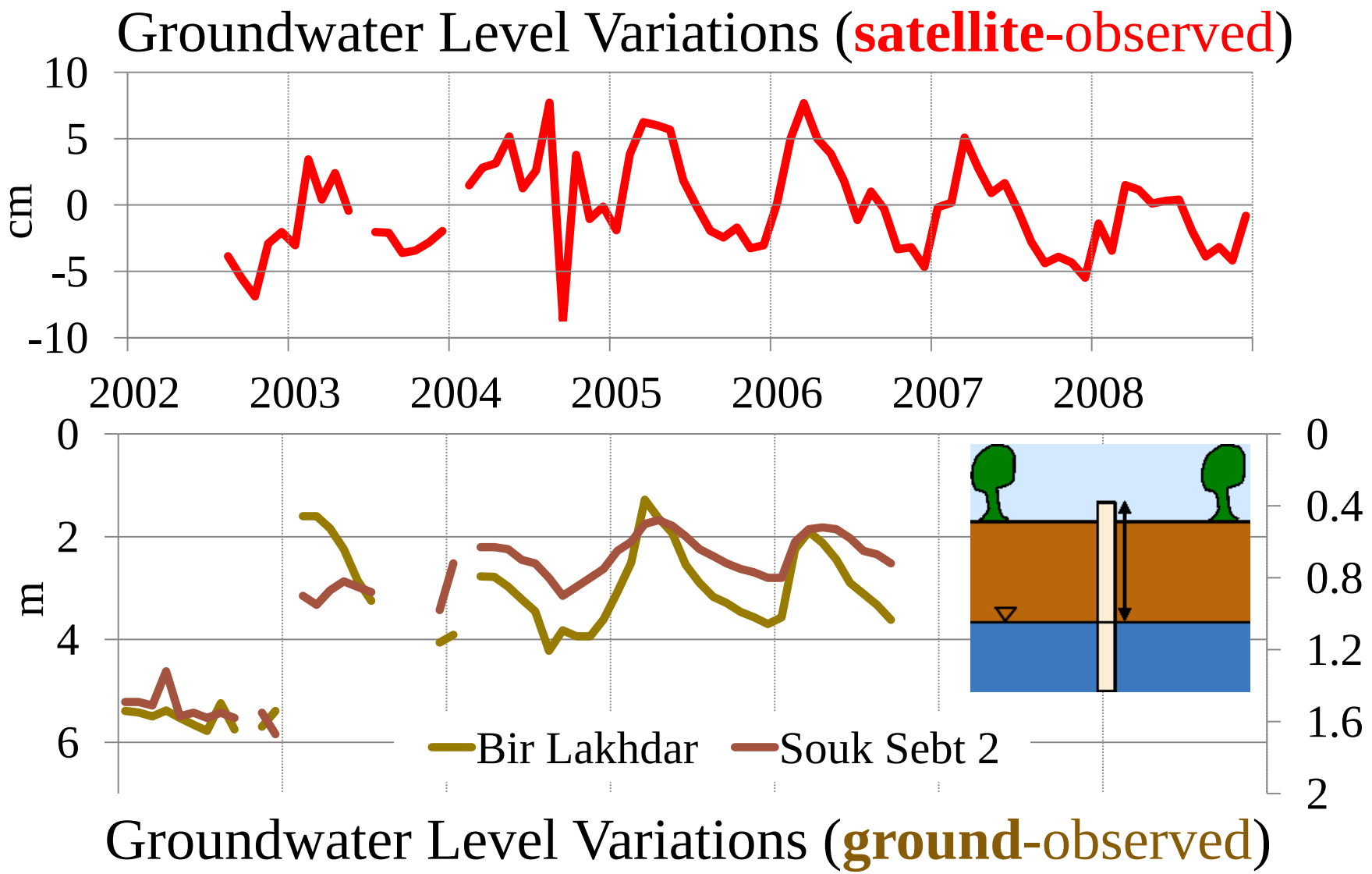




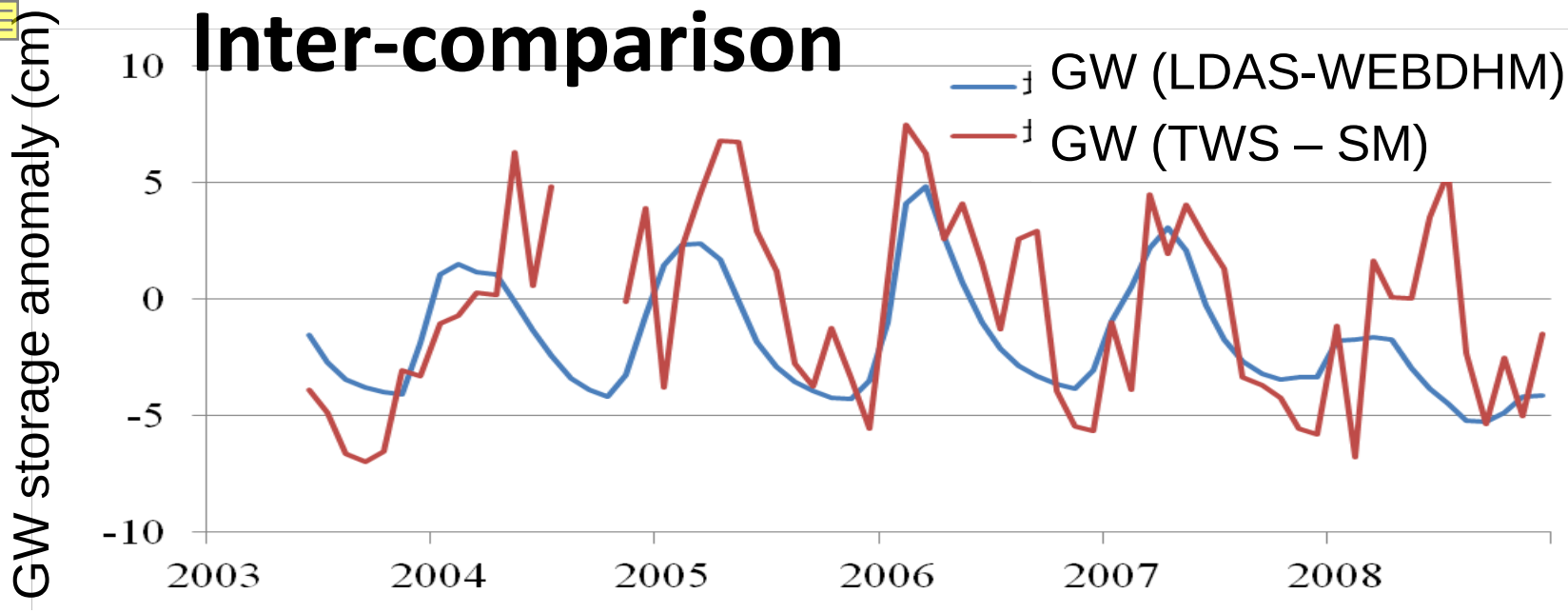

GPS
L1 & L2
24 & 32 GHz
Crosslink
S-Band
TT&C
NASA Stations
LEOP & Contingency
(Also McMurdo)
Poker Flat
Spitzbergen
Raw Data Centre
(DLR-DFD)


Terrestrial Water Storage Change
TWS (cm
−5
−10
2002/01
2003/01
2004/01
2005/01
2006/01
2007/01
2008/01

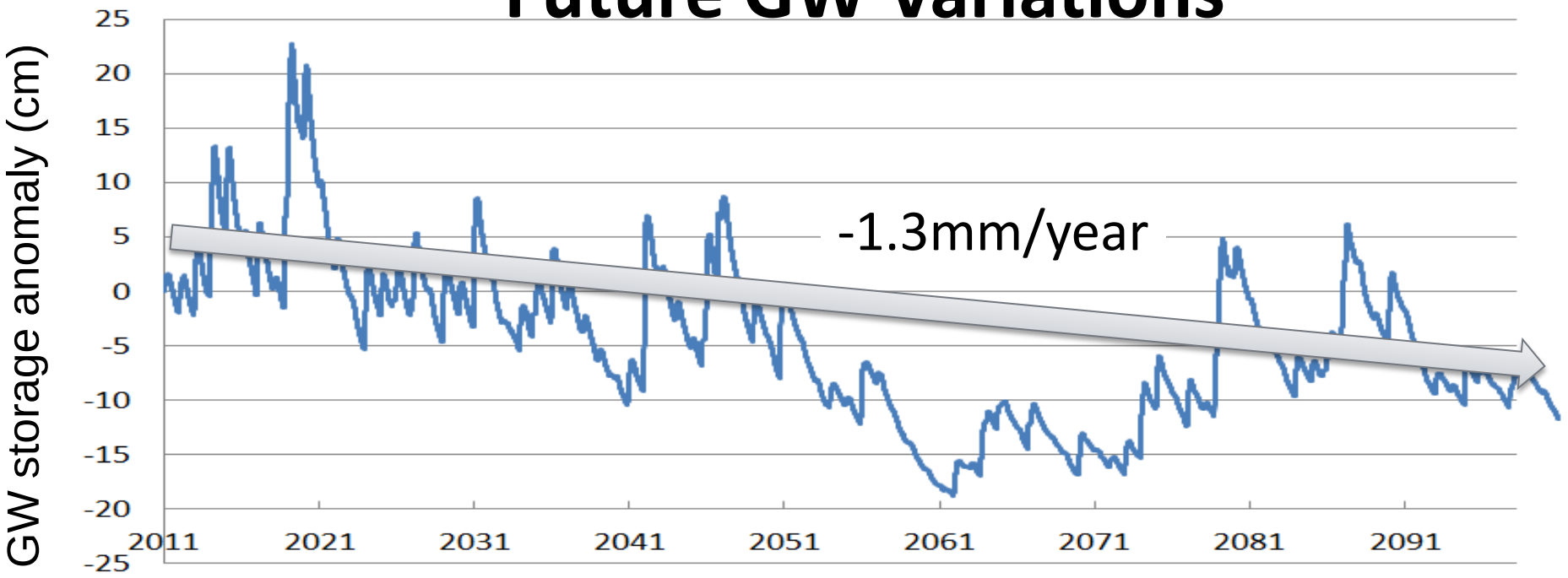

Soil Moisture
isture (g/cm3)
0.15
0.1
0.05
2003/01
2004/01
2005/01
2006/01
2007/01
2008/01


Groundwater Level Variations (satellite-observed)
10
5
0
-5
-10
cm
2002
2003
2004
2005
2006
2007
2008
0
2
4
6
m
0
0.4
0.8
1.2
1.6
2
Bir Lakhdar
Souk Sebt 2
Groundwater Level Variations (ground-observed)

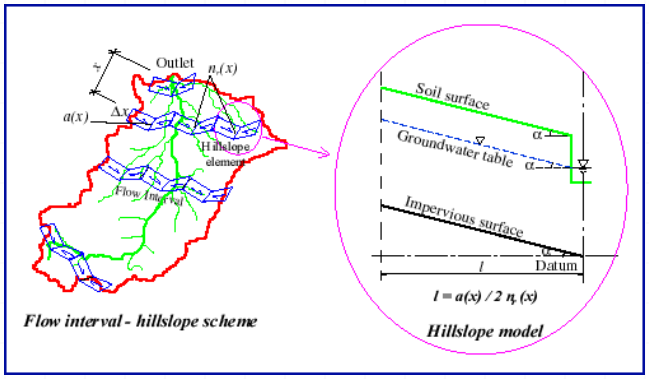
Inter-comparison



Future GW Variations



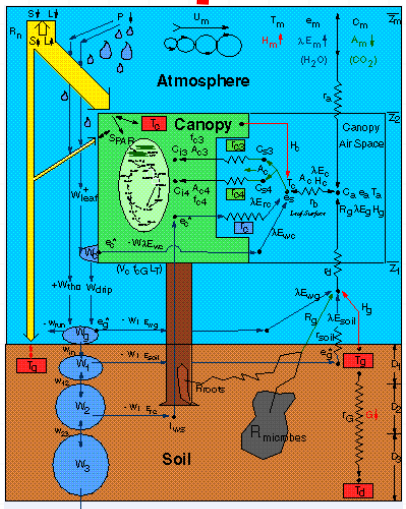
A eco-hydrological model: WEB-DHM + DVM



GBHM(river model)

⇒ WEB-DHM + DVM can simultaneously reproduce river discharge and vegetation growth.

Coupling



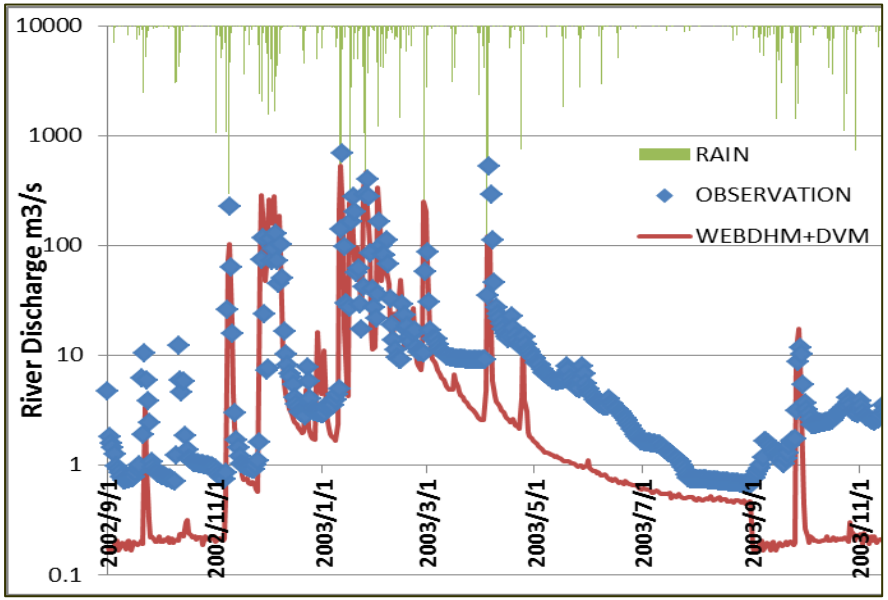
Hydro-SiB

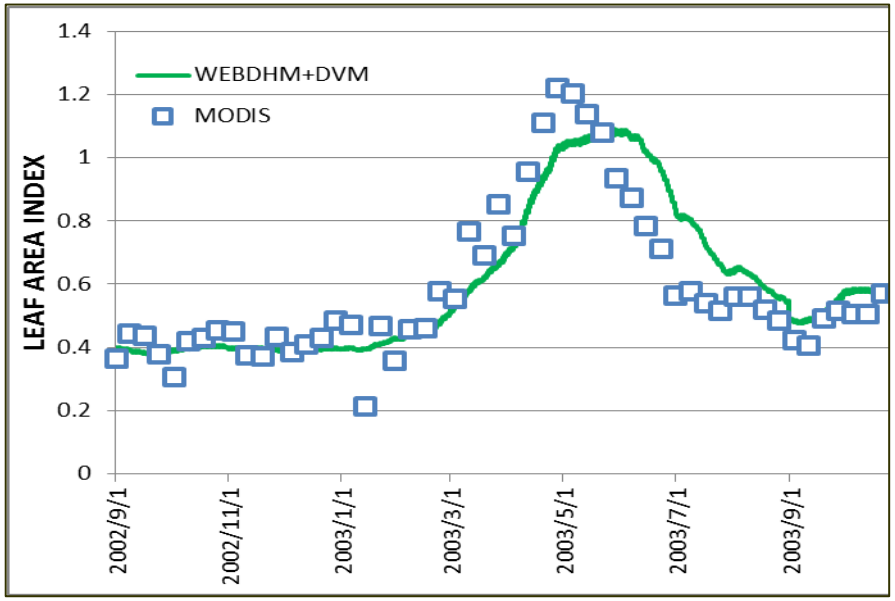
+

Dynamic Vegetation Model

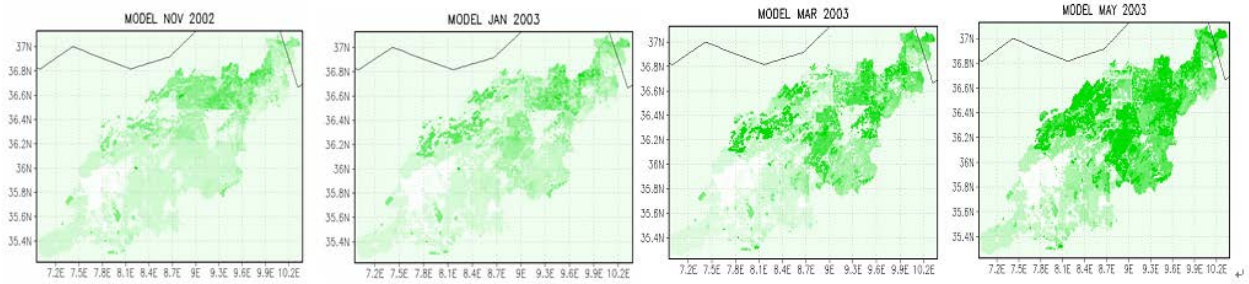
- Carbon Allocation Model
- Carbon-Pool Update Model
- Carbon-LAI Conversion Model

Seasonal Change of LAI by Coupled Model and Satellites



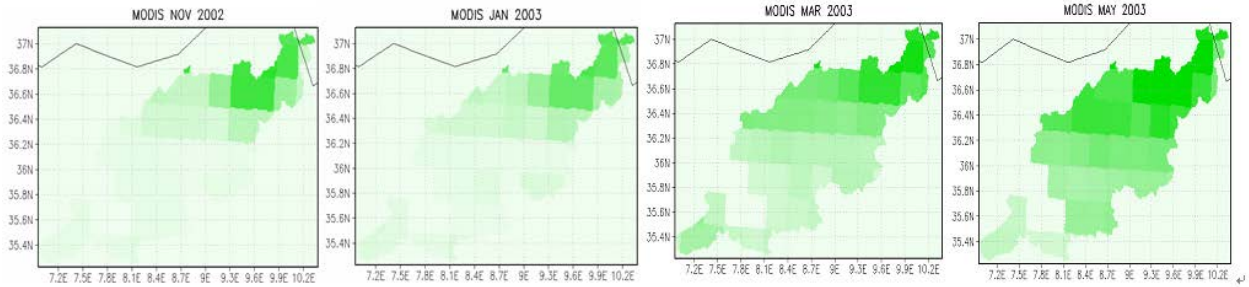


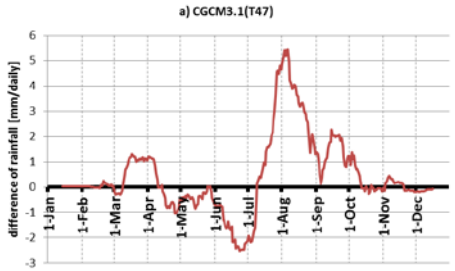
Simulated LAI

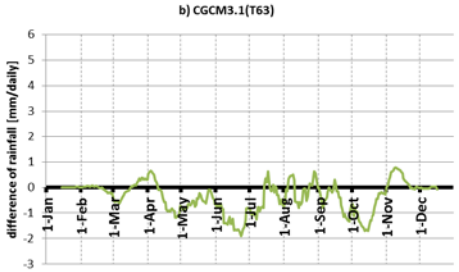


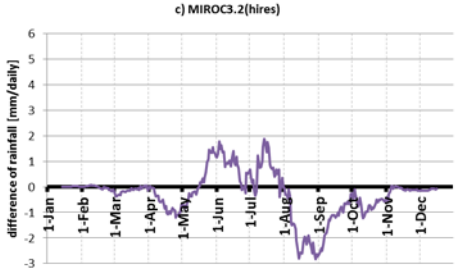
Medjerda River

MODIS LAI



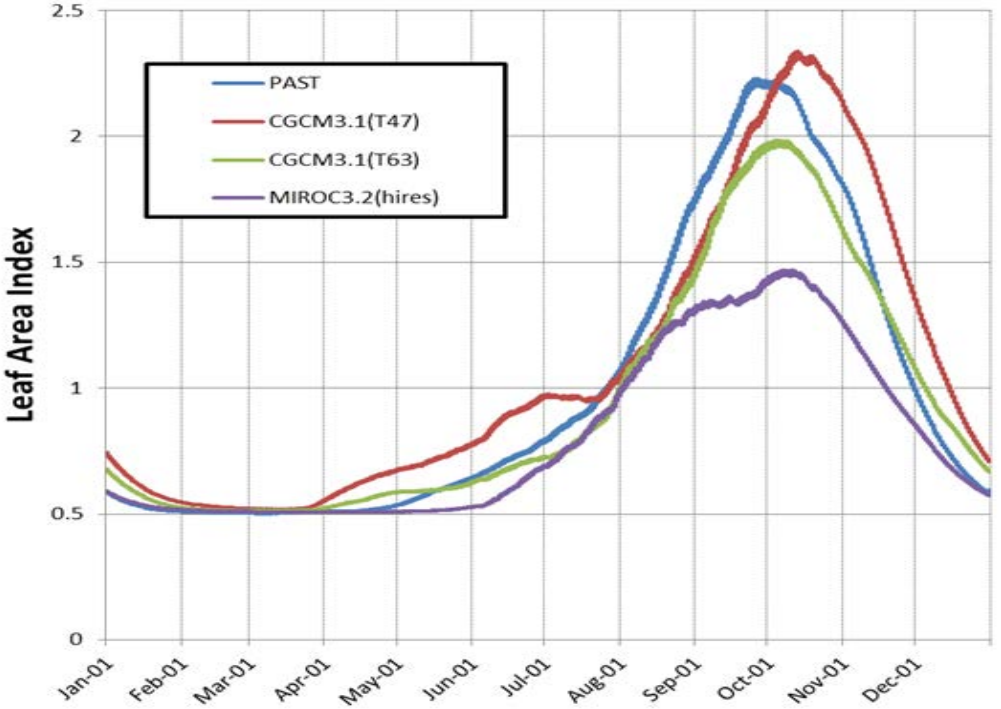




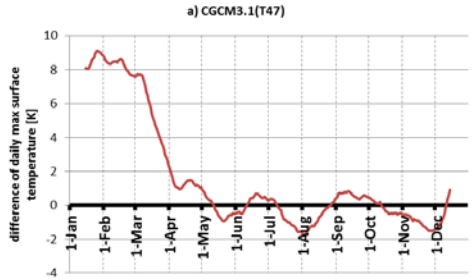


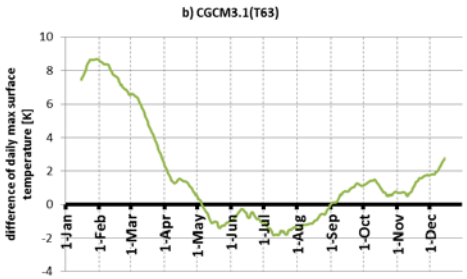
Precipitation Change Projected each Model

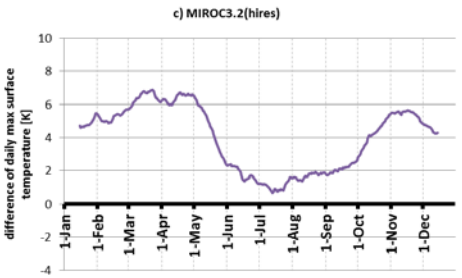
Climate Change Impact Assessment of Biomass Production in the Volta River Basin



Air Temperature Change Projected each Model







Jan. 2009 — 1st GEOSS African Water Cycle Symposium in Tunis, *Water-related Issues & Roles of EO*

Sept. 2009 — 1st Task Team Meeting in Geneva, *Strategy for Coordinated EO and CB*

Feb. 2011 — 2nd African Water Cycle Symposium in Addis Ababa
Planning for Demonstration

Jan. 2012 — GEO-UNESCO Joint Workshop in Nairobi
Report on Demonstrations and IWRM CB Program

Feb. 2012 — 3rd African Water Cycle Symposium in Libreville
Basic Idea of Implementation, Statement to Rio+20

Feb. 2013 — 3rd African Water Cycle Coordination Initiative Workshop in El Jadida, Draft Implementation Plan

Nov. 2013 — 1st GEOSS Africa & Asia Joint Water Cycle Symposium in Tokyo
1st AfWCCI Implementation Plan and 2nd AWCI Implementation Plan

GEO Water Strategy Report

Proposed Objectives for the Strategy

1) Provide a framework for guiding decisions regarding priorities and strategies for the maintenance and enhancement of water cycle observations.

2) **Enable improved water management based on a better quantification of fluxes and stores in the global water cycle.**

3) Promote strategies that will facilitate the acquisition, processing, and distribution of data products needed for effective management of the world's water resources.

4) **Provide expertise, information systems, and datasets to the global, regional, and national water communities through support to UN Water and its programmes, ICSU Future Earth Projects, non-governmental water programmes, and regional and national water and Earth Observation programmes.**

5) **Increase availability and use of data and information of quality of inland and near-coastal waters to support an operational water quality decision-making system.**

GEO Water Strategy Report
Purpose of the report

1.To update and synthesize the available information about the status of water cycle observations and information systems on the basis of the IGWCO report of 2004.

2.To describe a strategy for water cycle observations and information that will enable the short- term GEO objectives and the long-term community goals to be achieved.

3.To provide CEOS, GEO, WMO and other agencies with guidance about strategies for water cycle observations, information systems, interoperability, capacity building, etc.

4.To propose major initiatives that will advance this overall concept.

GEO Water Strategy Report
Why water information is important

1. Improves the welfare of the poor in developing countries through more effective water management.
2. Addresses the Water-Energy-Food Security issue.
3. Supports the climate change adaptation agenda.
4. Provides warning systems for hydrometeorological hazards.
5. Enhances human and environmental resilience
6. Supports human and environmental health

GEO Water Strategy Report

User needs and User engagement

A GEO assessment of user needs identified the requirements for water Cycle data. Based on that assessment;

Precipitation is the variable most commonly used. Other popular variables include **soil moisture and evapotranspiration**

Approaches to user engagement should include:

1) Reverse engineering to develop views on tailored products.
2) Assessments of the ways in which users make decisions should be carried out and the role of Earth Observations in those processes should be documented.

GEO-UIC-Water SBA-Final-V#32--Table-Excel(07)-25Feb10

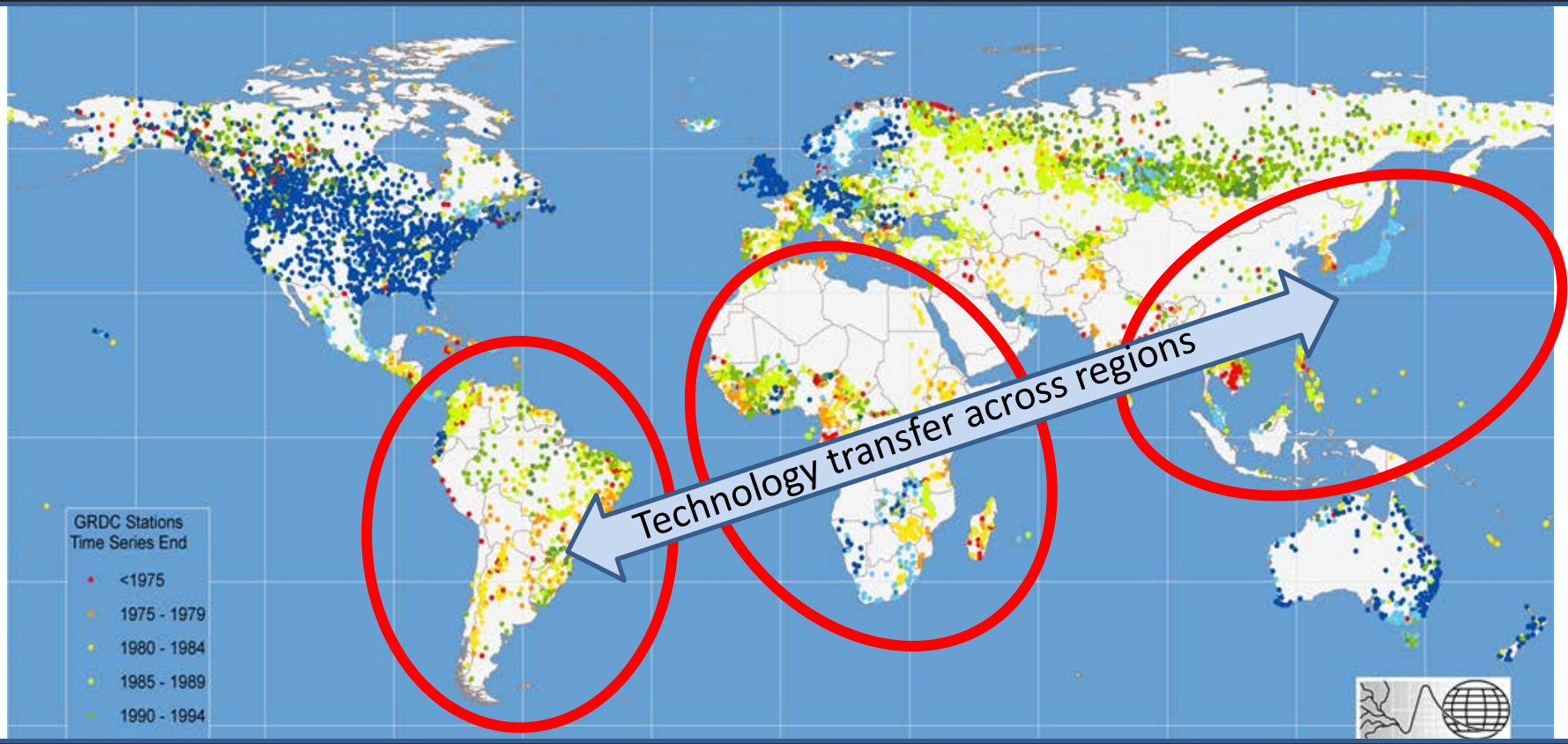
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1	Table 4: WATER-SBA DATA USE/NEEDS: PARAMETER(S), USER CLASSES BY CATEGORY (SUB-AREA) and USER TYPE/FUNCTION & PRIORITY RANKING	Critical Terrstr-Water Cycle Parameter(s)	Precipitation (liquid/snow/ice)	Soil Moisture/Temperature (Surface & Vadose Zone)	Evaporation & Evapotranspiratn	Runoff & Stream Flow /River Discharge /Stage..	Lake/Reservoir-Area/Level/Depth	Snowfice Cover & Depth/SWE/Freeze/Thaw Margins	Glacier/Ice Shts, Permafrst/Frozn Grnd--area/depth	Gmd Wat Table & Charge/Recharge/Infiltration Rates	Aquifer Levels, Geologic Stratification, Volumetric	Soil type/Texture, Composit'n, Porosity/Conductivity..	Surface Radiation Budget & Albedo--SW, LW & Clouds	Hydromet--Srfc Air Temp, Humidity/Moisture, Winds, Press..	Vegetation Cover Typs, Land Cover & Land Use	Topographic and/or Geological and Geomorphological	WaterQuality/Composition--Organic/Inorganic/Isotopic	Nutrient/Contaminant Effluents/Fluxes-->Water Bodies	W-Sources/Demnd/Use/Consmptn/Regultn+Socioecon/Demogr	Obs.Time Series+Statistics & Paleo/Proxy	Dynamic/Statistical Model Output/Analysis	Decision Support Information/Output	Average Score	Avg. Score w/out LOW (1), N/A (0) Cells
2	Sub-Areas----->		<----Surface Waters----><--G							<-GW&R->			<Forcings-->				<WQ/Use>			<Other...>				
3	COLR CDE/#VALUE	HIGH		10			MED				5			LOW		1				N/A		0			
4	*WATR RES. MANGMNT*																								
5	Resrch Hydrology		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	5	9.8	9.8
6	Lnd Sfc/Hydro Modeling		10	10	10	10	10	10	10	5	10	10	10	10	10	10	5	10	10	10	10	10	9.5	9.5
7	Stream/River Frcasting		10	5	5	10	10	10	10	5	5	10	5	10	10	10	0	5	1	10	10	10	7.6	8.3
8	Flood Forecasting		10	10	10	10	10	5	5	10	5	10	5	10	10	10	1	5	1	10	10	10	7.9	8.6
9	Reservoir Management		10	0	10	10	10	10	10	5	5	5	10	10	10	10	10	10	10	10	10	10	8.8	9.2
10	Water Res. Allocation		10	5	5	10	10	10	10	5	10	10	0	5	10	10	0	10	10	10	10	10	8.0	8.9
11	Water Res. Planning		10	5	5	10	10	10	10	10	10	10	5	10	10	10	10	10	10	10	10	10	9.3	9.3
12	Urban Water Supply		10	0	0	10	10	10	5	10	10	0	0	€	10	0	10	10	10	5	10	10	6.8	9.3
13	Water Qualty Managmnt		10	0	0	10	5	1	1	5	10	5	0	0	10	5	10	10	10	5	5	10	5.6	7.9
14	Drought Monitoring		10	10	5	10	5	5	1	5	1	1	5	10	5	0	0	0	0	10	10	10	5.2	7.7
15	Drought Forecasting		10	10	10	10	5	10	1	5	1	1	0	10	5	0	0	0	0	10	10	10	5.4	8.8
16	Drought Miti. Mangmnt		10	10	1	10	10	10	5	10	10	5	1	10	10	10	5	0	5	1	5	10	6.9	8.4
17	Flood Control Managmnt		10	10	0	10	10	5	5	10	5	10	0	5	10	10	5	10	10	5	5	10	7.3	8.1
18	Flood Control Planning		10	10	0	10	10	5	10	10	5	10	0	5	10	10	5	10	10	5	5	10	7.5	8.3
19	Catchment Management		10	10	10	10	10	5	10	10	10	10	10	10	10	10	1	10	10	10	10	10	9.3	9.7
20	*CLIMATE & GLOBAL CHANGE*																							
21	UN/IPCC		10	10	10	10	1	5	10	5	5	1	10	10	10	5	1	0	0	10	10	10	6.7	8.7
22	UN/FCCC		10	10	10	5	1	5	10	5	1	1	10	10	10	5	1	0	0	10	10	10	6.2	8.6
23	Climate Science		10	10	10	10	10	10	10	10	10	5	10	10	10	10	5	5	5	10	10	10	9.0	9.0
24	Clim. Adapt/Mitigat'n		10	10	5	10	10	10	10	5	10	5	10	10	10	10	10	10	10	10	10	10	9.3	9.3
25	Climate Chnge Modeling		10	10	10	5	1	10	10	5	5	5	10	10	10	10	0	5	0	10	10	10	7.3	8.5
26	Downscaling Glob--Reg		10	10	10	10	5	10	1	10	10	5	10	10	10	10	0	5	0	10	10	10	7.8	9.1
27	Clim. Simulatn Modeling		10	10	10	5	5	10	10	5	5	5	10	10	10	10	0	5	0	10	10	10	7.5	8.3
28	*WEATHER & EXTREMES*																							
29	Weather Research		10	10	10	1	5	10	1	1	1	1	10	10	10	10	0	0	0	10	10	10	6.0	9.6
30	Weather Forecasting		10	10	5	5	5	10	1	1	1	1	10	10	5	10	0	0	0	10	10	10	5.7	8.5

Page 1 of 4

The GEO Water Strategy Report
contents

- Primary implementation partners for the water strategy
- Water Cycle Variables
- Water Quality
- Data Issues
- Water Cycle Integration and Interoperability
- Linkages
- Capacity Building

The GEOSS Water Strategy will focus its **capacity building** efforts in three main areas but add others as interest increases.



The GEOSS Water Strategy will increase synergistic projects and sharing of expertise, data and information systems across these regions.


Thank you for your attention!