Floods and Land Slides

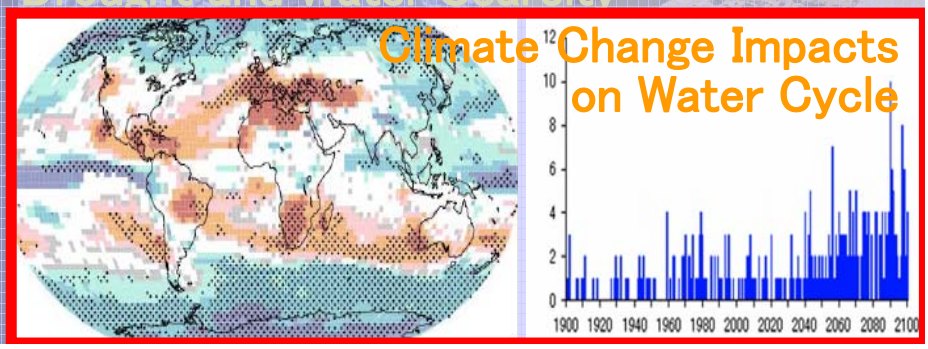
Integrated Water Resources Management System

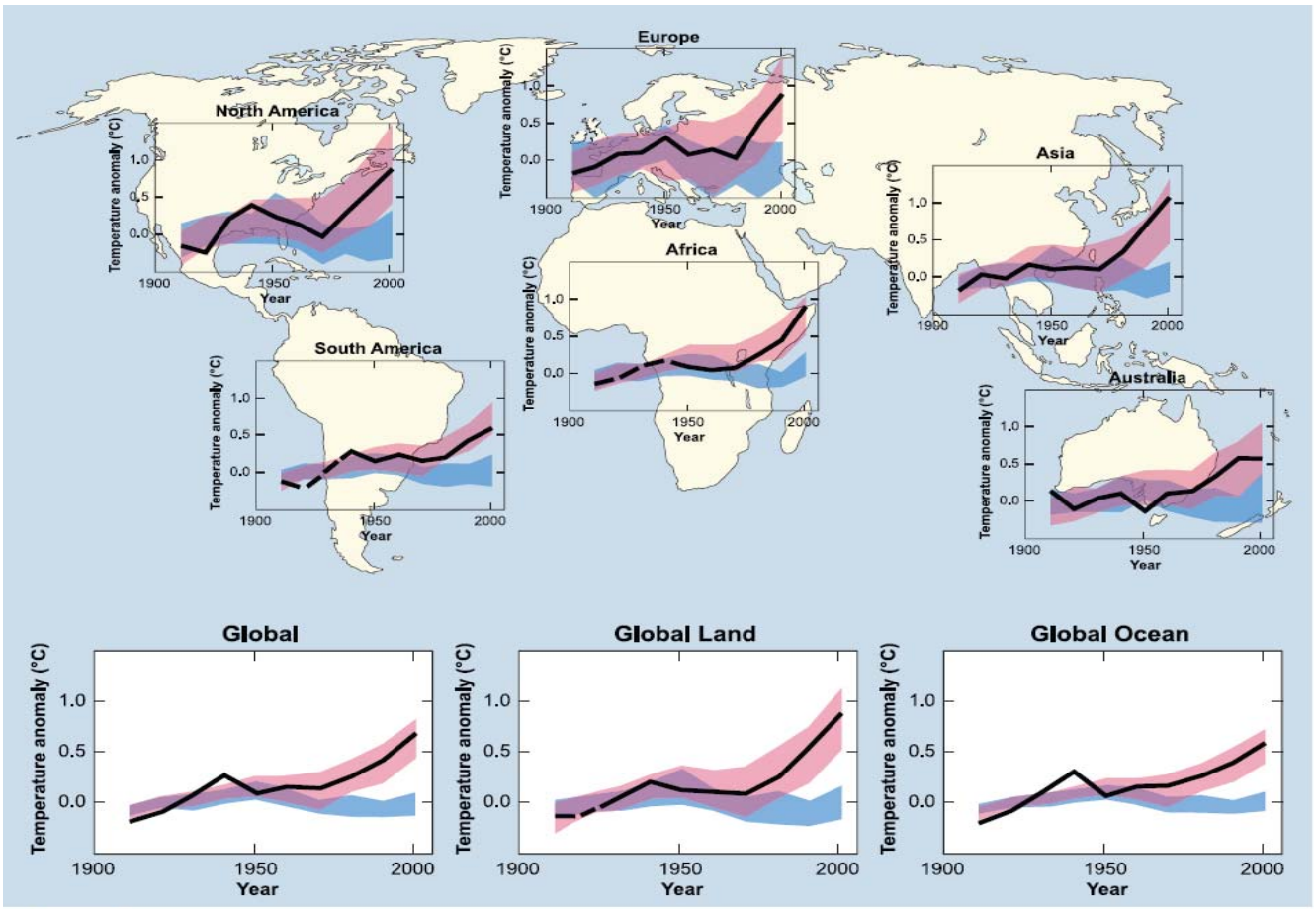
GEOSS
Asian Water Cycle Initiative (AWCI)

Toshio Koike
Earth Observation Data Integration and Fusion Research Initiative (EDITORIA)
The University of Tokyo

Drought and Water Scarcity

Water Pollution and Ecosystem Degradation

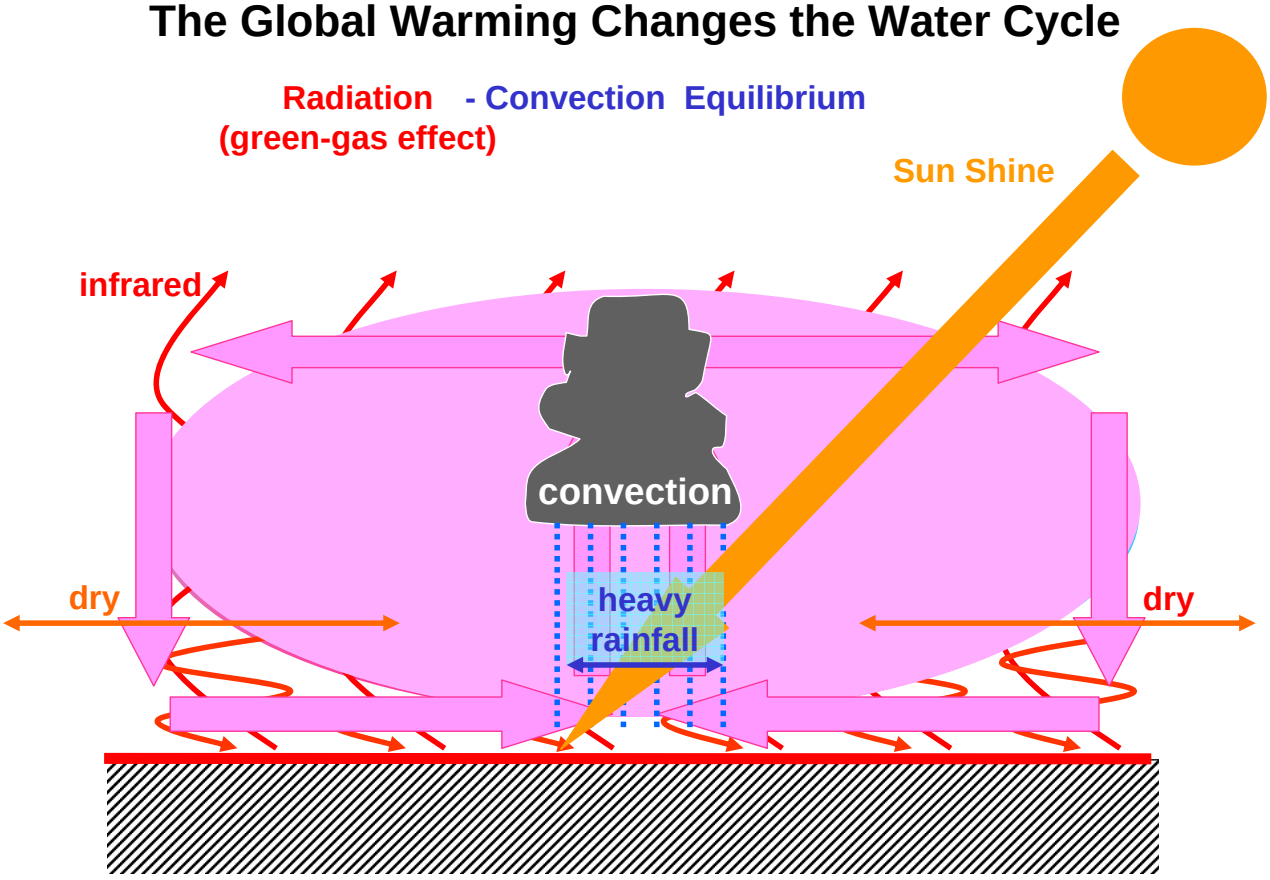




Observed rate of sea level rise and estimated contributions from different sources.

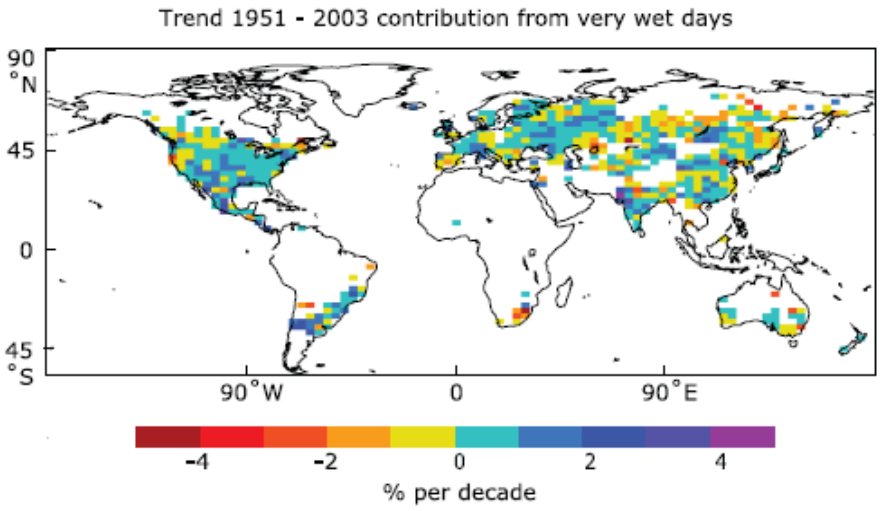
Source of sea level rise	Rate of sea level rise (mm per year) 1961–2003	1993–2003
Thermal expansion	0.42 ± 0.12	1.6 ± 0.5
Glaciers and ice caps	0.50 ± 0.18	0.77 ± 0.22
Greenland Ice Sheet	0.05 ± 0.12	0.21 ± 0.07
Antarctic Ice Sheet	0.14 ± 0.41	0.21 ± 0.35
Sum of individual climate contributions to sea level rise	1.1 ± 0.5	2.8 ± 0.7
Observed total sea level rise	1.8 ± 0.5[a]	3.1 ± 0.7[a]
Difference (Observed minus sum of estimated climate contributions)	0.7 ± 0.7	0.3 ± 1.0

The Global Warming Changes the Water Cycle

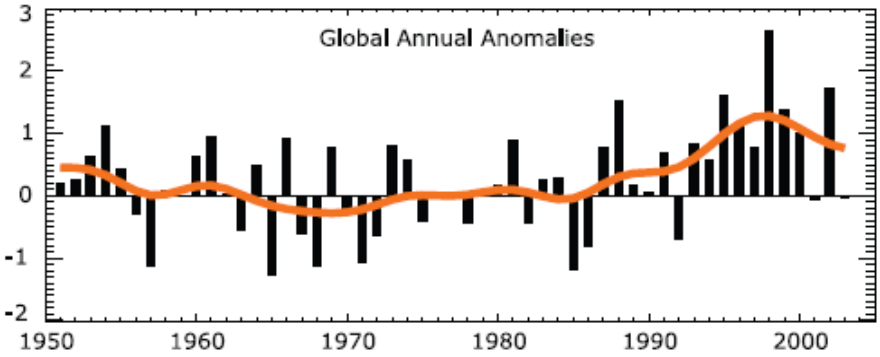


Changes in heavy precipitation frequencies >> Changes in precipitation totals

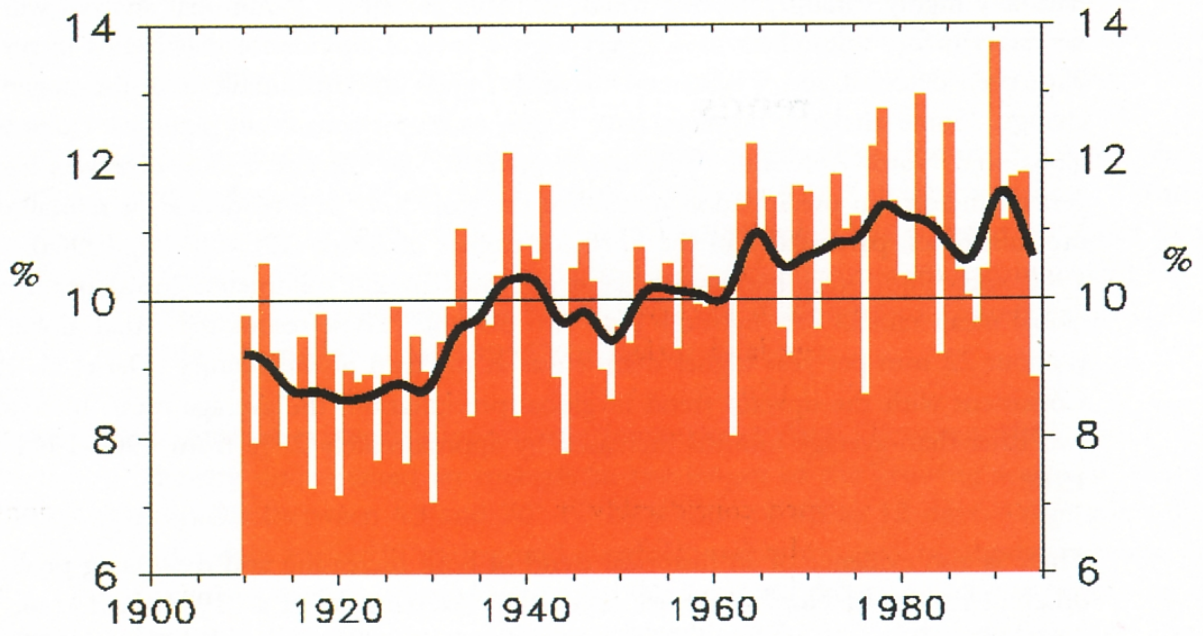
Observed trends for 1951 to 2003 in the contribution to total annual precipitation from very wet days



Anomalies (%) of the global annual time series (1961 to 1990)

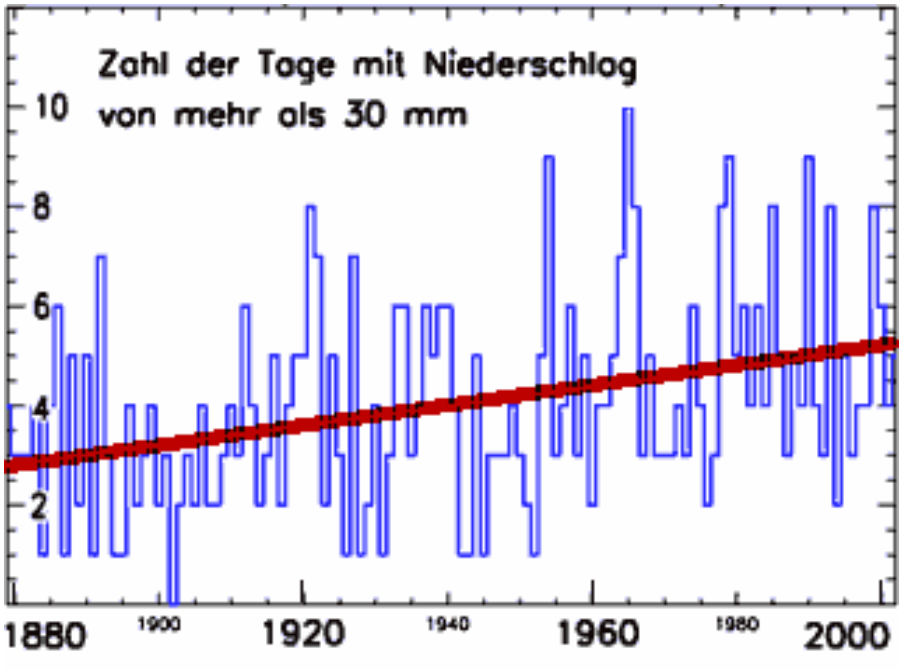


Increase of Heavy Rainfall Events in USA



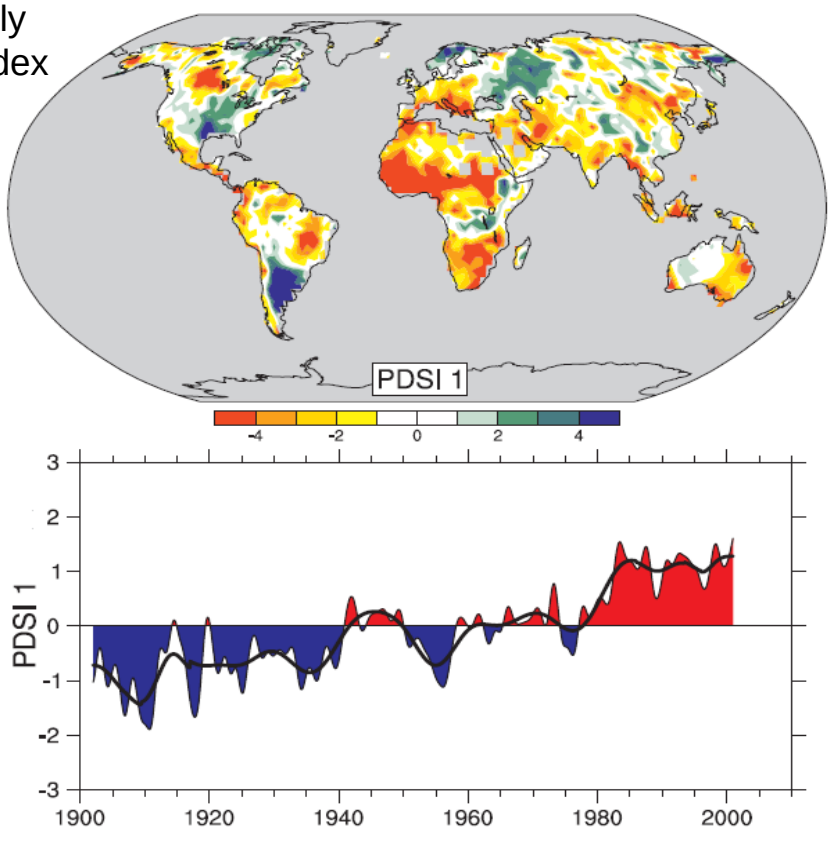
Source: http://www.ncdc.noaa.gov/ol/climate/research/gcps/papers/amsbull/amsbull.html

Increase of Heavy Rainfall Events in Germany



Source: Wetterstation Hohenpeißenberg

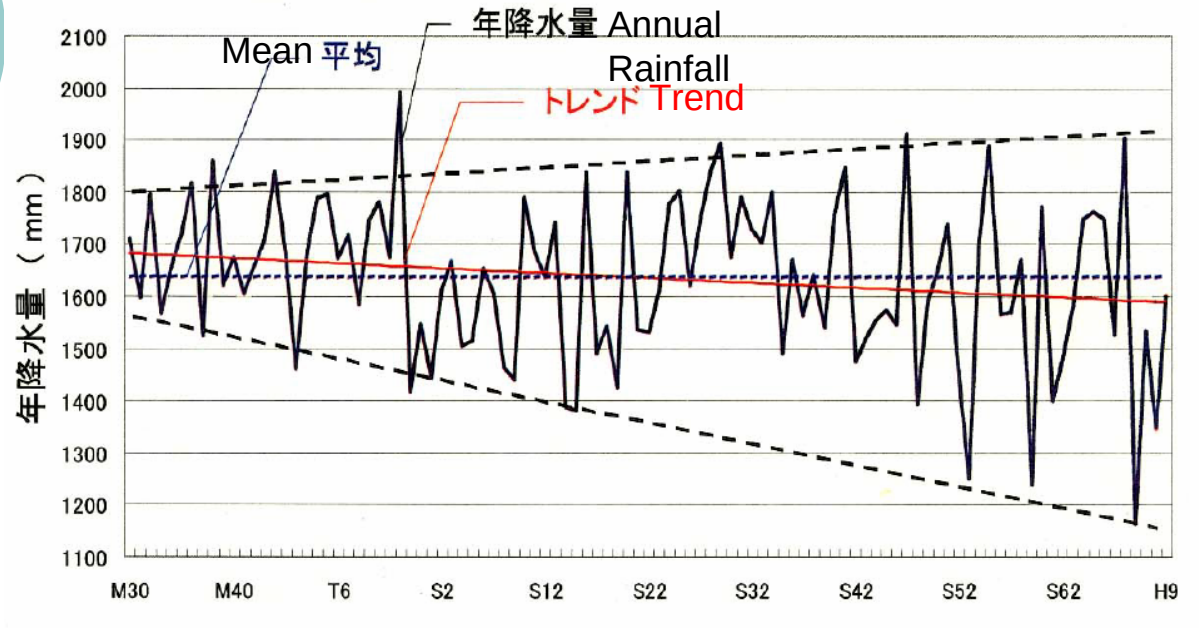
Spatial pattern of the monthly Palmer Drought Severity Index (PDSI) for 1900 to 2002.



Area affected by drought increase.

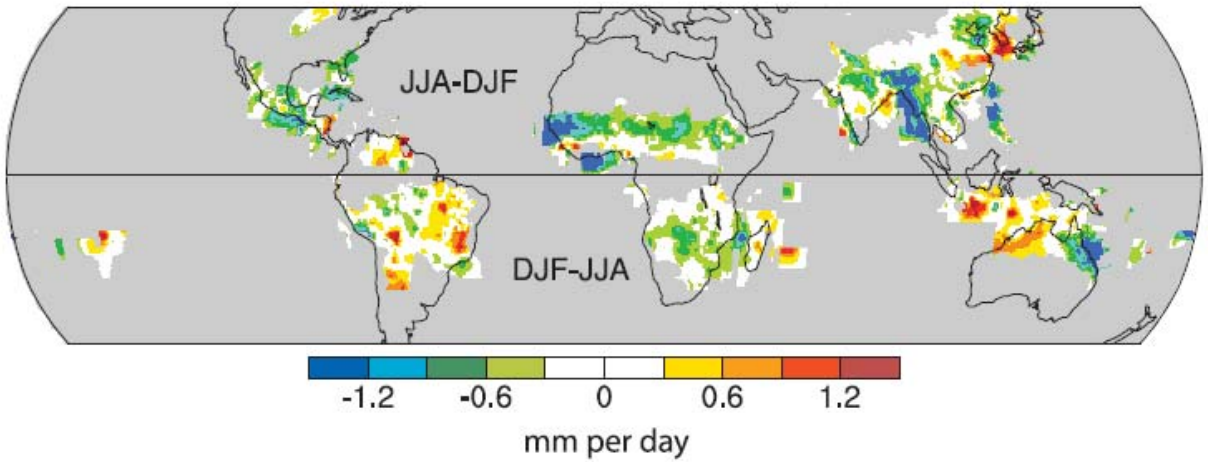
PDSI: a prominent index of drought and measures the cumulative deficit in surface land moisture by incorporating previous precipitation and estimates of moisture drawn into the atmosphere into a hydrological accounting system.

Change in Annual Rainfall in Japan



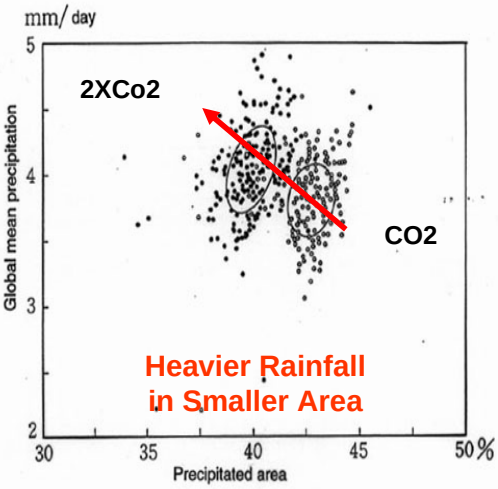
MLIT HP
http://www.mlit.go.jp/tochimizushigen/

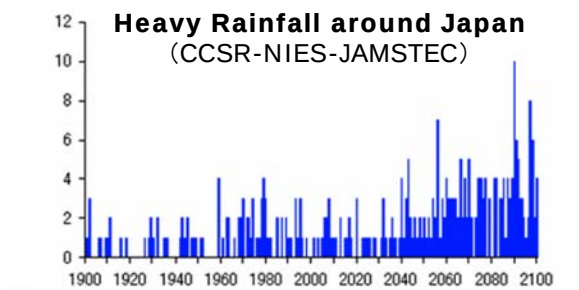
Monsoon Rainfall increase or decrease ?

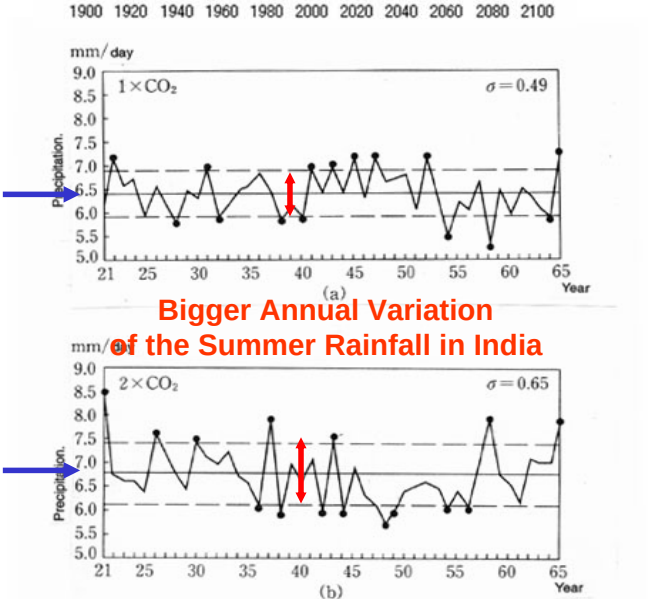


Change in the mean annual range of precipitation:
]1976 to 2003 minus 1948 to 1975 periods (mm per day).

Impacts of Co2 Increase on the Water Cycle Predicted by Models



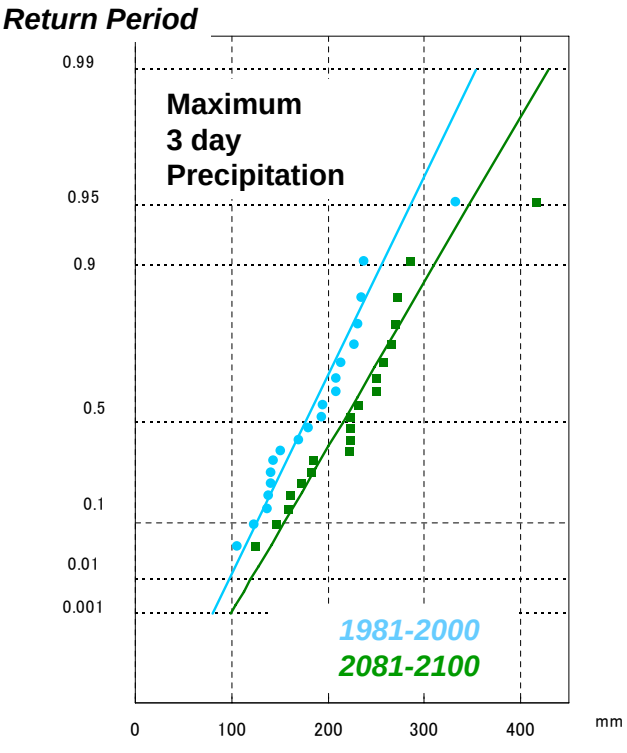


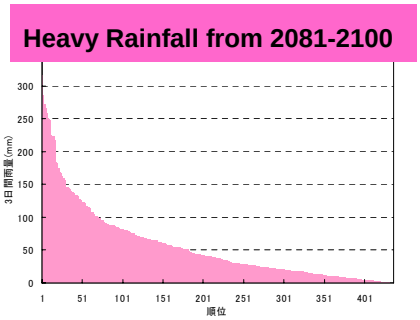


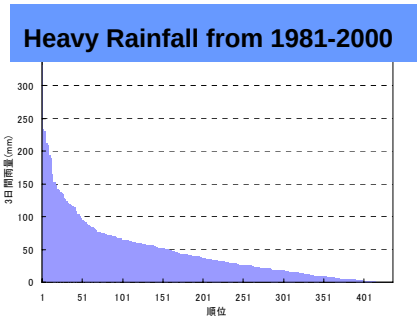
Recent trends, assessment of human influence on the trend and projections for extreme weather events for which there is an observed late-20th century trend.

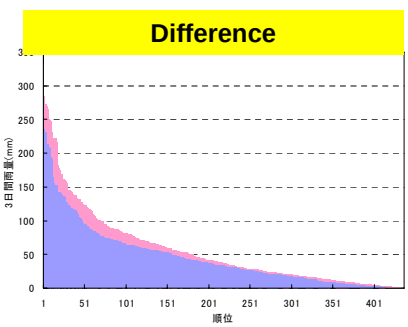
Phenomenon[a] and direction of trend	Likelihood that trend occurred in late 20th century (typically post 1960)	Likelihood of a human contribution to observed trend[b]	Likelihood of future trends based on projections for 21st century using SRES scenarios
Warmer and fewer cold days and nights over most land areas	*Very likely*[c]	*Likely*[d]	*Virtually certain*[d]
Warmer and more frequent hot days and nights over most land areas	*Very likely*[e]	*Likely (nights)*[d]	*Virtually certain*[d]
Warm spells/heat waves. Frequency increases over most land areas	*Likely*	*More likely than not*[f]	*Very likely*
Heavy precipitation events. Frequency (or proportion of total rainfall from heavy falls) increases over most areas	*Likely*	*More likely than not*[f]	*Very likely*
Area affected by droughts increases	*Likely* in many regions since 1970s	*More likely than not*	*Likely*
Intense tropical cyclone activity increases	*Likely* in some regions since 1970	*More likely than not*[f]	*Likely*
Increased incidence of extreme high sea level (excludes tsunamis)[g]	*Likely*	*More likely than not*[f,h]	*Likely*[i]

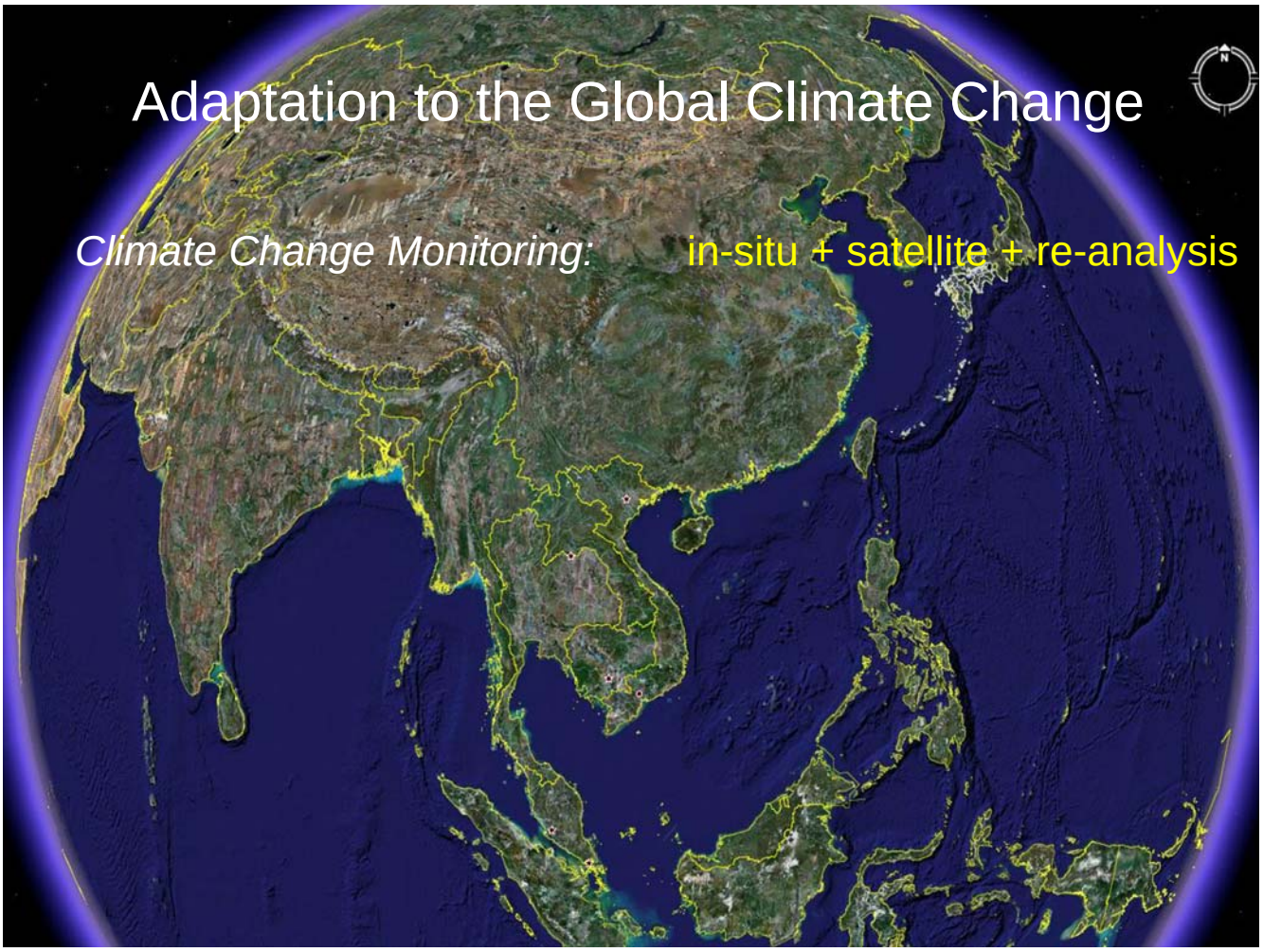
Heavy Rainfall by Typhoons in Tone River from the Simulation by RCM20











Satellite Data

AMSR on ADEOS-II

AMSR-E on AQUA

6.925, 10.65, 18.7, 23.8, 36.5, (50.3), (52.8) and 89.0 GHz

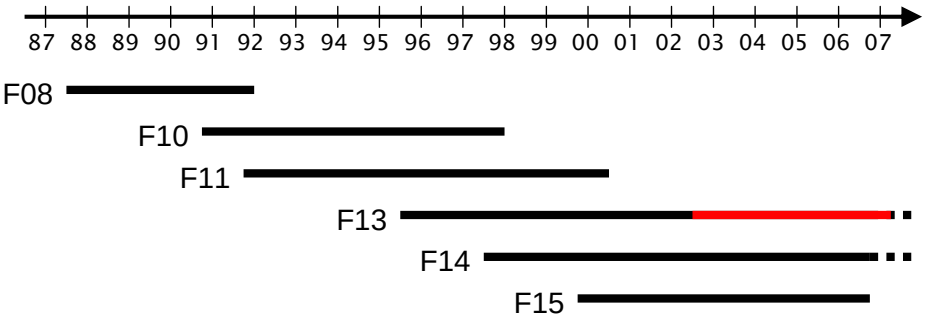
System Development and Validation

AMSR-E

AMSR

SSM/I on DMSP

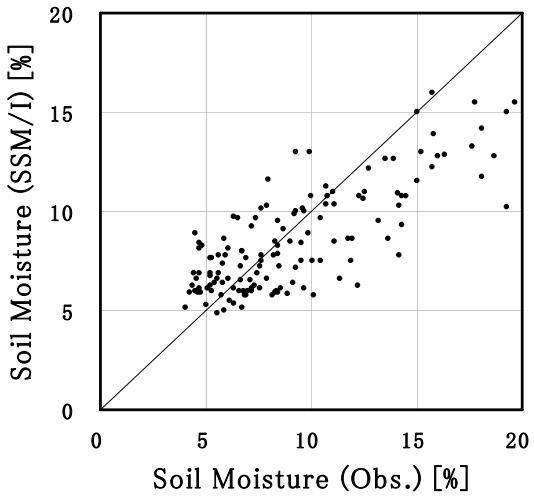
19.35, 22.235, **37.0** and 85.5 GHz

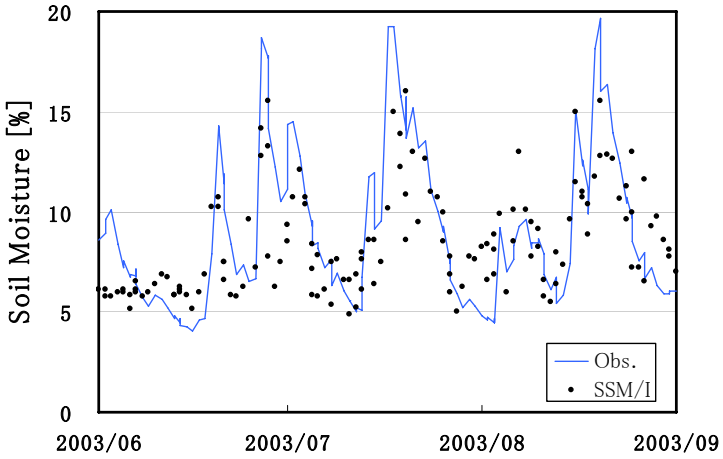


Validation of Soil Moisture

Mean Absolute Error: 2.00 [%]

RMS Error: 2.55 [%]





Satellite Data

AMSR on ADEOS-II AMSR-E on AQUA

AMSR-E

AMSR

6.925, 10.65, 18.7, 23.8, 36.5, (50.3), (52.8) and 89.0 GHz

SSM/I on DMSP

87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07

F08

F10

F11

F13

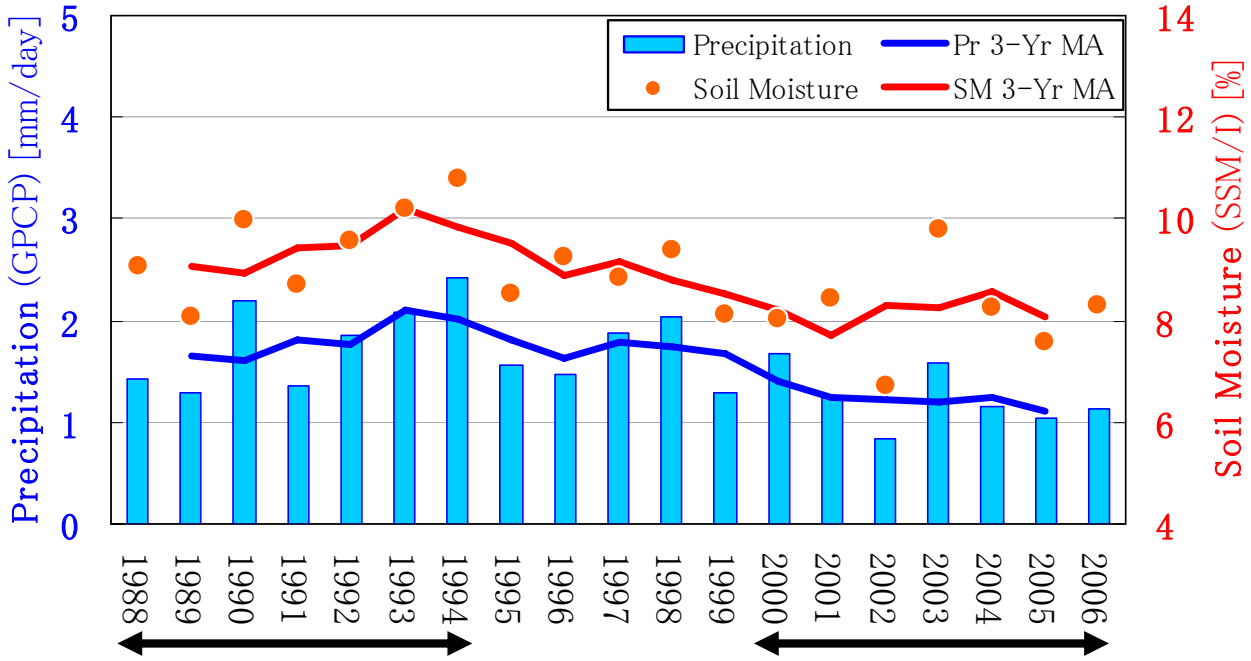
F14

F15

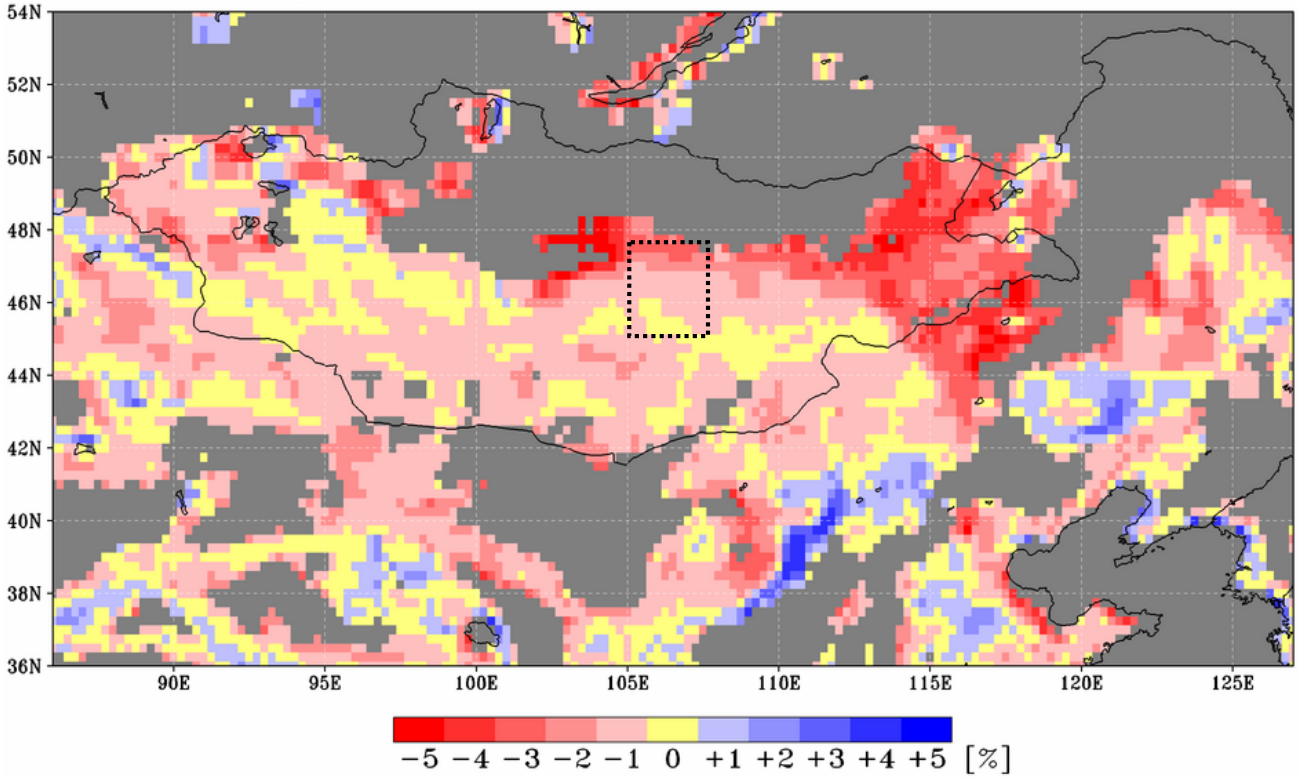
19.35, 22.235, **37.0** and 85.5 GHz

Long Data Set Generation and Analysis

Long Term Application of 2.5 x 2.5 Degrees Area including Validation Sites (JJA Average)

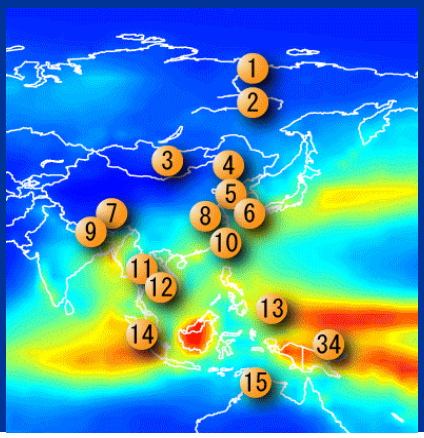


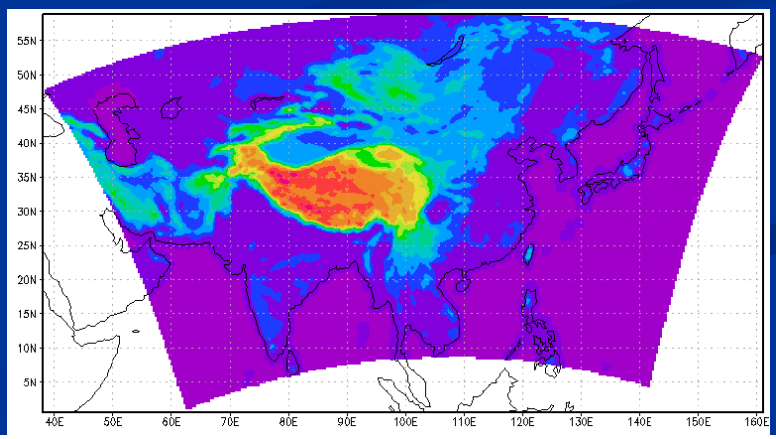
Variable Trend of Soil Moisture (JJA, 1988-2006)

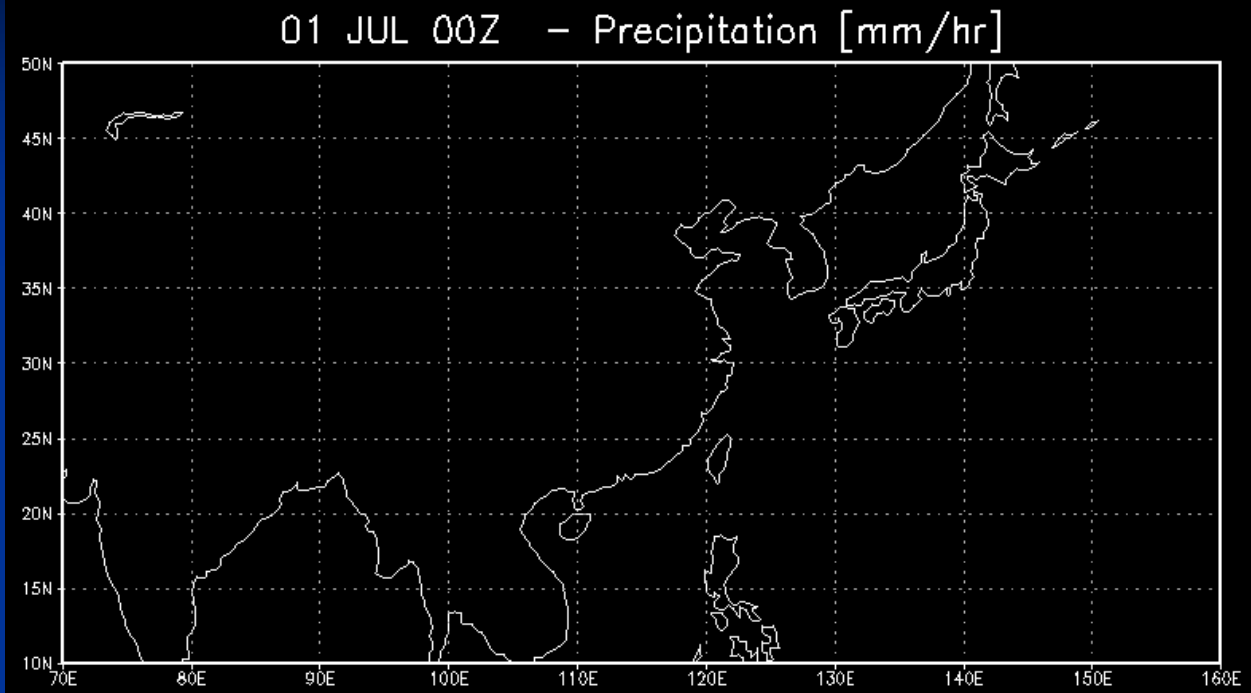


Preliminary Design for Multi-scale Land Impact Research by of L-A Coupled DAS

- Regional-scale approach by L-A DAS without CMDAS
  - Extent: 40ºE - 160ºE and 0ºN - 60ºN
  - Grid size: 25 km → nx = 355, ny = 223, nz = 35
- Meso-scale "mobile" approach by L-A DAS with CMDAS
- Point-scale by the CEOP Reference Sites Network +



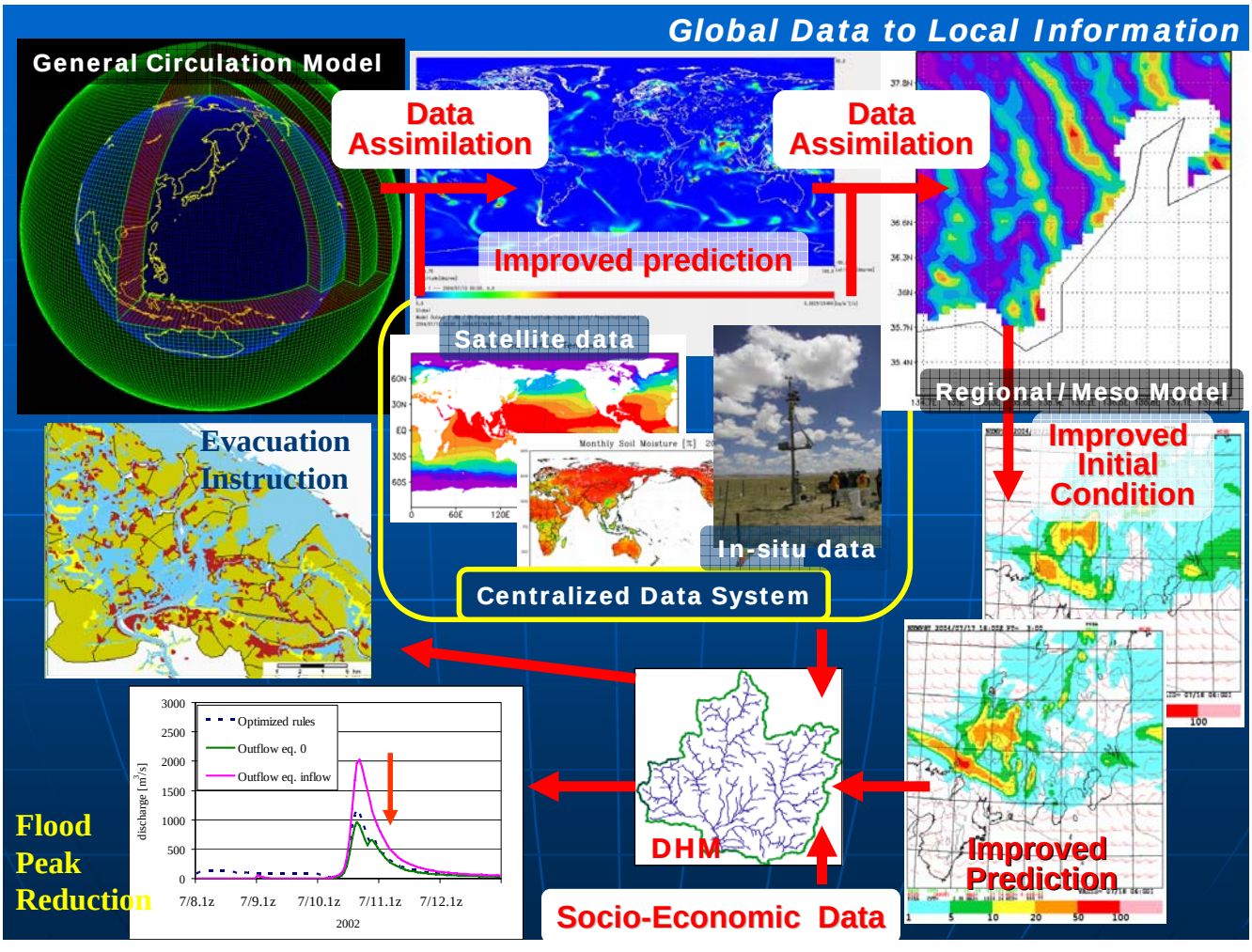




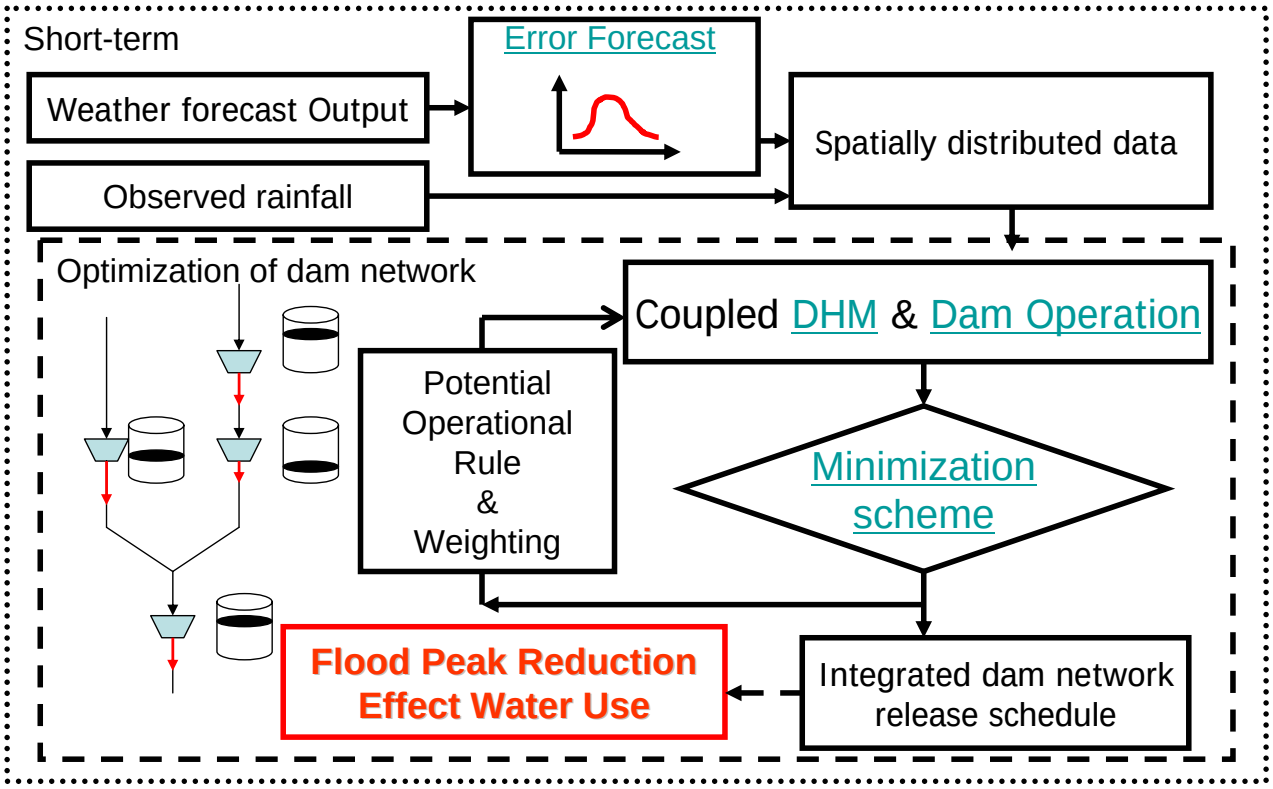
Adaptation to the Global Climate Change

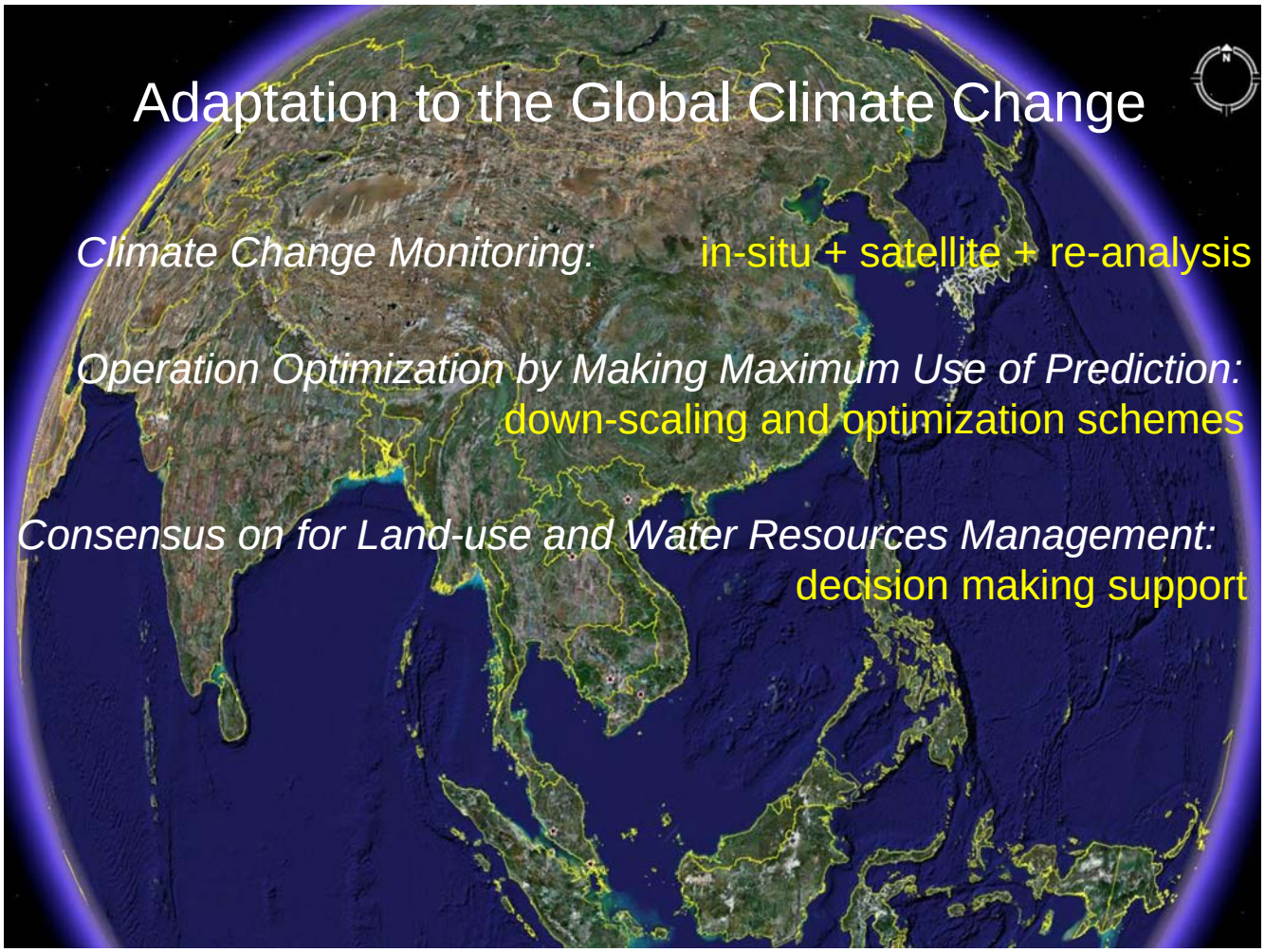
Climate Change Monitoring: in-situ + satellite + re-analysis

Operation Optimization by Making Maximum Use of Prediction: down-scaling and optimization schemes

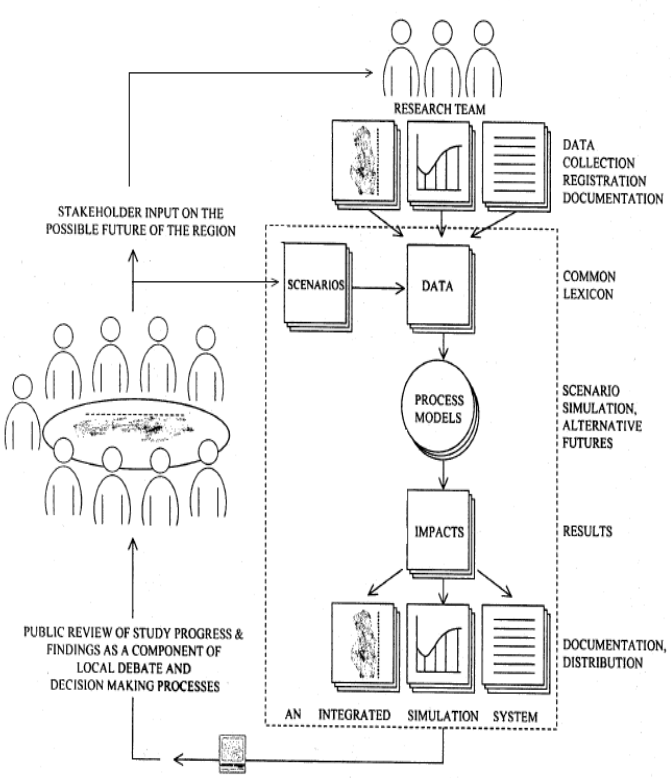


Dam Operation Optimization System by Using Rainfall Forecasting

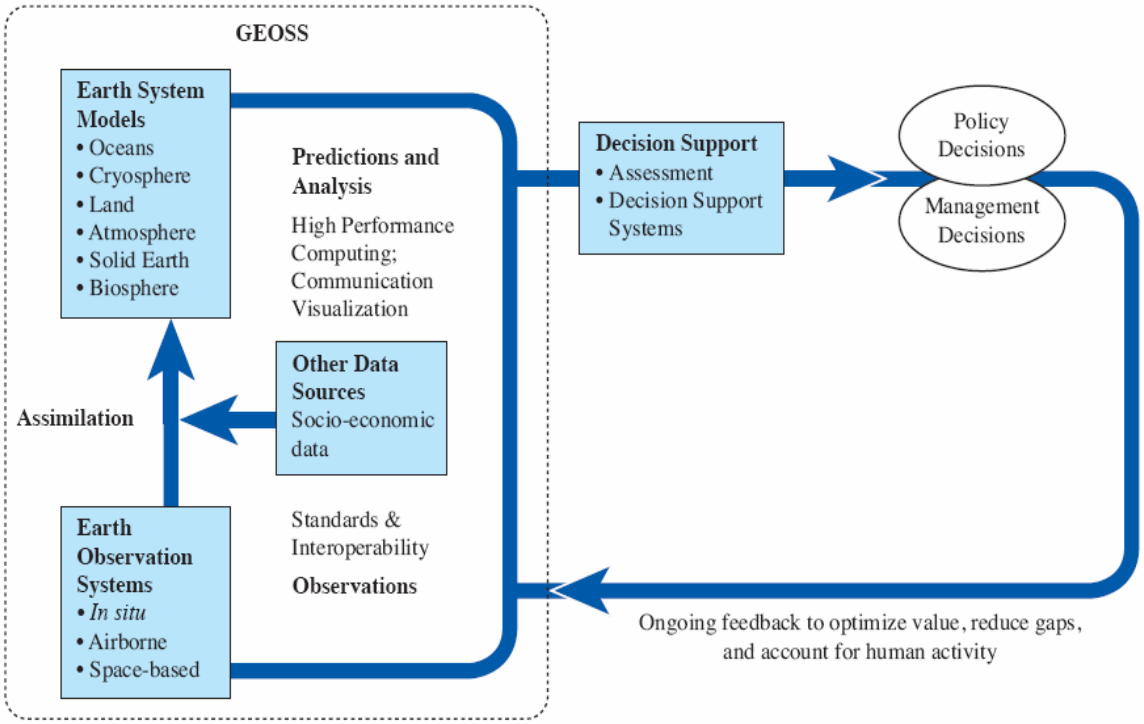




Consensus Building Cycle for Climate Change Adaptation



Group on Earth Observations



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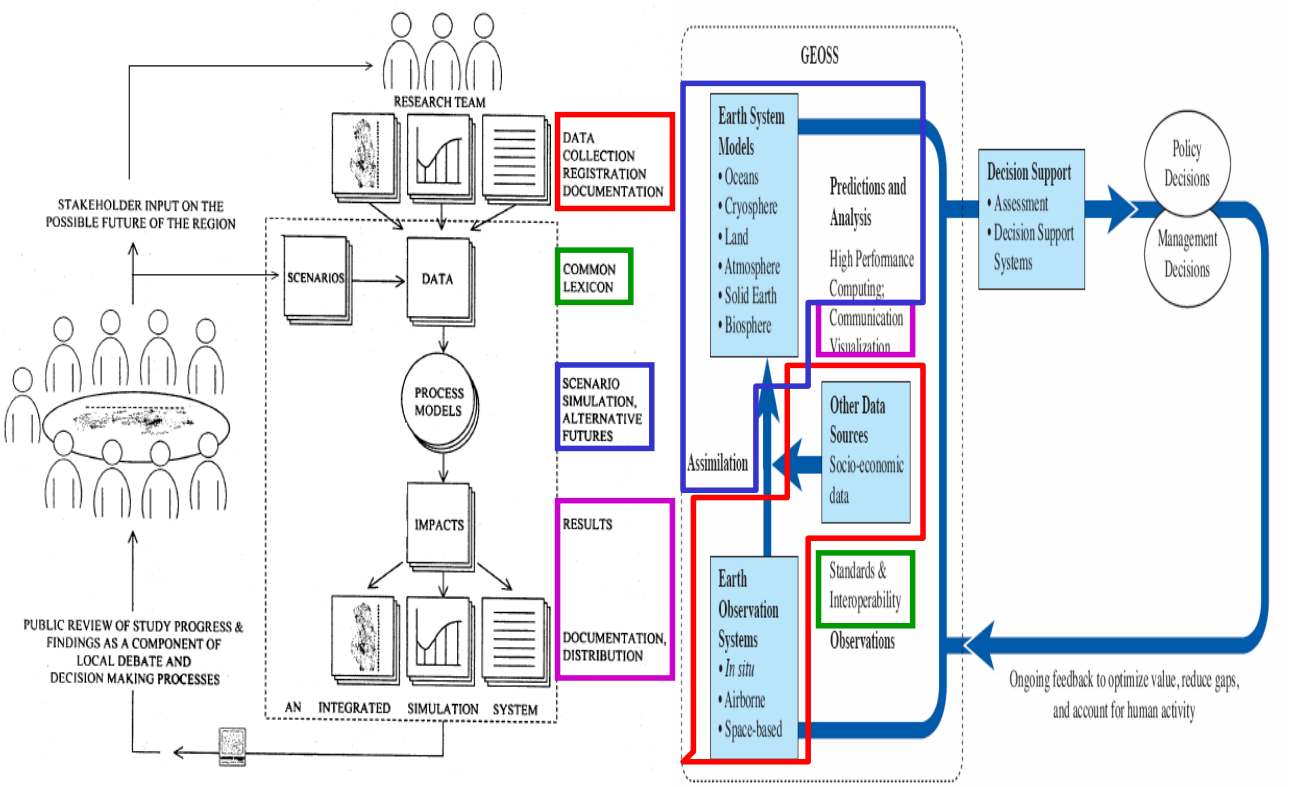
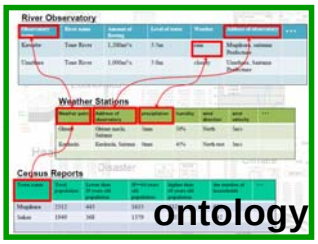
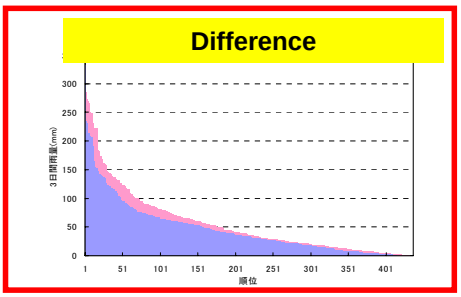
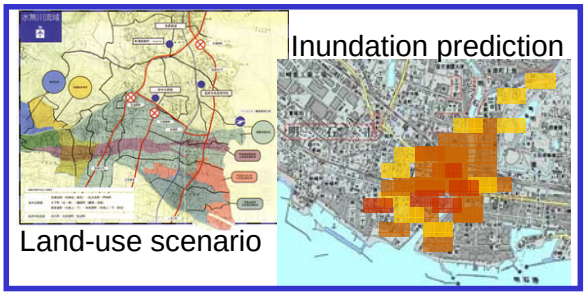
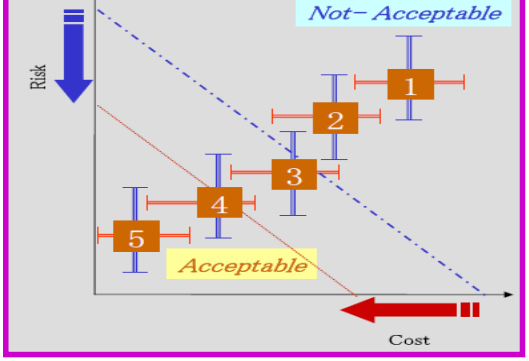


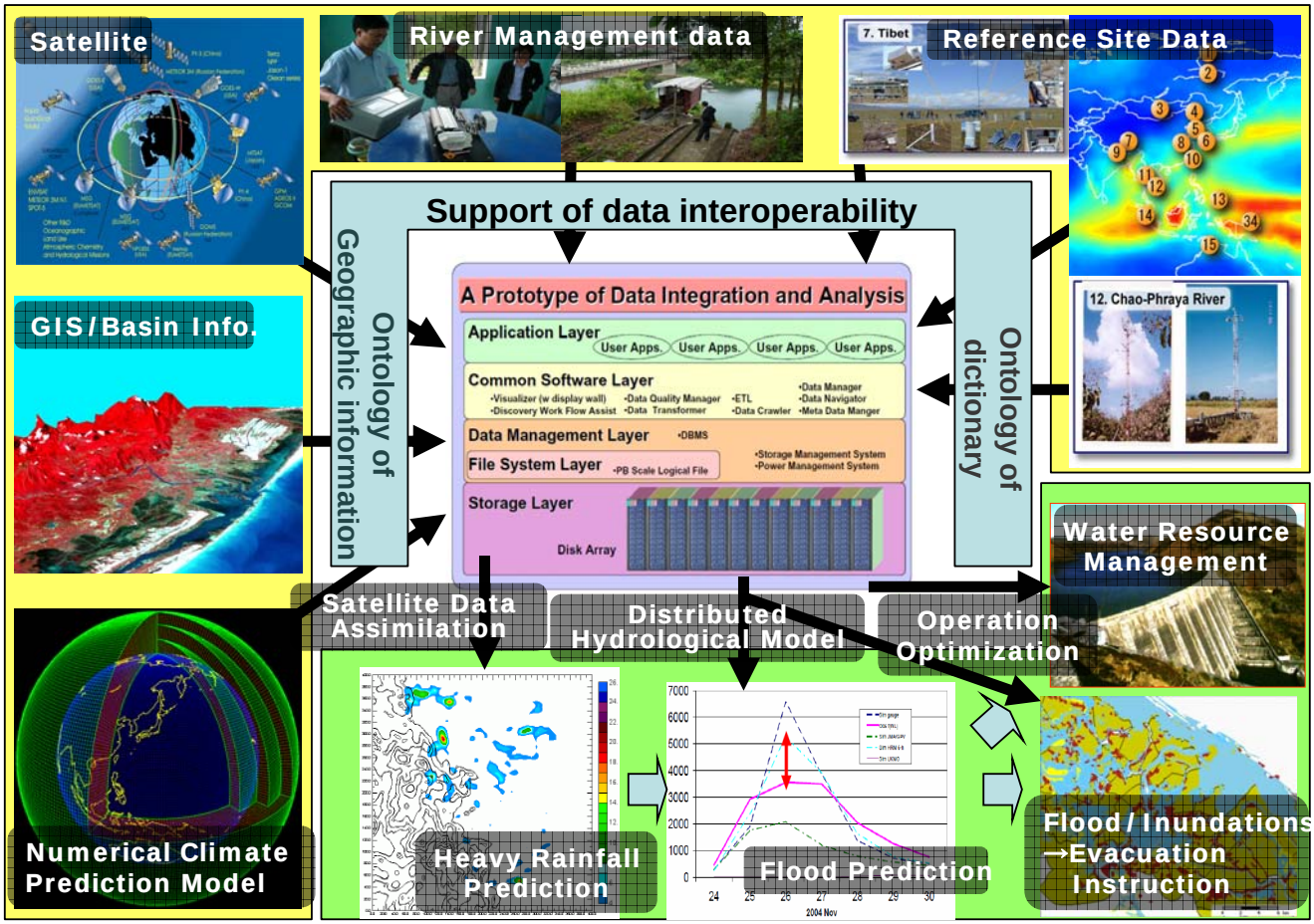
Consensus Building Cycle for Climate Change Adaptation










Satellite
River Management data
7. Tibet
Reference Site Data
Support of data interoperability
Ontology of Geographic information
A Prototype of Data Integration and Analysis
Application Layer
User Apps.
User Apps.
User Apps.
User Apps.
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
File System Layer
•PB Scale Logical File
•Storage Management System
•Power Management System
Storage Layer
Disk Array
Ontology of dictionary
12. Chao-Phraya River
GIS/Basin Info.
Water Resource Management
Satellite Data Assimilation
Distributed Hydrological Model
Operation Optimization
Numerical Climate Prediction Model
Heavy Rainfall Prediction
Flood Prediction
Flood / Inundations →Evacuation Instruction