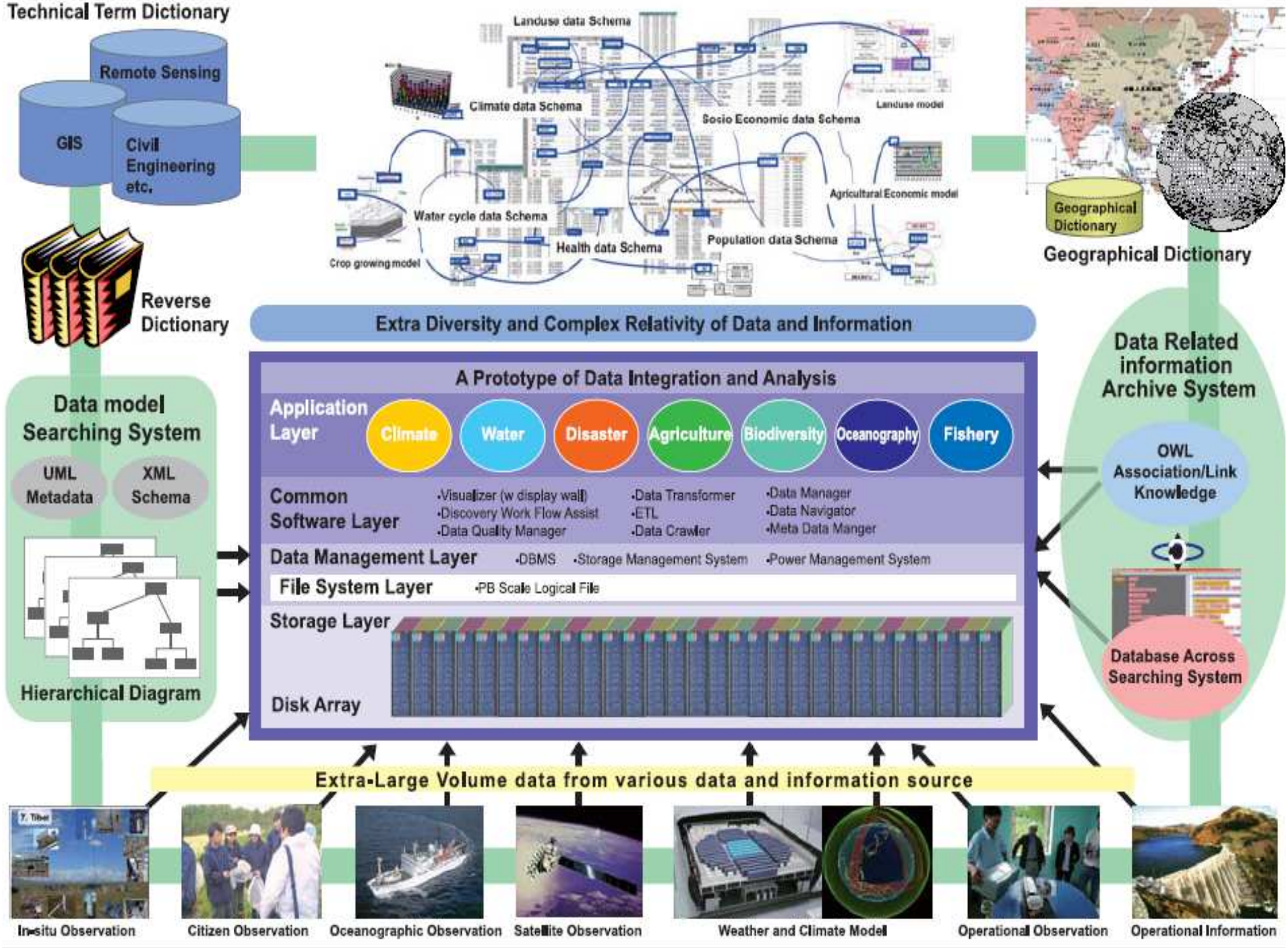
The 9th International Coordination Group (ICG) Meeting and
2nd AWCI Climate Change Assessment and Adaptation (CCAA) Study Worksh
GEOSS Asian Water Cycle Initiative (AWCI)

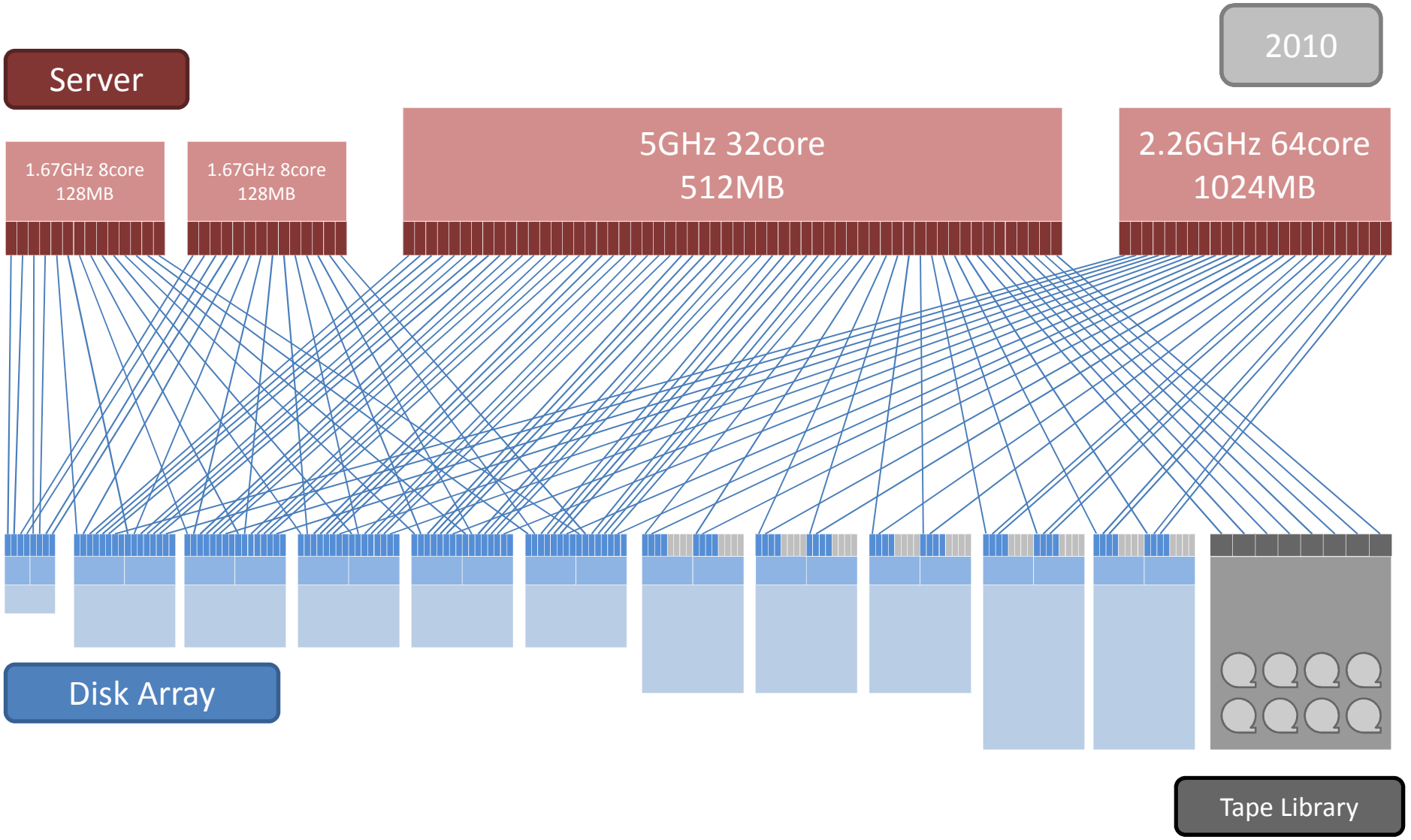
APN Project (ARCP) Report

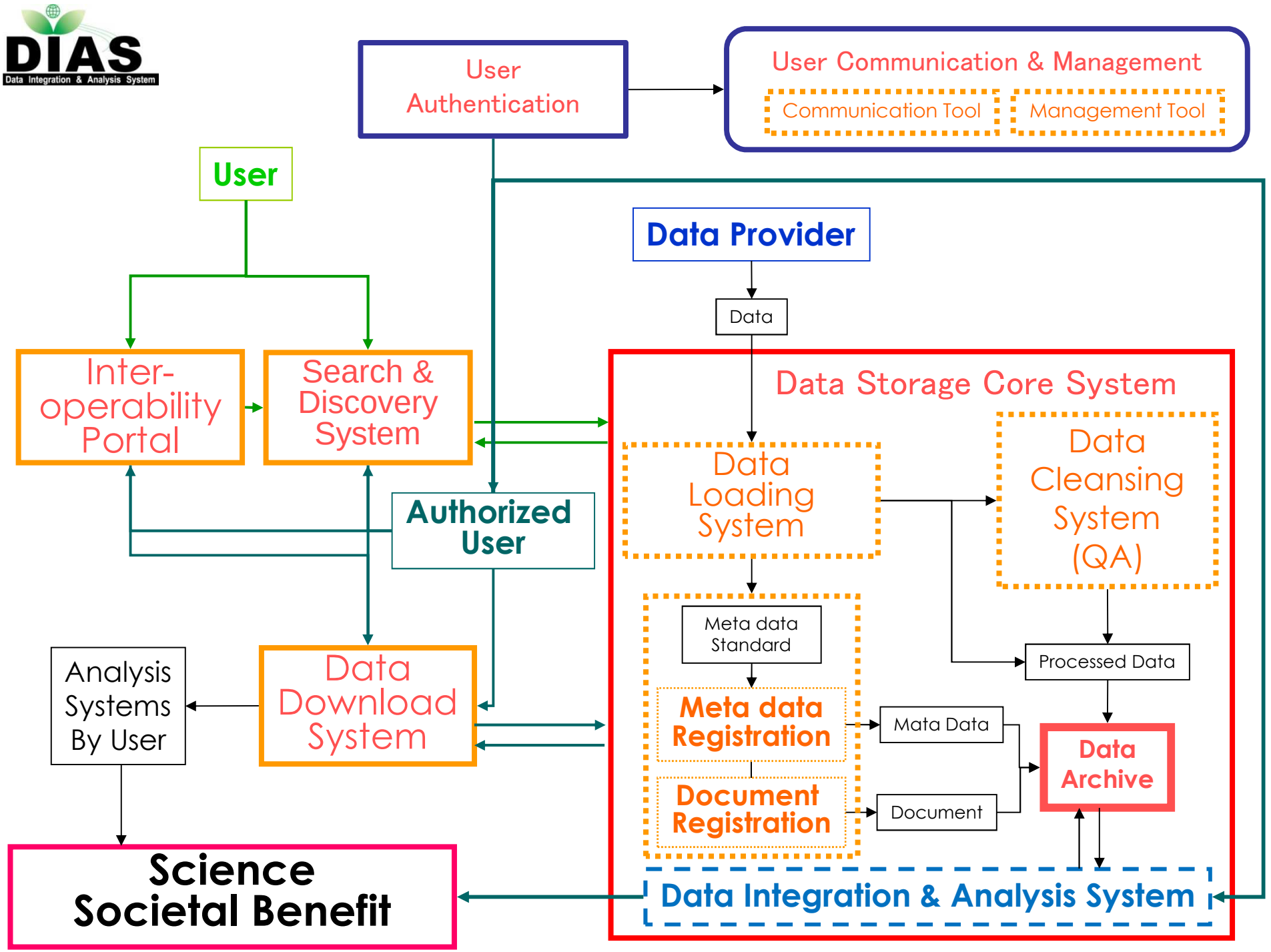
River Management System Development in Asia Based on Data Integration and Analysis System (DIAS) under the GEOSS

Toshio Koike
The University of Tokyo

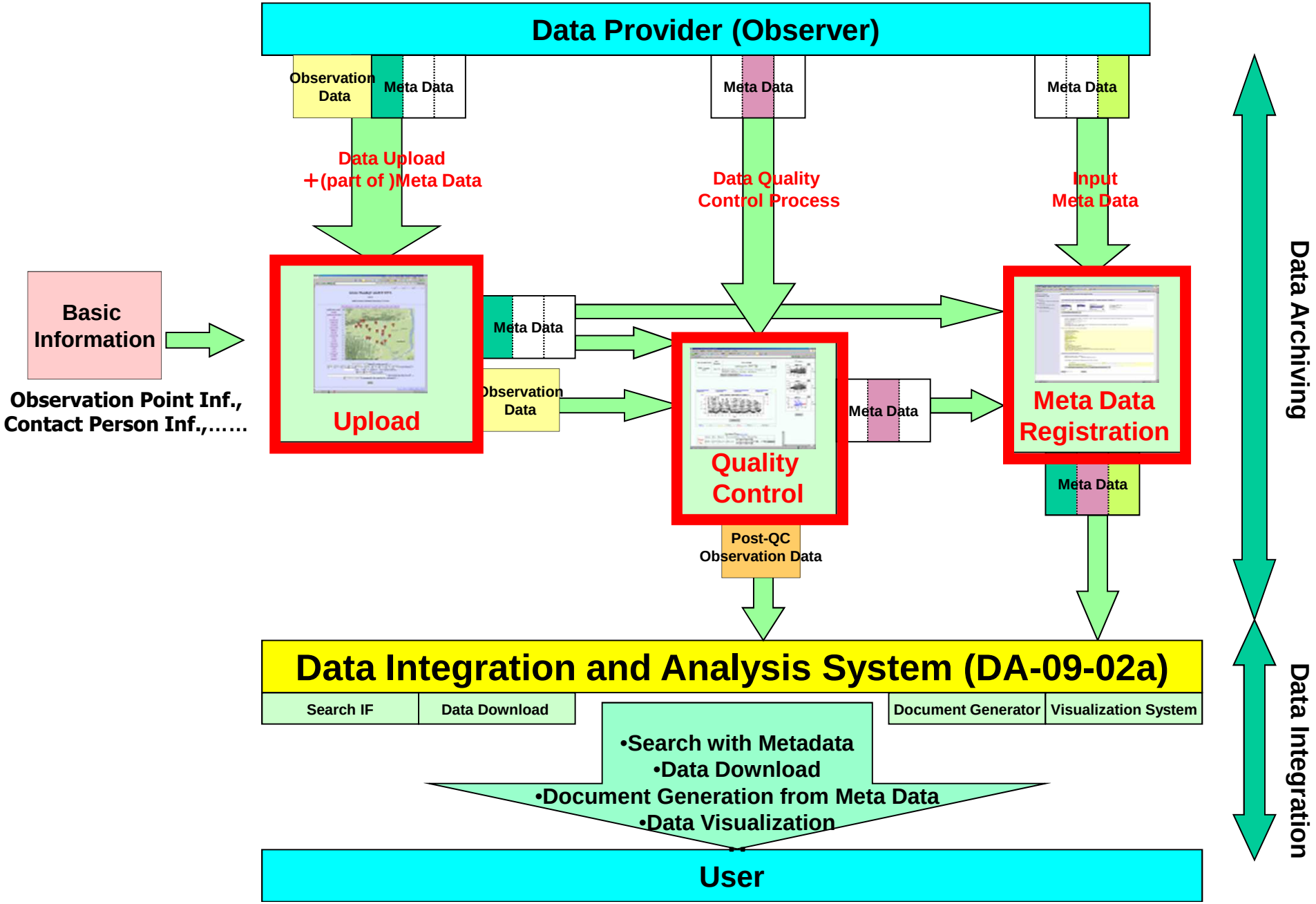

Technical Term Dictionary
Remote Sensing
GIS
Civil Engineering etc.
Reverse Dictionary
Landuse data Schema
Climate data Schema
Socio Economic data Schema
Landuse model
Agricultural Economic model
Water cycle data Schema
Health data Schema
Population data Schema
Crop growing model
Geographical Dictionary
Geographical Dictionary
Extra Diversity and Complex Relativity of Data and Information
Data model Searching System
UML Metadata
XML Schema
Hierarchical Diagram
A Prototype of Data Integration and Analysis
Application Layer
Climate
Water
Disaster
Agriculture
Biodiversity
Oceanography
Fishery
Common Software Layer
•Visualizer (w display wall)
•Discovery Work Flow Assist
•Data Quality Manager
•Data Transformer
•ETL
•Data Crawler
•Data Manager
•Data Navigator
•Meta Data Manger
Data Management Layer
•DBMS
•Storage Management System
•Power Management System
File System Layer
•PB Scale Logical File
Storage Layer
Disk Array
Data Related information Archive System
OWL Association/Link Knowledge
Database Across Searching System
Extra-Large Volume data from various data and information source
In-situ Observation
Citizen Observation
Oceanographic Observation
Satellite Observation
Weather and Climate Model
Operational Observation
Operational Information

Server-Storage Coupled System

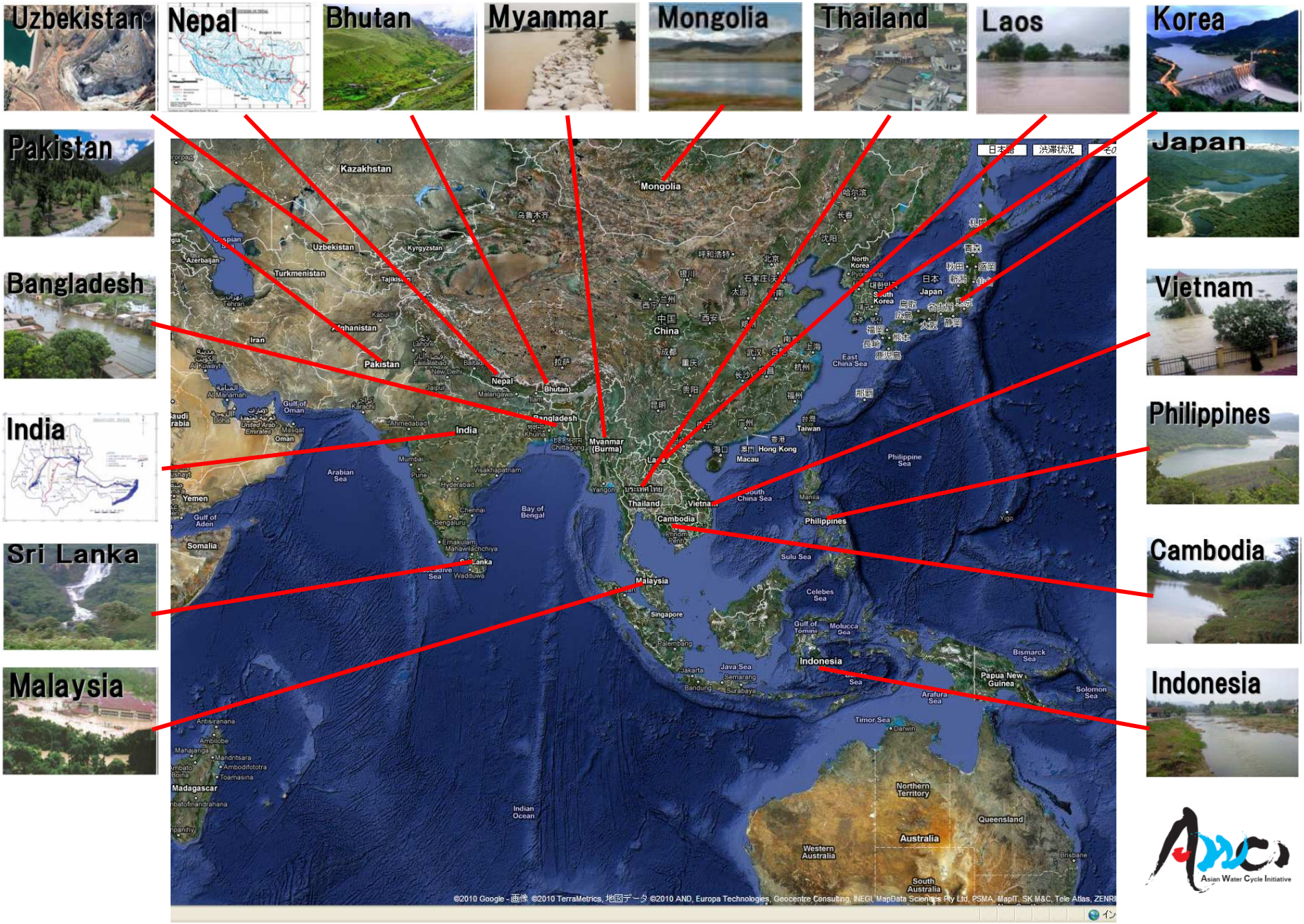



DIAS
Data Integration & Analysis System
User Authentication
User Communication & Management
Communication Tool
Management Tool
User
Data Provider
Data
Inter-operability Portal
Search & Discovery System
Data Storage Core System
Data Loading System
Data Cleansing System (QA)
Authorized User
Meta data Standard
Processed Data
Meta data Registration
Mata Data
Data Archive
Document Registration
Document
Analysis Systems By User
Data Download System
Science
Societal Benefit
Data Integration & Analysis System

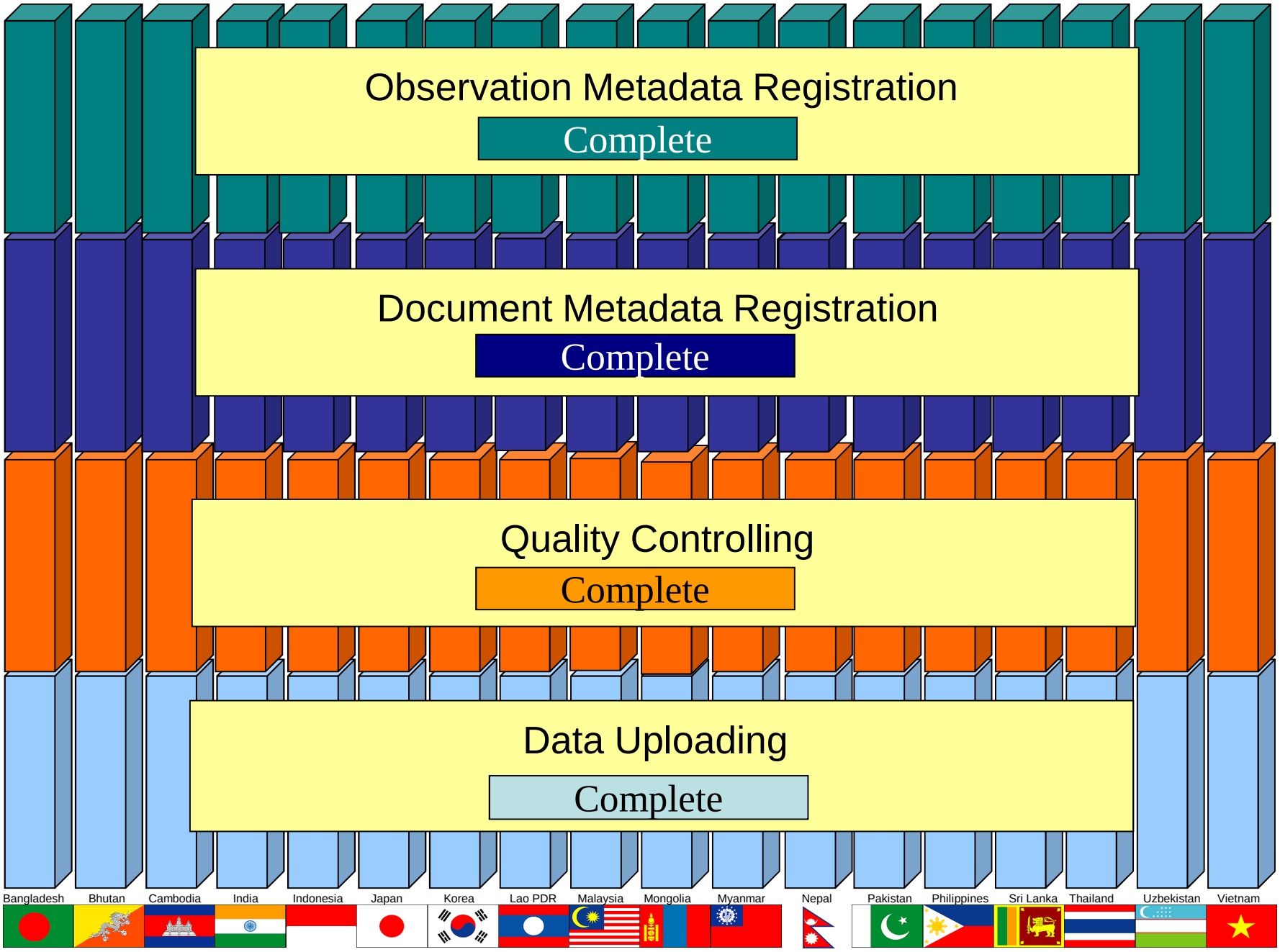
Web-based Data Archiving & Integration System



Demonstration River Basins



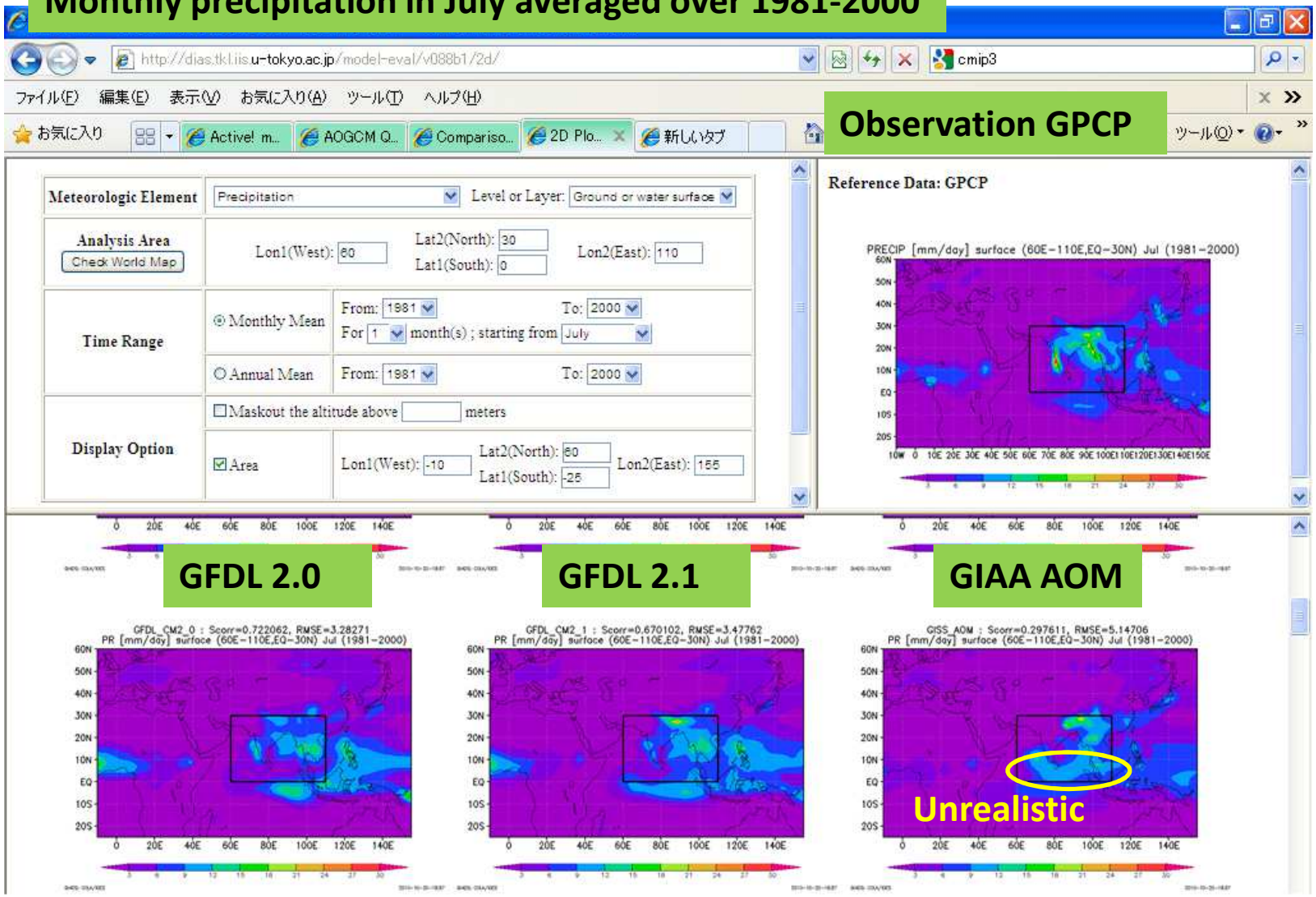
Asian Water Cycle Initiative

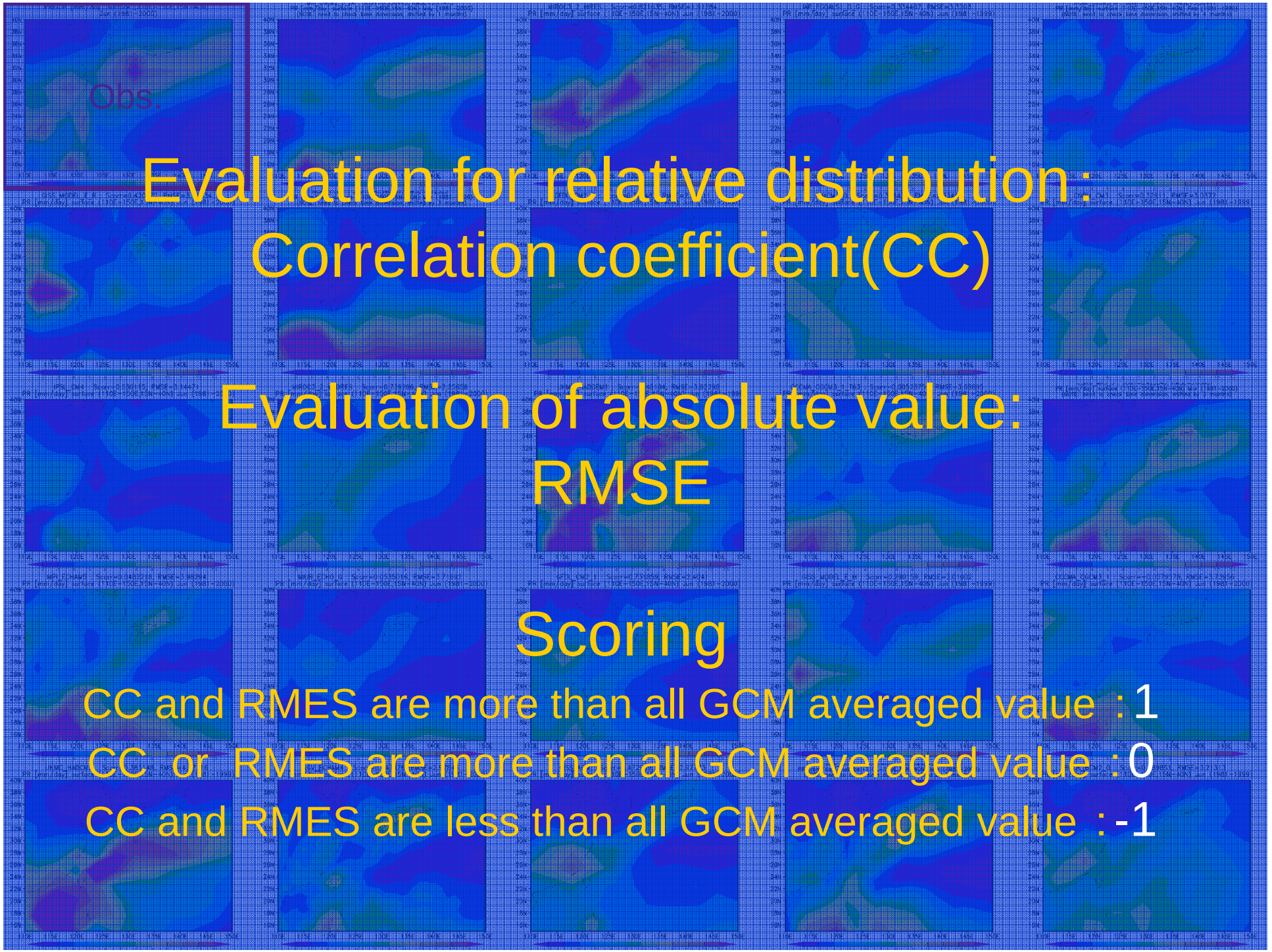

Observation Metadata Registration
Complete
Document Metadata Registration
Complete
Quality Controlling
Complete
Data Uploading
Complete
Bangladesh
Bhutan
Cambodia
India
Indonesia
Japan
Korea
Lao PDR
Malaysia
Mongolia
Myanmar
Nepal
Pakistan
Philippines
Sri Lanka
Thailand
Uzbekistan
Vietnam

1. Selection of CMIP3 models based on reproducibility in the 20th century

In order to evaluate the variability of the Asian summer monsoon in the global warming as simulated by the CMIP3 models, it is necessary to pick up best models to reproduce the seasonal evolution of the Asian summer monsoon in the 20th century.

Monthly precipitation in July averaged over 1981-2000





Evaluation for relative distribution :
Correlation coefficient(CC)

Evaluation of absolute value:
RMSE

Scoring

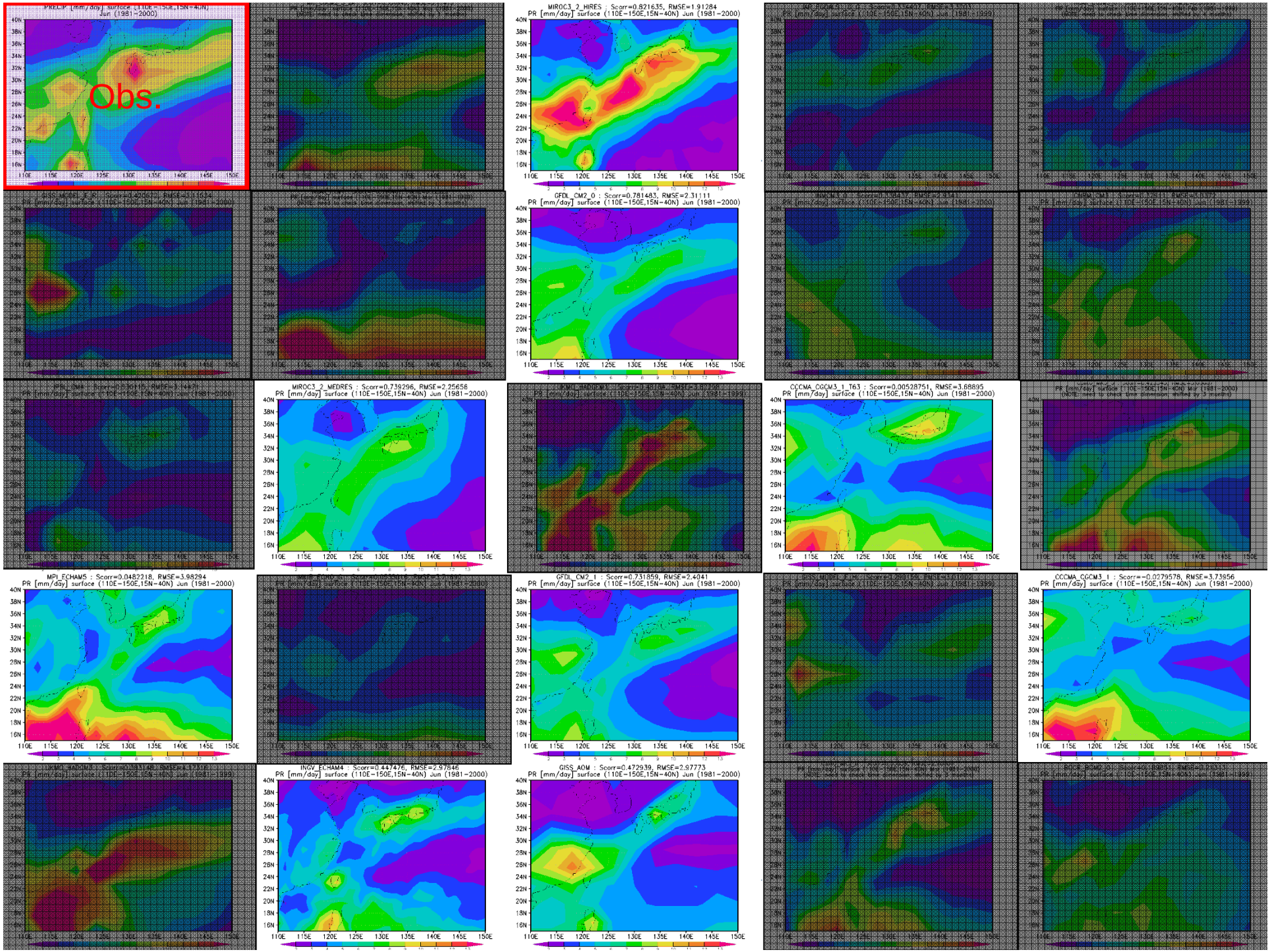
CC and RMES are more than all GCM averaged value : 1

CC or RMES are more than all GCM averaged value : 0

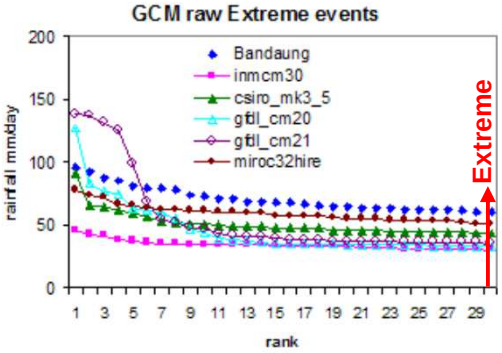
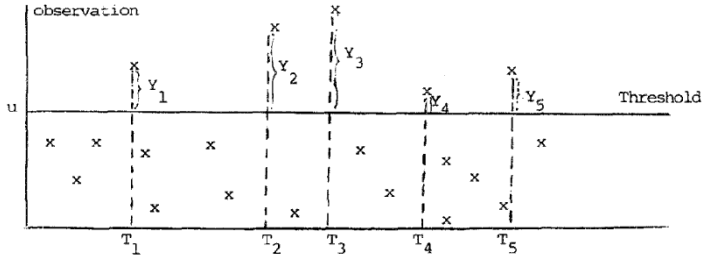
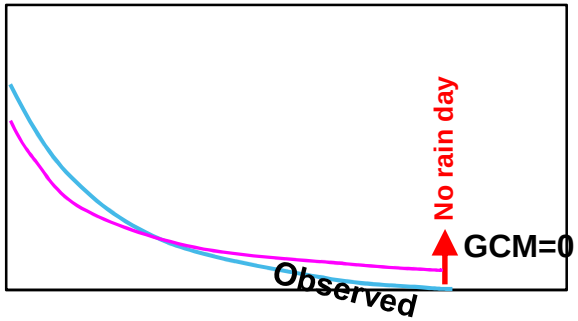
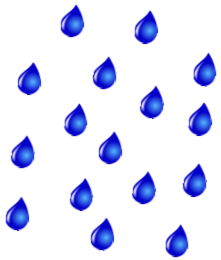
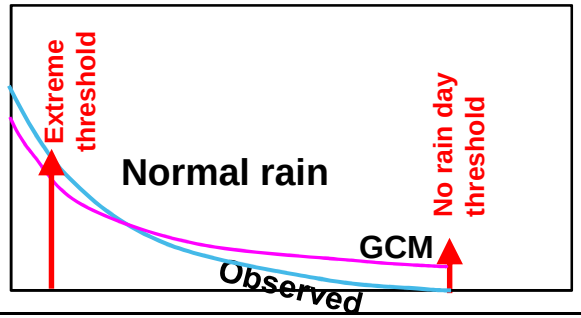
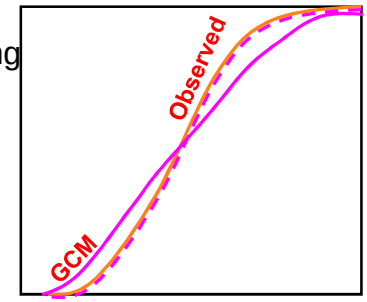
CC and RMES are less than all GCM averaged value : -1

	SASM Precip	SASM OLR	SASM Z850	EASM Precip	EASM OLR	EASM Z850	Tibetan H Z200	Tibetan H Z500	Tibetan H T200	ASM SST	Total Score
bcc_cm1	bcc_cm1	bcc_cm1	bcc_cm1	bcc_cm1	bcc_cm1	bcc_cm1	bcc_cm1	bcc_cm1	bcc_cm1	bcc_cm1	0
bccr_bcm2_0	bccr_bcm2	bccr_bcm2	bccr_bcm2	bccr_bcm2	bccr_bcm2	bccr_bcm2	bccr_bcm2	bccr_bcm2	bccr_bcm2	bccr_bcm2	3
cccma_cgcm3_1	cccma_cgc	cccma_cgc	cccma_cgc	cccma_cgc	cccma_cgc	cccma_cgc	cccma_cgc	cccma_cgc	cccma_cgc	cccma_cgc	8
cccma_cgcm3_1_t63	cccma_cgc	cccma_cgc	cccma_cgc	cccma_cgc	cccma_cgc	cccma_cgc	cccma_cgc	cccma_cgc	cccma_cgc	cccma_cgc	7
cnrm_cm3	cnrm_cm3	cnrm_cm3	cnrm_cm3	cnrm_cm3	cnrm_cm3	cnrm_cm3	cnrm_cm3	cnrm_cm3	cnrm_cm3	cnrm_cm3	2
csiro_mk3_0	csiro_mk3_(	csiro_mk3_(	csiro_mk3_(	csiro_mk3_(	csiro_mk3_(	csiro_mk3_(	csiro_mk3_(	csiro_mk3_(	csiro_mk3_(	csiro_mk3_(	4
csiro_mk3_5	csiro_mk3_5	csiro_mk3_5	csiro_mk3_5	csiro_mk3_5	csiro_mk3_5	csiro_mk3_5	csiro_mk3_5	csiro_mk3_5	csiro_mk3_5	csiro_mk3_5	0
gfdl_cm2_0	gfdl_cm2_0	gfdl_cm2_0	gfdl_cm2_0	gfdl_cm2_0	gfdl_cm2_0	gfdl_cm2_0	gfdl_cm2_0	gfdl_cm2_0	gfdl_cm2_0	gfdl_cm2_0	8
gfdl_cm2_1	gfdl_cm2_1	gfdl_cm2_1	gfdl_cm2_1	gfdl_cm2_1	gfdl_cm2_1	gfdl_cm2_1	gfdl_cm2_1	gfdl_cm2_1	gfdl_cm2_1	gfdl_cm2_1	9
giss_aom	giss_aom	giss_aom	giss_aom	giss_aom	giss_aom	giss_aom	giss_aom	giss_aom	giss_aom	giss_aom	5
giss_model_e_h	giss_model	giss_model	giss_model	giss_model	giss_model	giss_model	giss_model	giss_model	giss_model	giss_model	0
giss_model_e_r	giss_model	giss_model	giss_model	giss_model	giss_model	giss_model	giss_model	giss_model	giss_model	giss_model	0
iap_fgoals1_0_g	iap_fgoals1	iap_fgoals1	iap_fgoals1	iap_fgoals1	iap_fgoals1	iap_fgoals1	iap_fgoals1	iap_fgoals1	iap_fgoals1	iap_fgoals1	0
ingv_echam4	ingv_echam	ingv_echam	ingv_echam	ingv_echam	ingv_echam	ingv_echam	ingv_echam	ingv_echam	ingv_echam	ingv_echam	6
inmcm3_0	inmcm3_0	inmcm3_0	inmcm3_0	inmcm3_0	inmcm3_0	inmcm3_0	inmcm3_0	inmcm3_0	inmcm3_0	inmcm3_0	0
ipsl_cm4	ipsl_cm4	ipsl_cm4	ipsl_cm4	ipsl_cm4	ipsl_cm4	ipsl_cm4	ipsl_cm4	ipsl_cm4	ipsl_cm4	ipsl_cm4	0
miroc3_2_hires	miroc3_2_h	miroc3_2_h	miroc3_2_h	miroc3_2_h	miroc3_2_h	miroc3_2_h	miroc3_2_h	miroc3_2_h	miroc3_2_h	miroc3_2_h	6
miroc3_2_medres	miroc3_2_m	miroc3_2_m	miroc3_2_m	miroc3_2_m	miroc3_2_m	miroc3_2_m	miroc3_2_m	miroc3_2_m	miroc3_2_m	miroc3_2_m	8
mpi_echam5	mpi_echam5	mpi_echam5	mpi_echam5	mpi_echam5	mpi_echam5	mpi_echam5	mpi_echam5	mpi_echam5	mpi_echam5	mpi_echam5	7
mri_cgcm2_3_2a	mri_cgcm2_	mri_cgcm2_	mri_cgcm2_	mri_cgcm2_	mri_cgcm2_	mri_cgcm2_	mri_cgcm2_	mri_cgcm2_	mri_cgcm2_	mri_cgcm2_	0
ncar_ccsm3_0	ncar_ccsm3	ncar_ccsm3	ncar_ccsm3	ncar_ccsm3	ncar_ccsm3	ncar_ccsm3	ncar_ccsm3	ncar_ccsm3	ncar_ccsm3	ncar_ccsm3	2
ncar_pcm1	ncar_pcm1	ncar_pcm1	ncar_pcm1	ncar_pcm1	ncar_pcm1	ncar_pcm1	ncar_pcm1	ncar_pcm1	ncar_pcm1	ncar_pcm1	0
ukmo_hadcm3	ukmo_hadc	ukmo_hadc	ukmo_hadc	ukmo_hadc	ukmo_hadc	ukmo_hadc	ukmo_hadc	ukmo_hadc	ukmo_hadc	ukmo_hadc	3
ukmo_hadgem1	ukmo_hadg	ukmo_hadg	ukmo_hadg	ukmo_hadg	ukmo_hadg	ukmo_hadg	ukmo_hadg	ukmo_hadg	ukmo_hadg	ukmo_hadg	3

As for the precipitation over the SASM, we evaluated models according to totally 10 variables such as the 850 hPa geopotential height, variables over the EASM domain and SST. As a result, 9 models were evaluated as the best models to reproduce the Asian summer monsoon in the 20th century.


PREC.P [mm/day] surface (110E-150E,15N-40N)
Jun (1981-2000)
Obs.
MIROC3_2_HIRES : Scorr=0.821635, RMSE=1.91284
PR [mm/day] surface (110E-150E,15N-40N) Jun (1981-2000)
GFDL_CM2_0 : Scorr=0.781483, RMSE=2.31111
PR [mm/day] surface (110E-150E,15N-40N) Jun (1981-2000)
MIROC3_2_MEDRES : Scorr=0.739296, RMSE=2.25656
PR [mm/day] surface (110E-150E,15N-40N) Jun (1981-2000)
CCCMA_CGCM3_1_T63 : Scorr=0.00528751, RMSE=3.68895
PR [mm/day] surface (110E-150E,15N-40N) Jun (1981-2000)
MPI_ECHAM5 : Scorr=0.0482218, RMSE=3.98294
PR [mm/day] surface (110E-150E,15N-40N) Jun (1981-2000)
GFDL_CM2_1 : Scorr=0.731859, RMSE=2.4041
PR [mm/day] surface (110E-150E,15N-40N) Jun (1981-2000)
CCCMA_CGCM3_1 : Scorr=-0.0279578, RMSE=3.73956
PR [mm/day] surface (110E-150E,15N-40N) Jun (1981-2000)
INGV_ECHAM4 : Scorr=0.447476, RMSE=2.97846
PR [mm/day] surface (110E-150E,15N-40N) Jun (1981-2000)
GISS_AOM : Scorr=0.472939, RMSE=2.97773
PR [mm/day] surface (110E-150E,15N-40N) Jun (1981-2000)

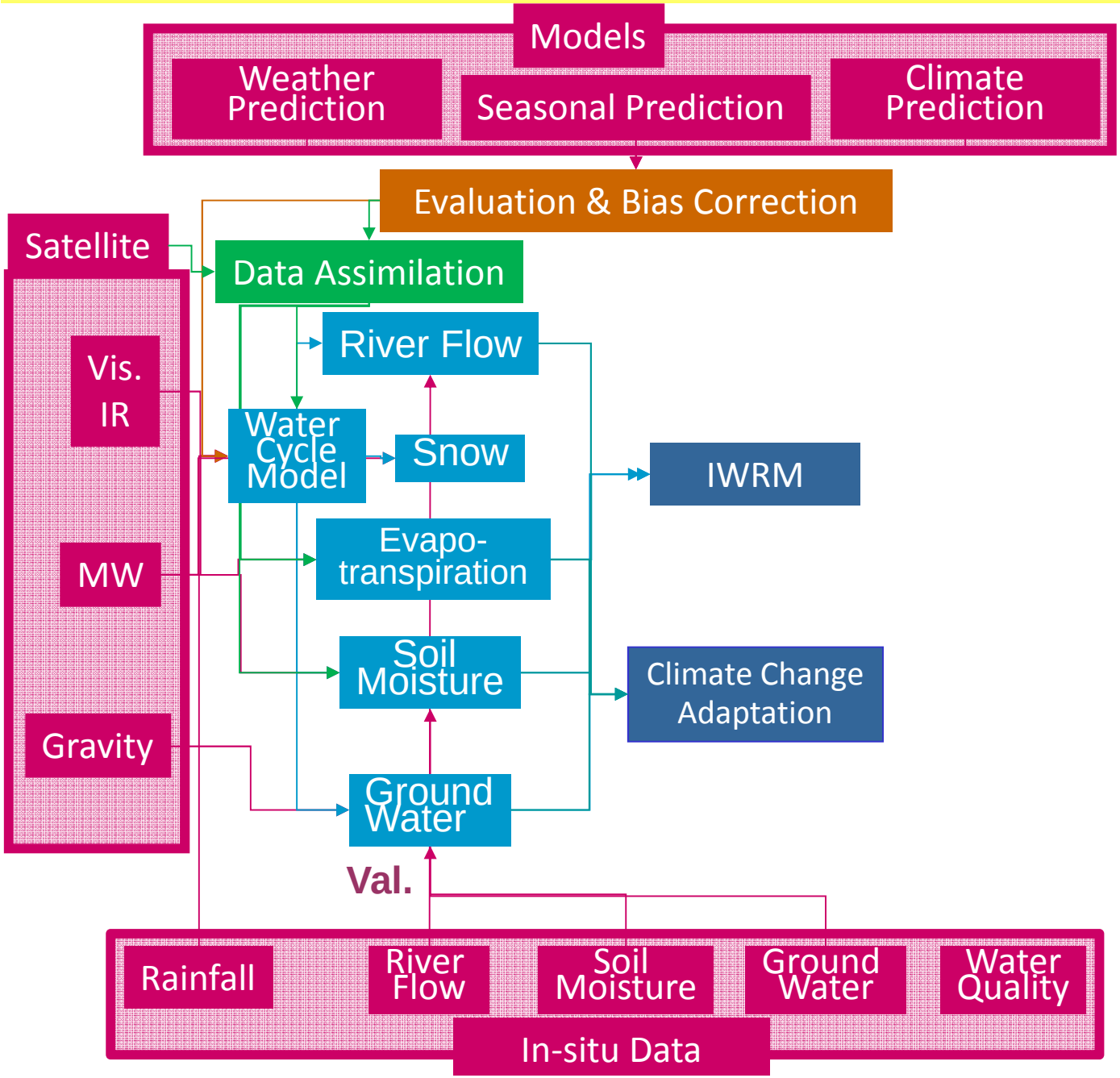
Bias correction Scheme

Rain Type	Threshold	Correction
Extreme 	- Larger than minimum of annual maxima of observed - count the number of extreme events in obs station (eg. Top of 30 rainfall by ranking all rainfall) - apply same number of extremes in GCM 	**Generalized Pareto Distribution** -Non every year statistics -Extreme (long or short tailed) fitting -Peak over threshold method  Fig. 2. Illustration of threshold model. G.R.Dargahi-Noubary; Mathematical Geology ,1989
No rain day 		**Ranking order statistics** - frequency of no rain day in GCM is same as station - less than no rain day threshold change zero rainfall.
Normal 		**Gamma Distribution** - monthly CDF of GCM mapping to monthly CDF of station - inverse of Gamma CDF in each month is corrected rain 

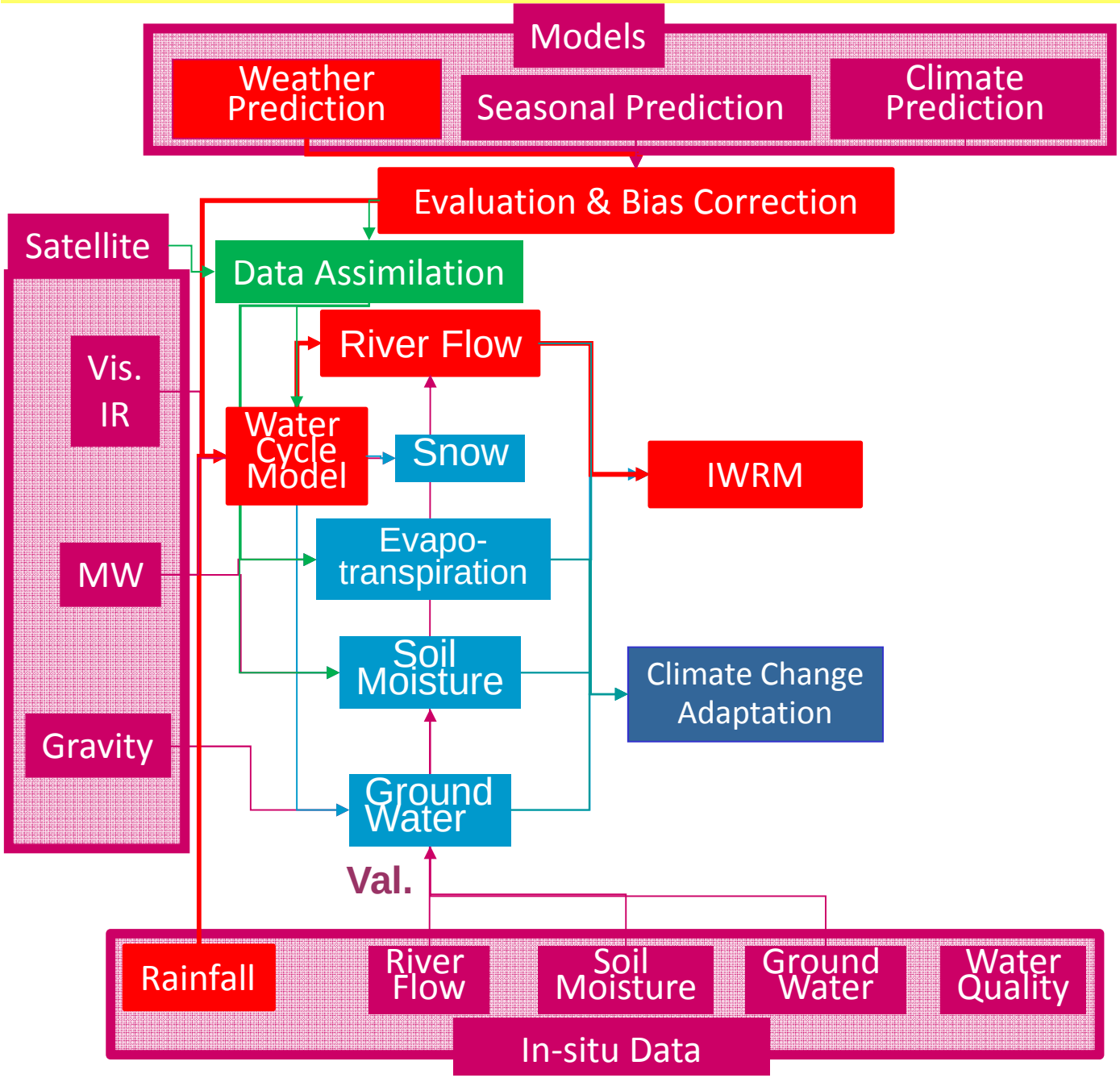

Nepal


Bangladesh
Bhutan
Malaysia
Nepal
Philippines

Water Cycle Integrator



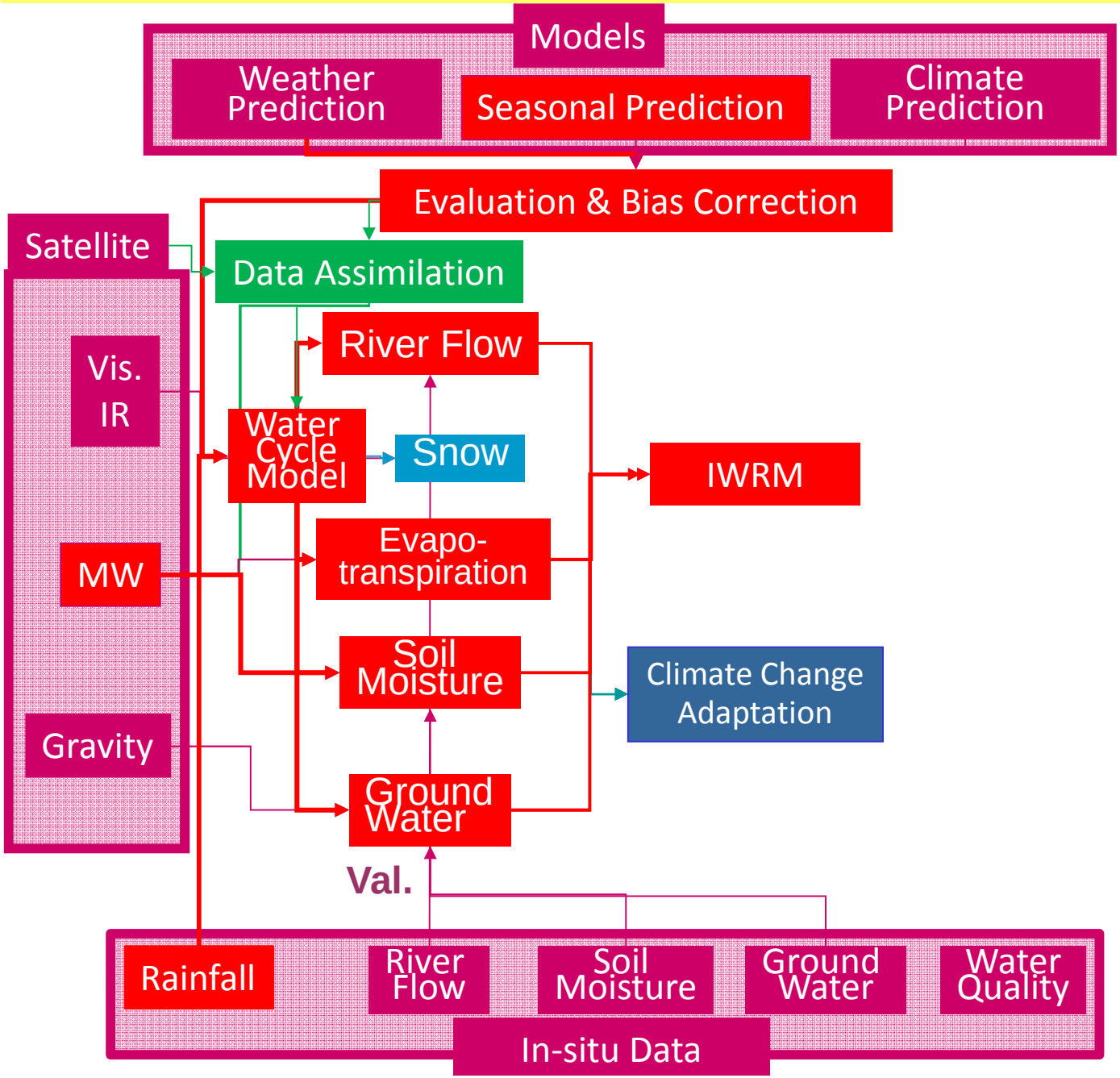
Water Cycle Integrator



Demonstration River Basins

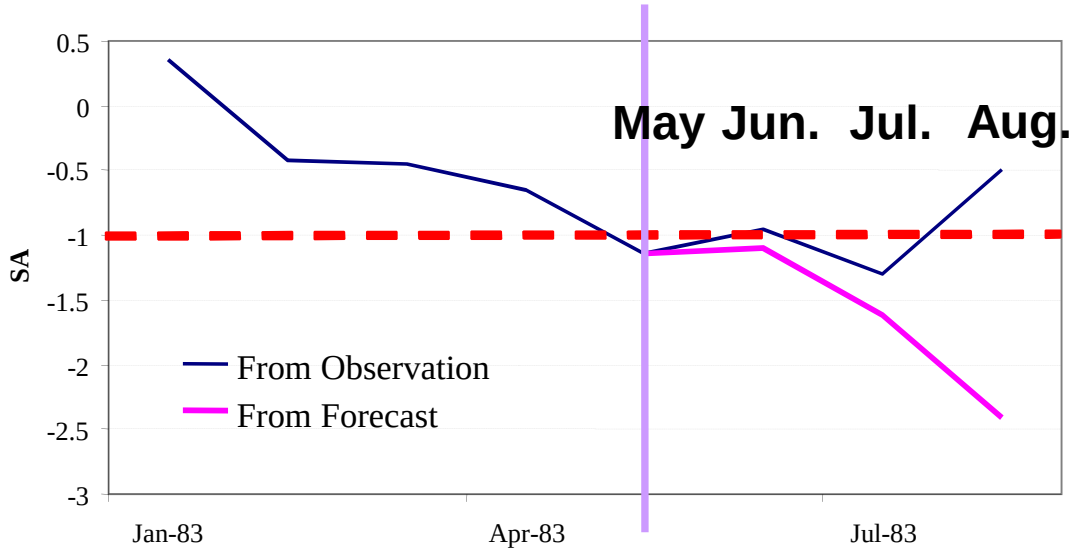
Asian Water Cycle Initiative

Water Cycle Integrator

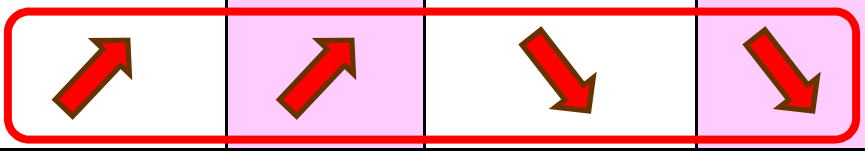
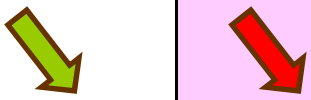
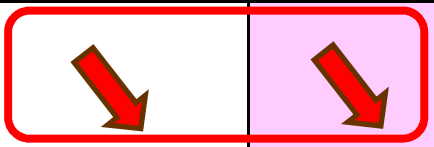
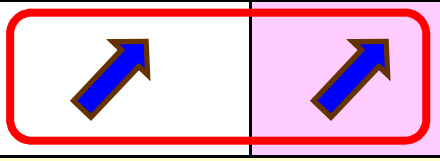


Seasonal Drought Prediction

Month	SA FROM OBSERVED DISCHARGE	SA FROM FORECAST DISCHARGE
June	-0.954	-1.010455
July	-1.30505	-1.61425
August	-0.4937	-2.41276



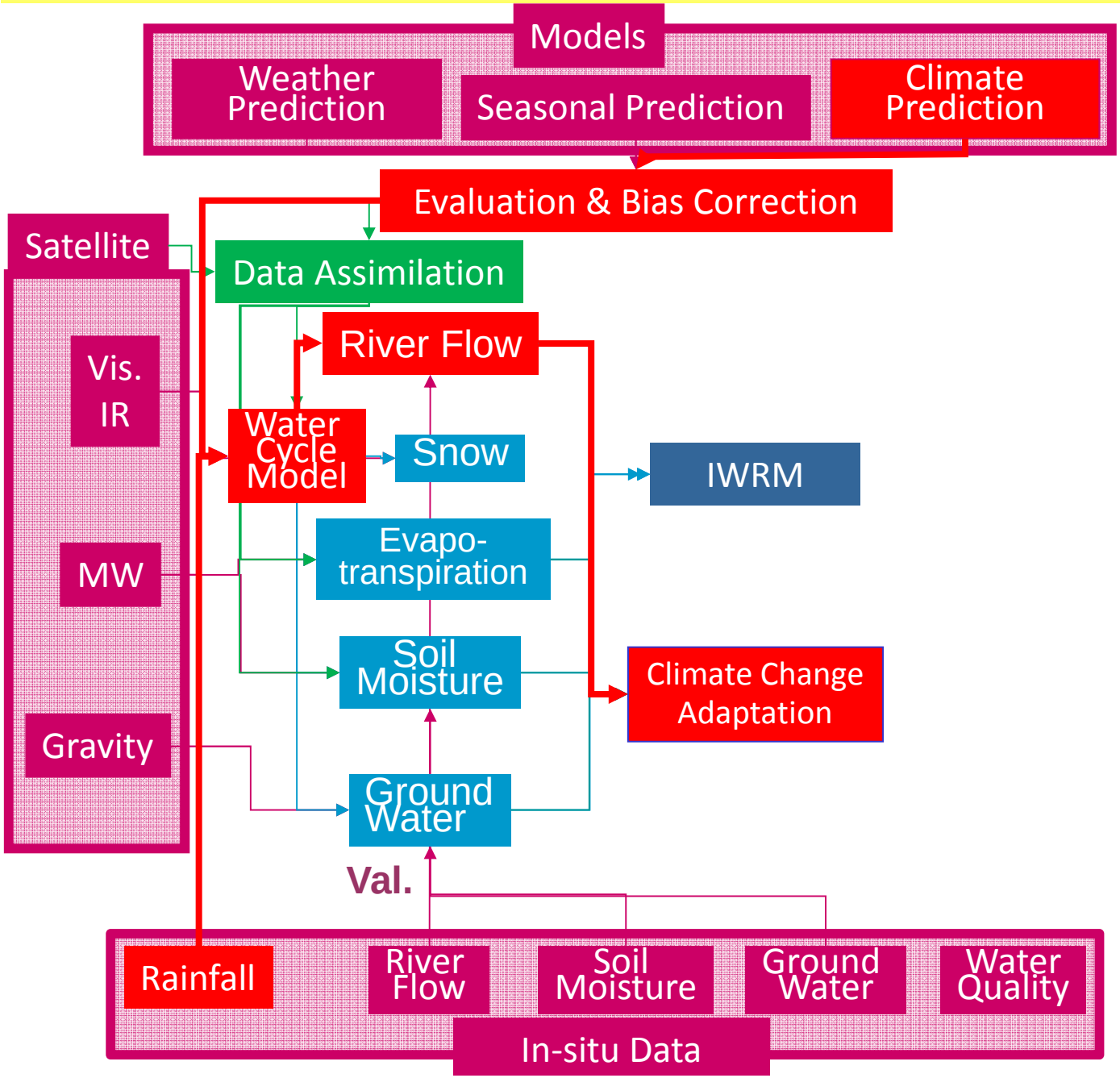
Seasonal Drought Prediction

Months	1st		2nd		3rd	
Year	Observed	SFC	Observed	SCF	Observed	SCF
1983						
1991						
1997						
1999-2000						

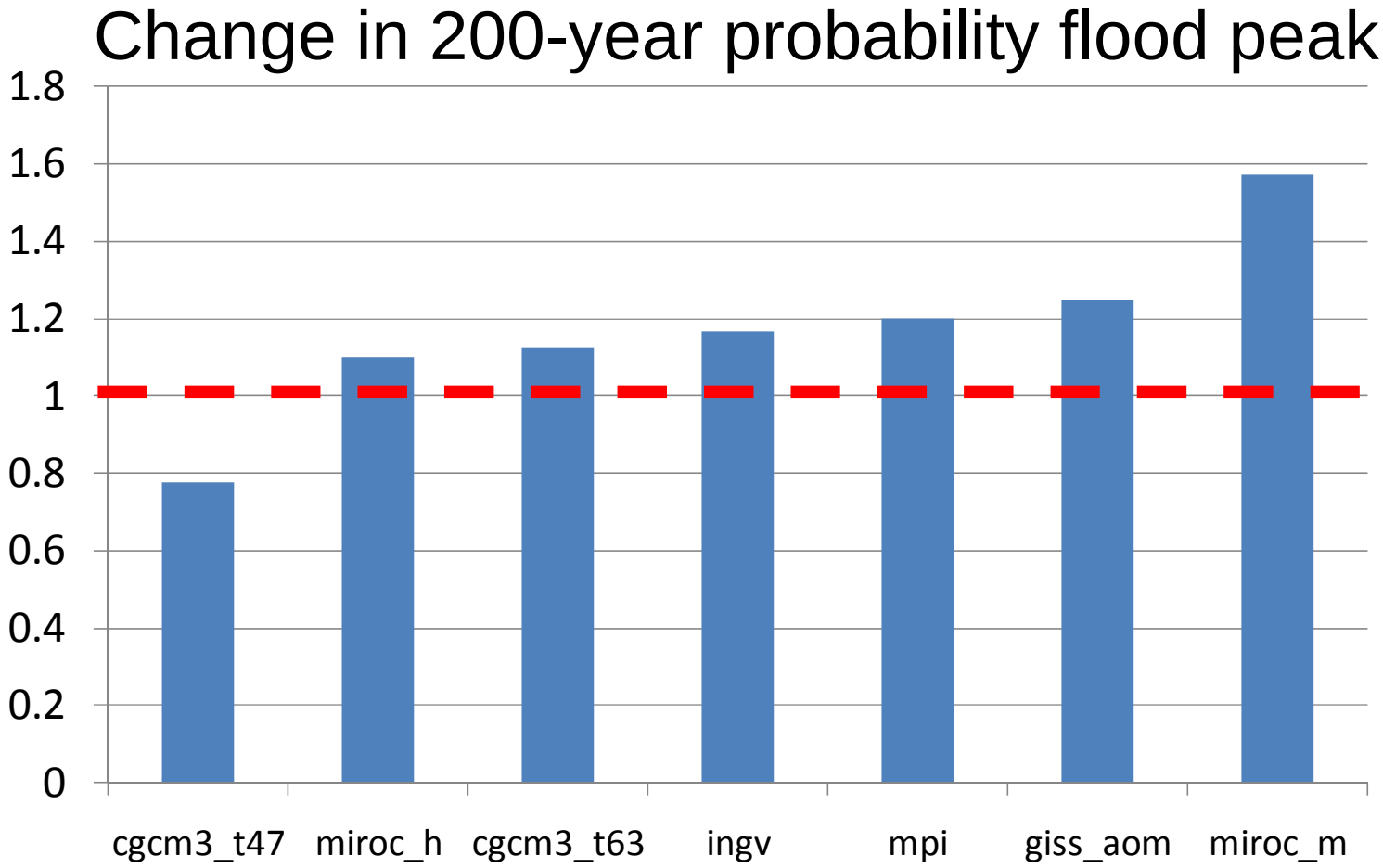
ARROW Legends: **red**= drought; **green**=normal; **blue**=wet

e.g. increase towards drought conditions 

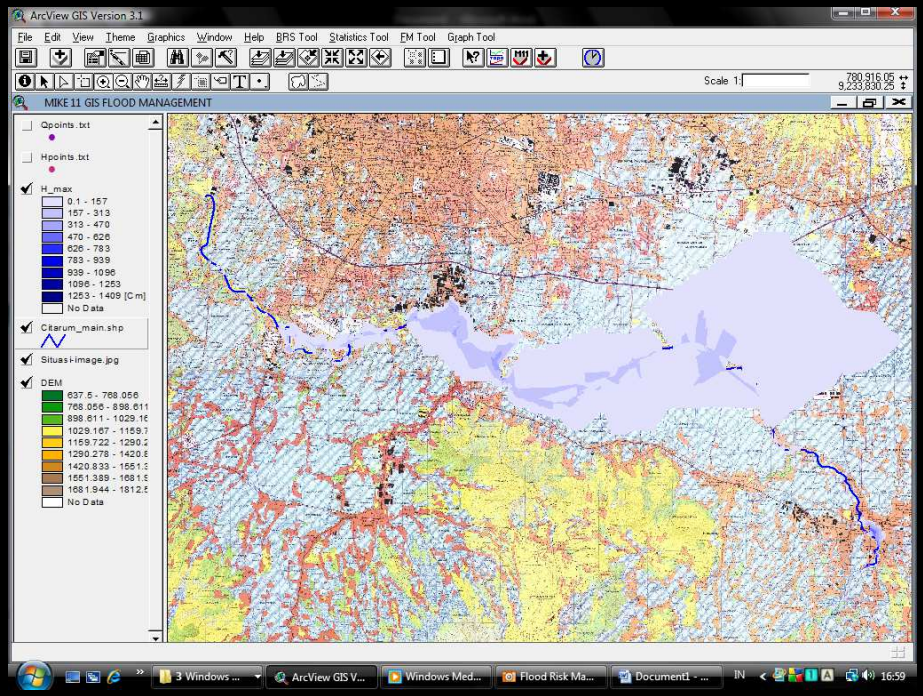
Water Cycle Integrator



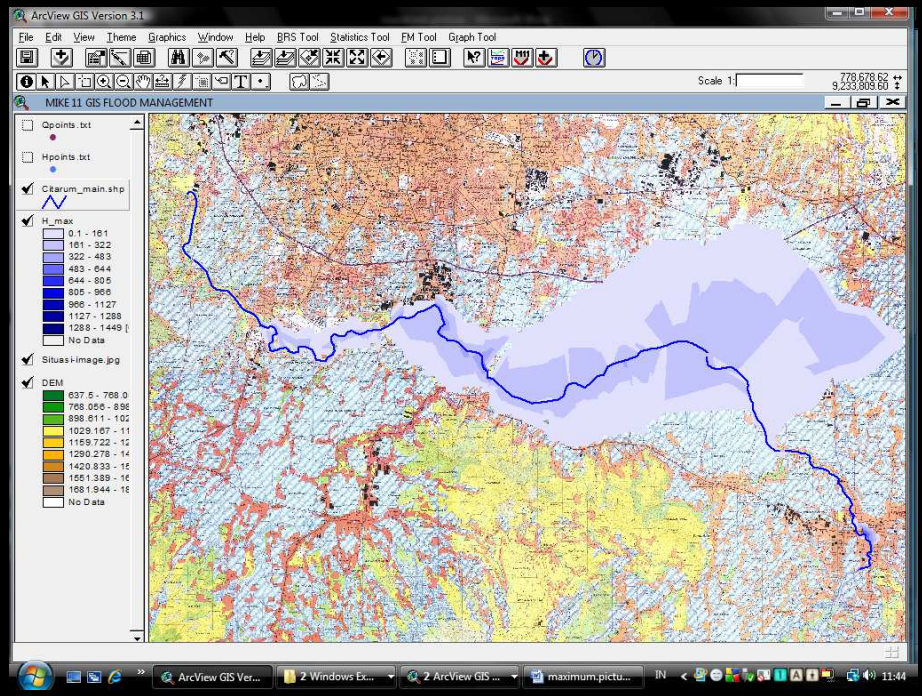
Climate Change Impact Assessment



Climate Change Impacts on Flood Control Plan in Indonesia

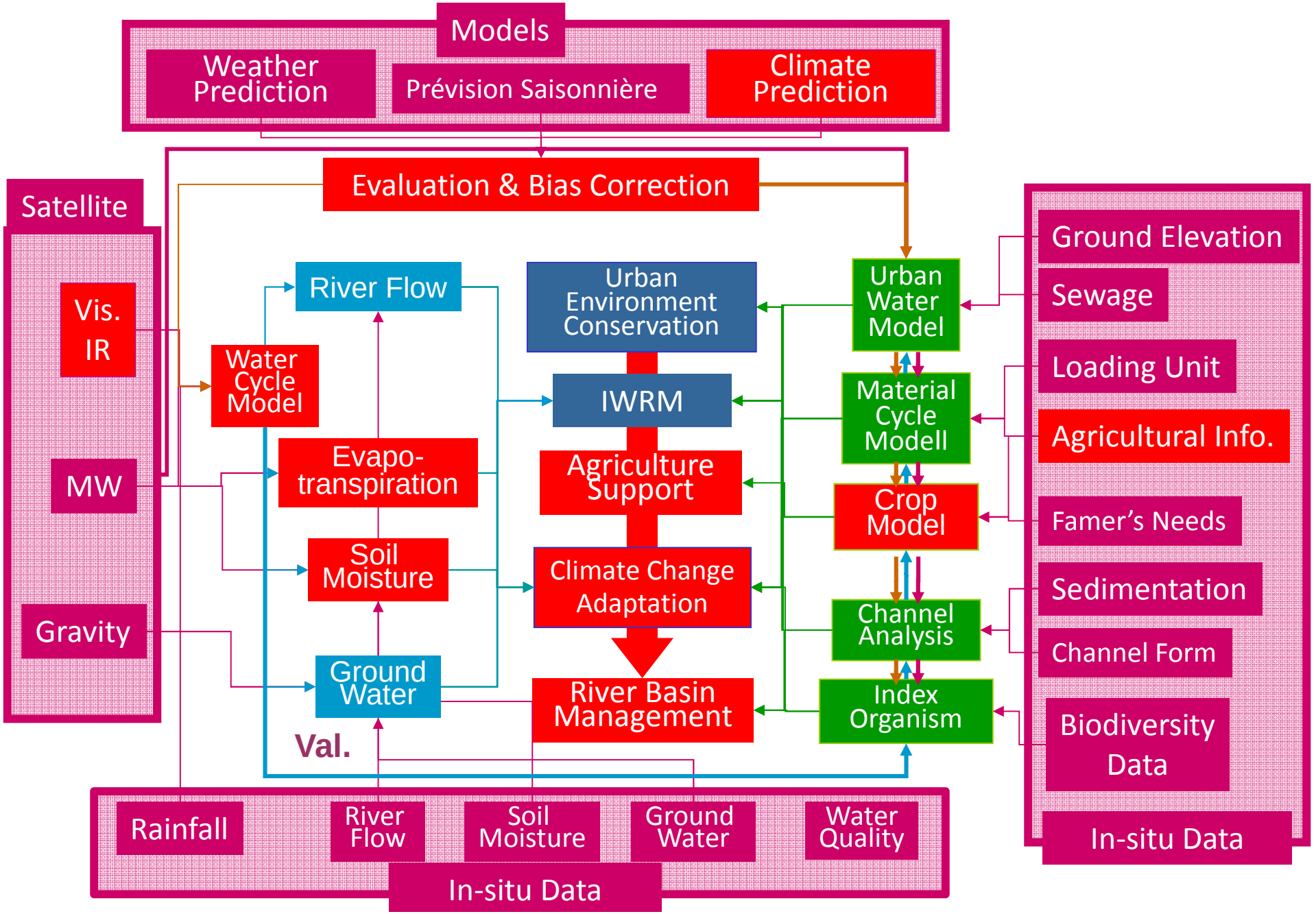


10year Probable flood
Current Climate

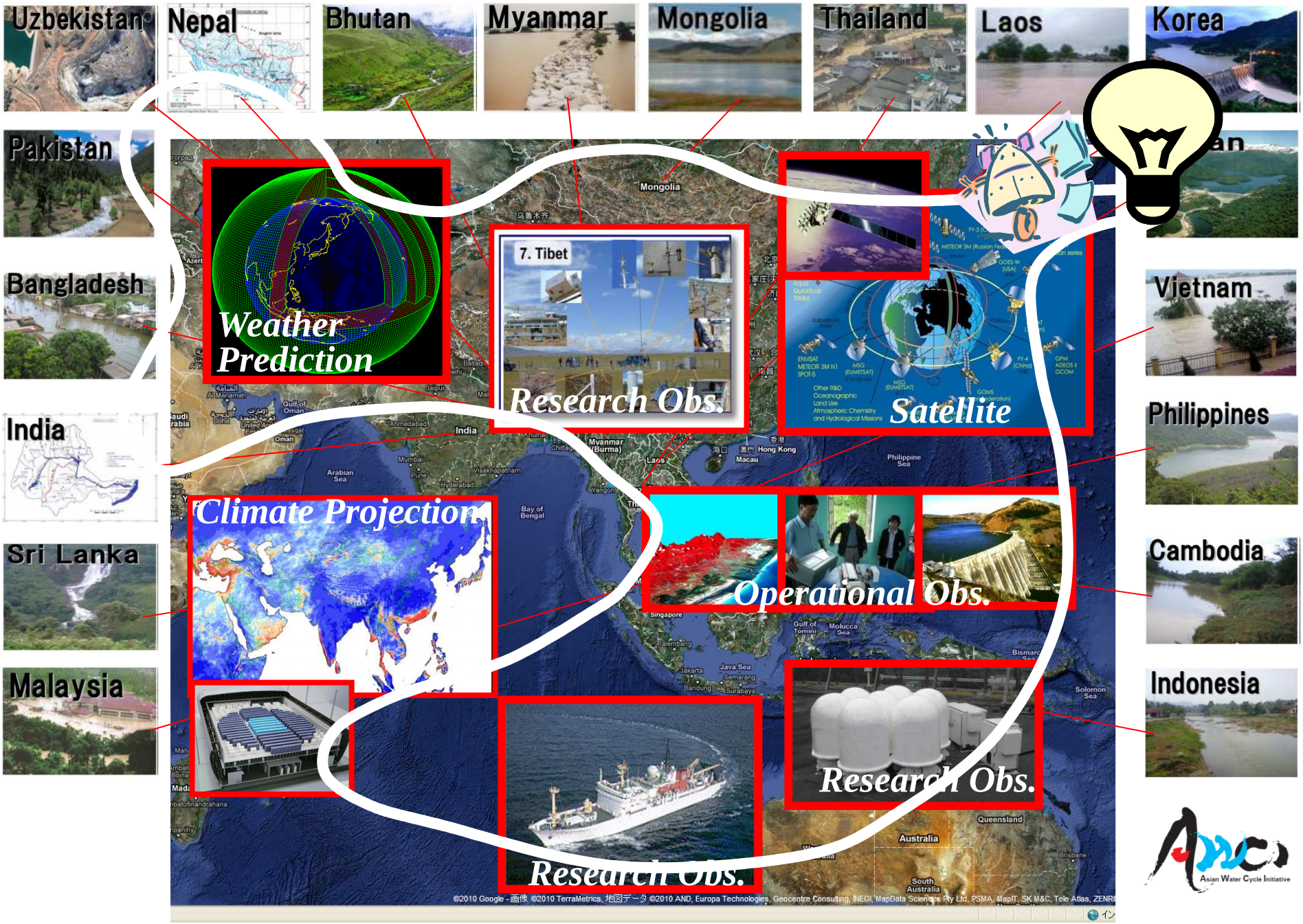


10year Probable flood
50 years later

Water Cycle Integrator



Data Integration and Analysis




Thank You.