IMPROVING URBAN WATER MANAGEMENT IN WESTERN AND CENTRAL ASIA WORKSHOP SERIAL (2021-2024)

High Level Panel and Kick-off Workshop (online)

Essential Quality Assured Data and Information for Integrated Urban Water Management

Importance of in-situ and remote sensing data for decision-making in water management with special focus on drought management

Toshio Koike

Executive Director, International Centre for Water Hazard and Risk Management (ICHARM)

Council Member, Science Council of Japan (SCJ), Cabinet Office of Japan

Professor Emeritus, the University of Tokyo

Chair, River Council of Japan

Microwave Remote Sensing of Land Hydrology

Soil Moisture

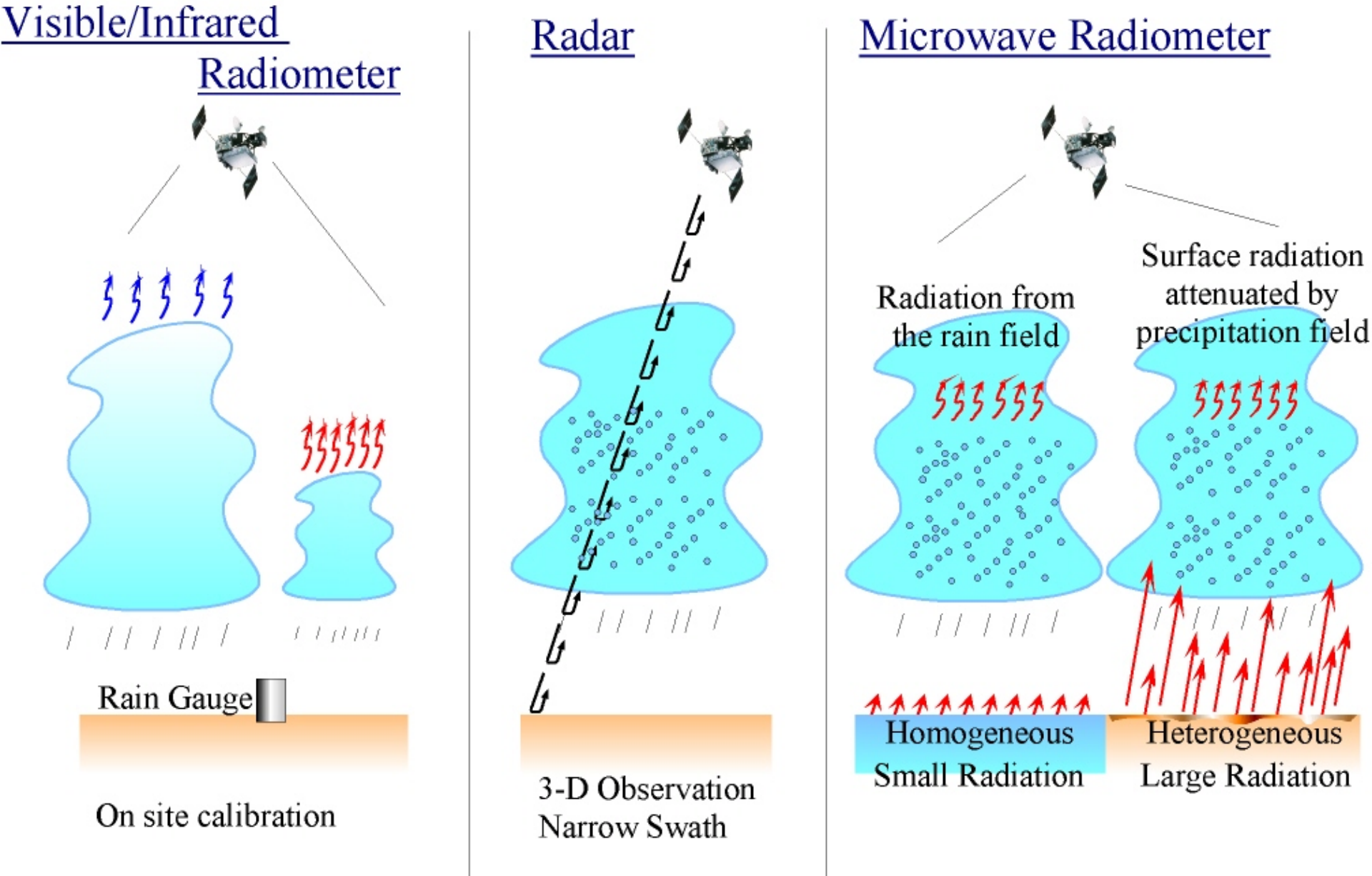
Vegetation/Snow

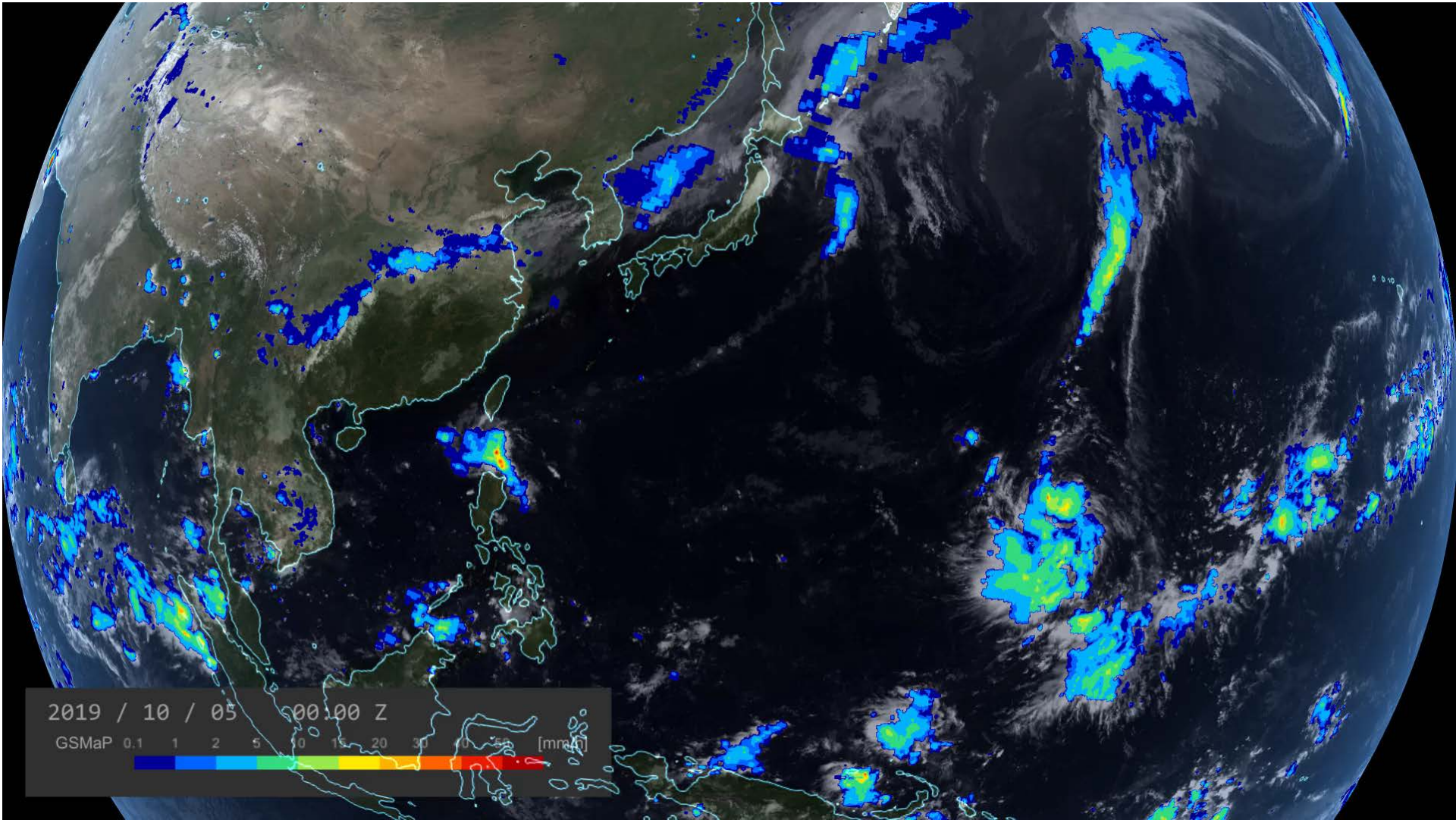
Active & Passive Microwave Sensors

Precipitation

Surface Emissivity & Temp.

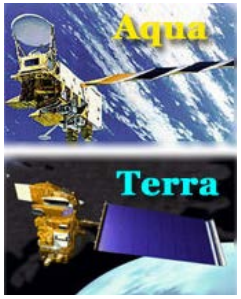
Satellite Precipitation Sensors



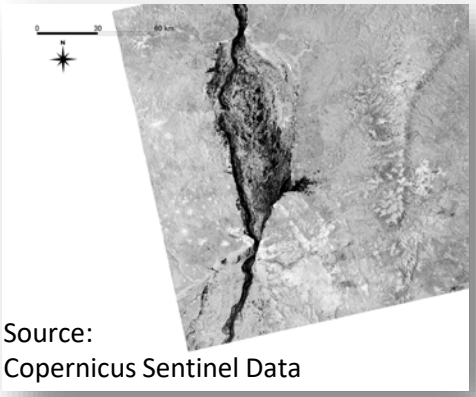

2019 / 10 / 05 00:00 Z
GSMaP 0.1 1 2 5 10 15 20 30 [mm/h]

Identify inundation area on Sep-22, 2018

MODIS (optical)

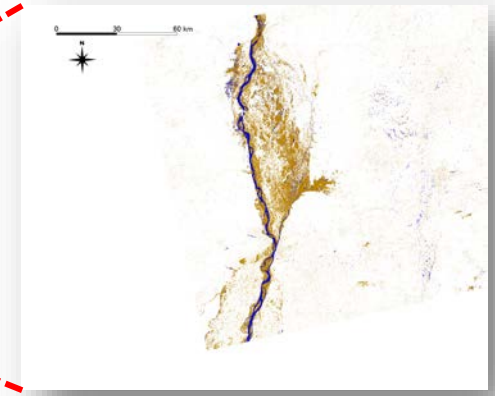


Easily identification & high frequency but covered with cloud

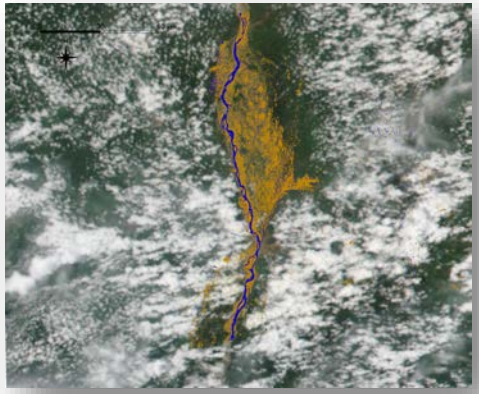


Sentinel1 (SAR)

All weather & high spatial resolution but low frequency



Flood Area by SAR



Flood Area map

Source of back image: "NASA Worldview"

United Nations Educational, Scientific and Cultural Organization

International Centre for Water Hazard and Risk Management under the auspices of UNESCO

Public Works Research Institute, National Research and Development Agency, Japan

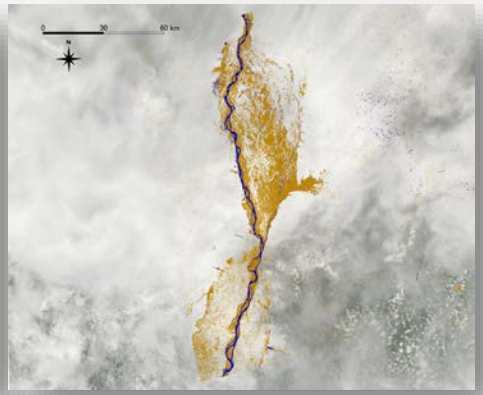
DIAS Data Integration & Analysis System

THE UNIVERSITY OF TOKYO

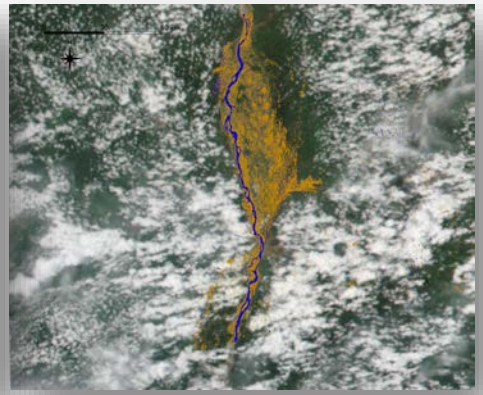
Niger River Flood Area Map

1) Sep-04, 2018

2) Sep-16, 2018

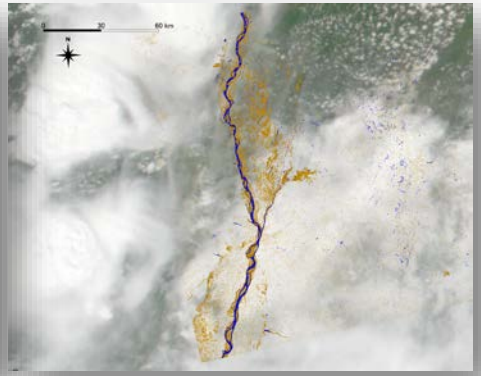


3) Sep-22, 2018

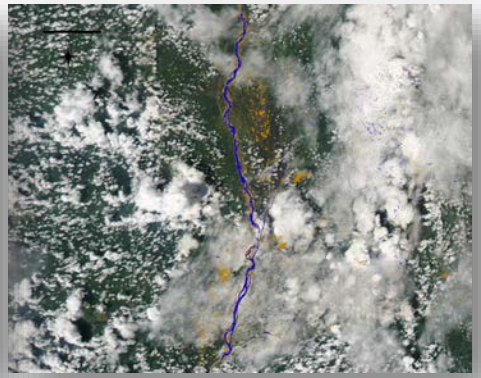


4) Sep-28, 2018

5) Oct-10, 2018



6) Oct-22, 2018

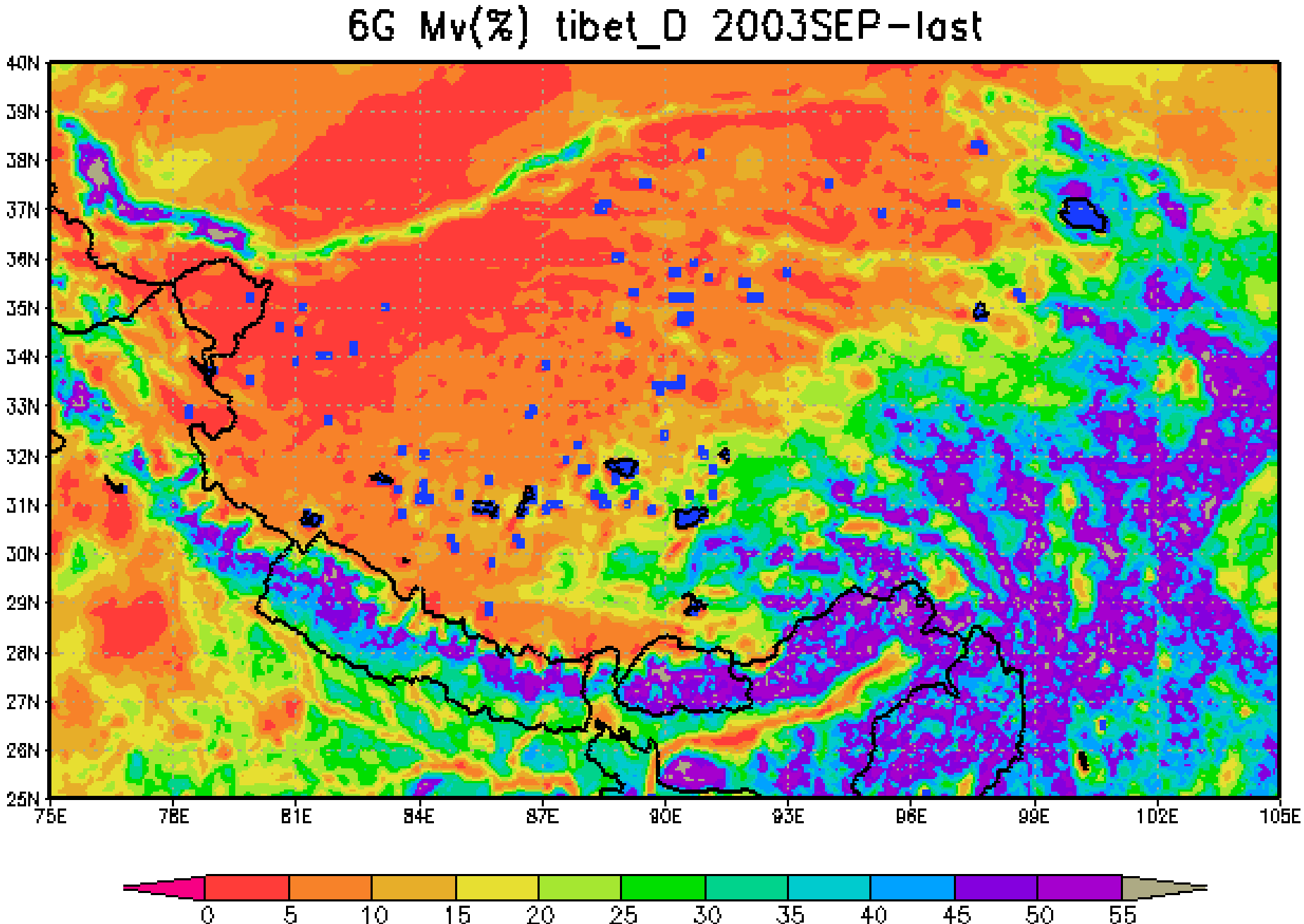


7) Nov-03, 2018

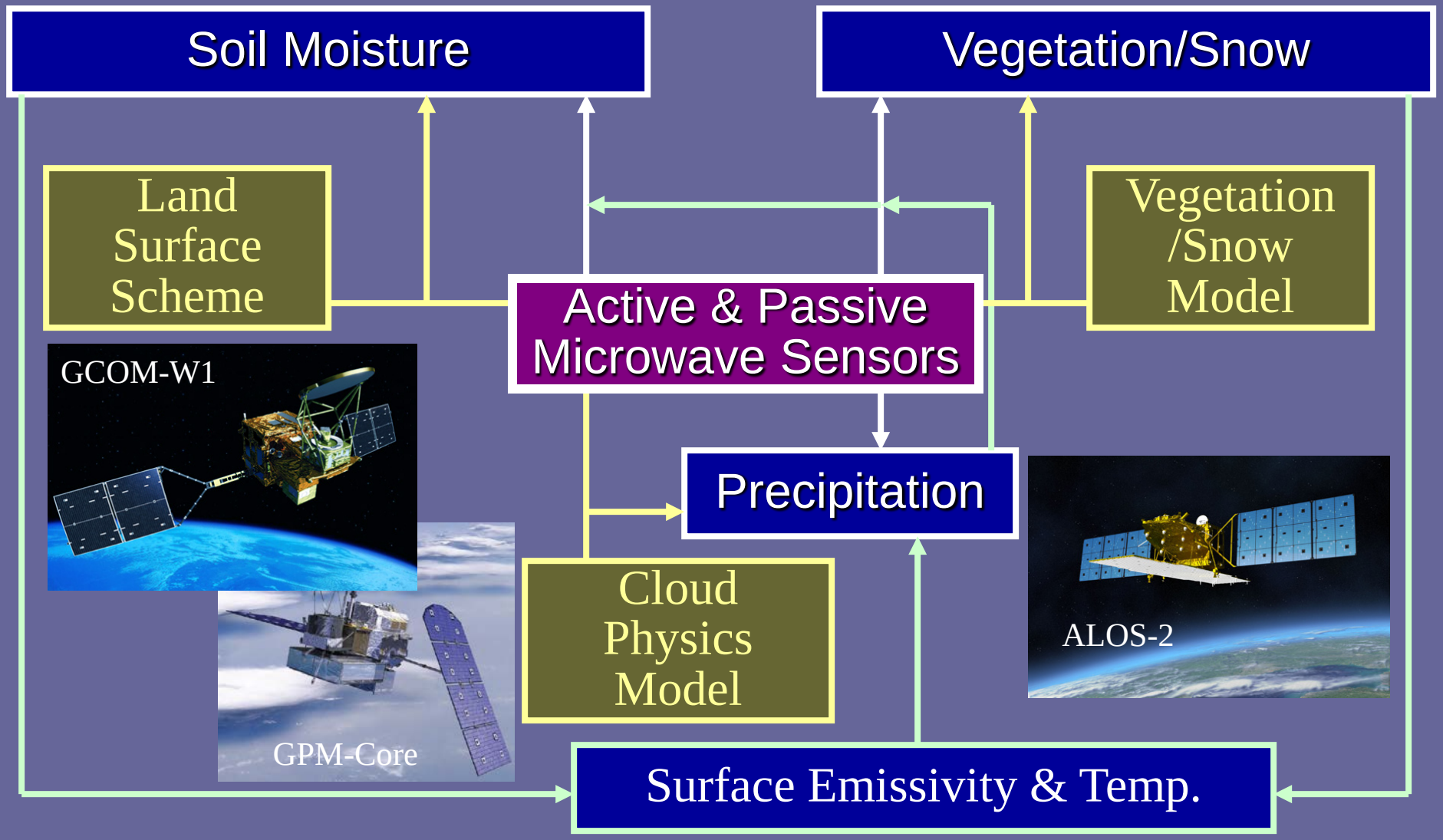
8) Nov-15, 2018

Source of back image: "NASA Worldview

Seasonal Variation of the Soil Moisture in the Tibetan Plateu



Microwave Remote Sensing of Land Hydrology



United Nations Educational, Scientific and Cultural Organization

International Centre for Water Hazard and Risk Management under the auspices of UNESCO

Public Works Research Institute, National Research and Development Agency, Japan

DIAS Data Integration & Analysis System

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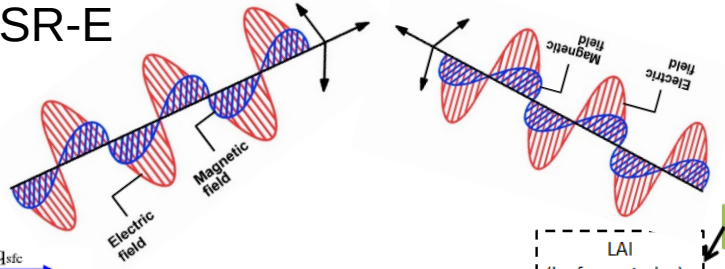
Background: Scientific Contribution

Coupled Data Assimilation

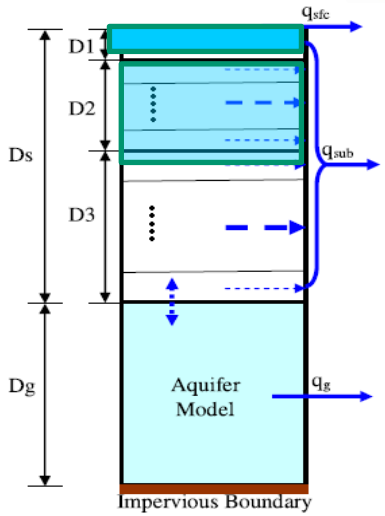
AMSR-E

AMSR2

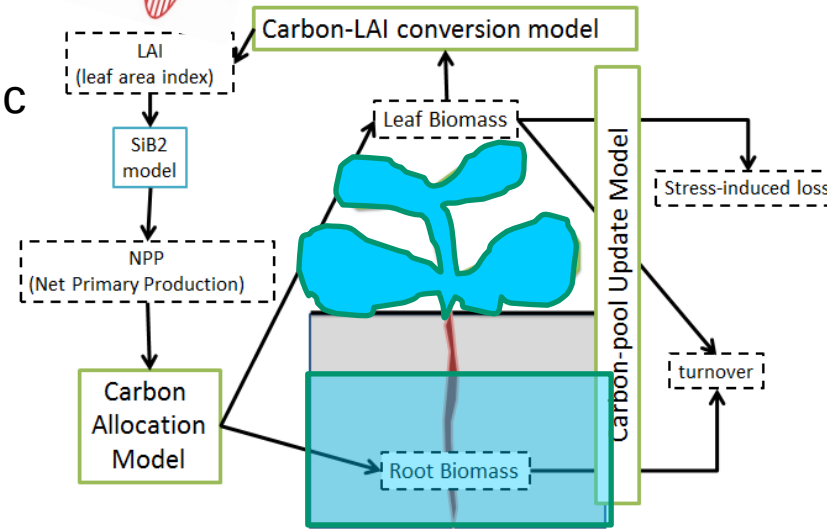


Electronic-Magnetic Wave

+



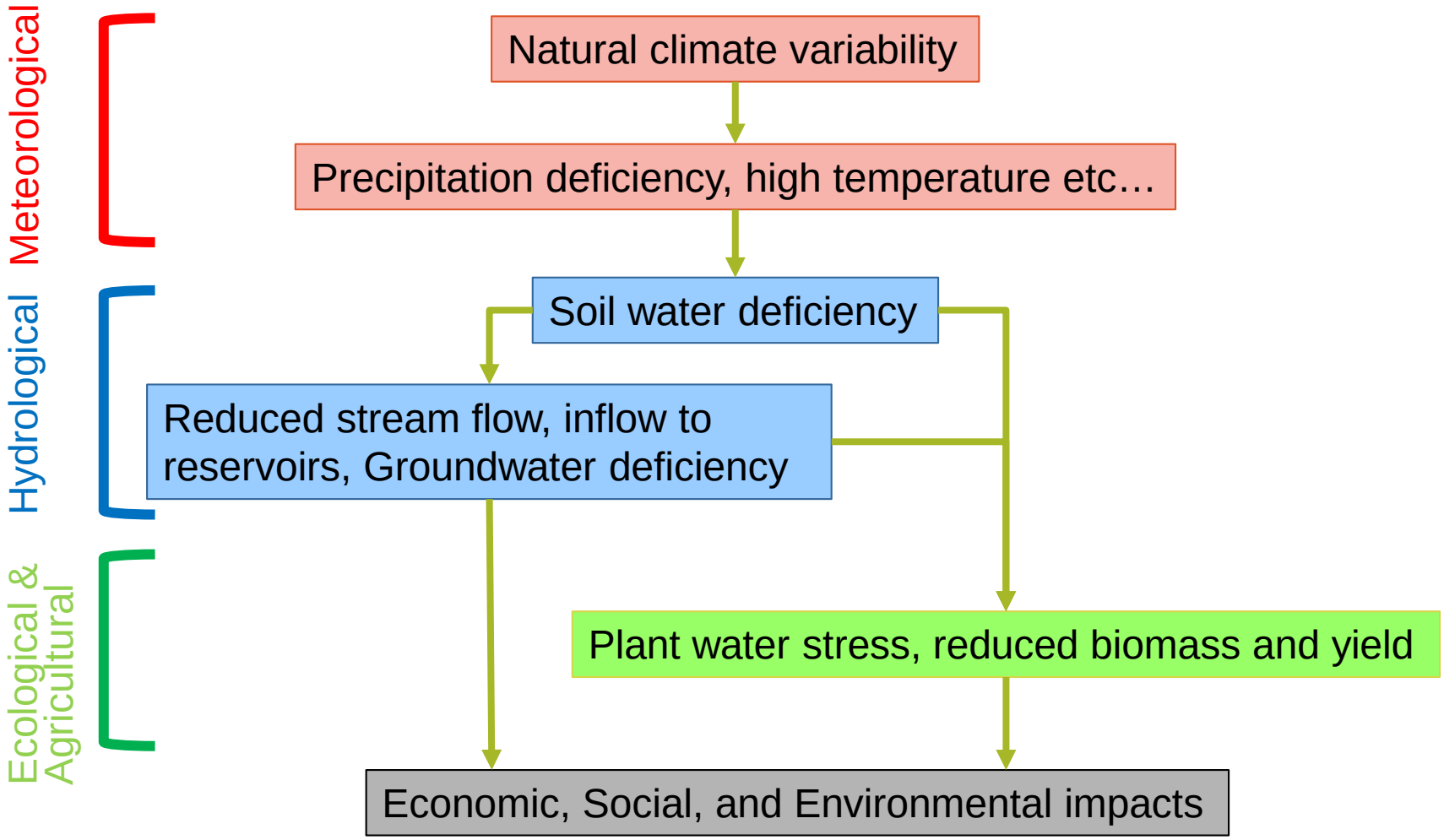
Yang, Koike, et al. JMSJ (2007)



Dynamic Vegetation Model

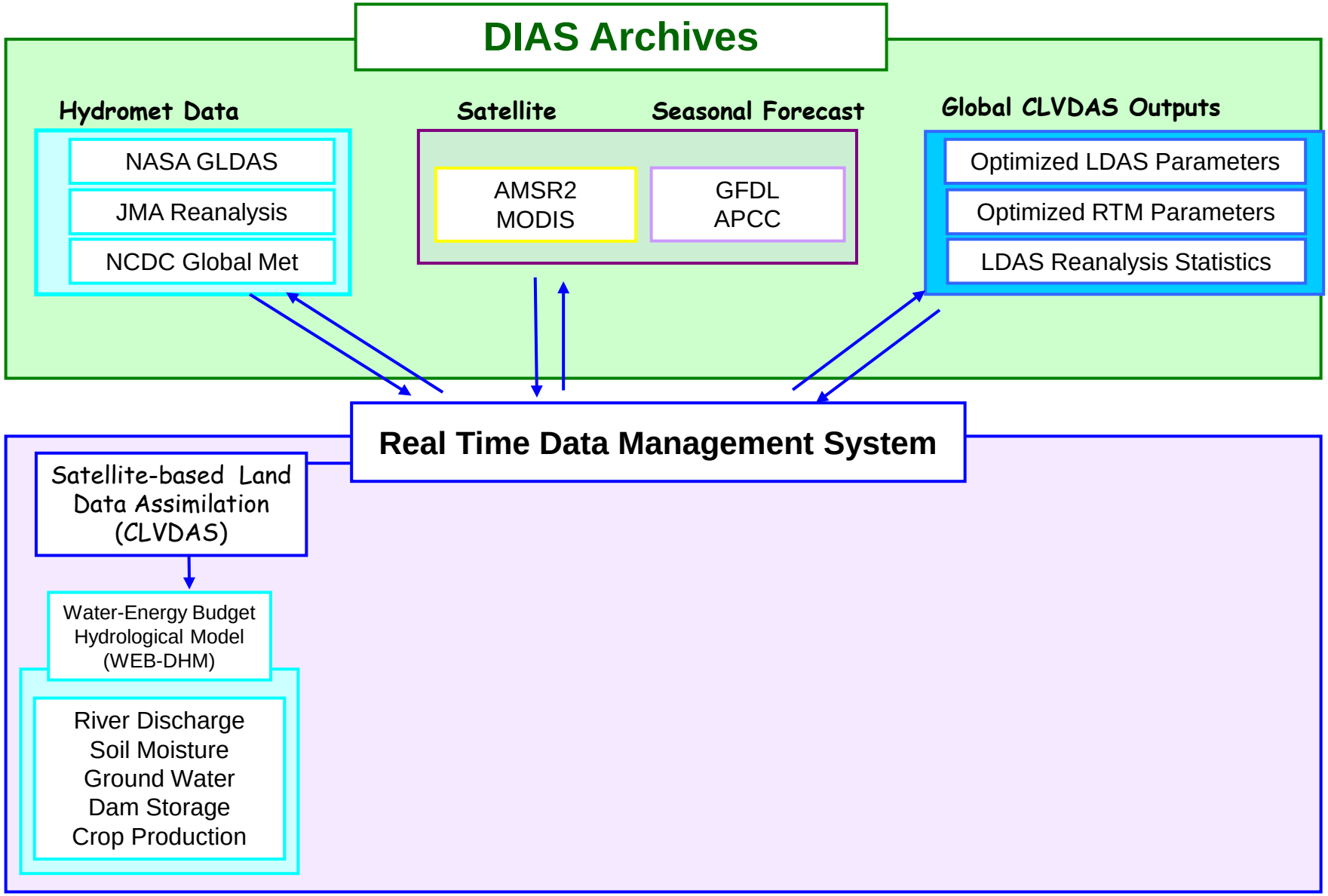
Sawada & Koike, JGR (2014)

The grant which financed this Pilot for Agriculture Drought Monitoring and Prediction in Brazil was received under the Japan-Bank Program for Main-streaming DRM in Developing Countries which is financed by the Government of Japan



→ Relationship between ecological and hydrological processes is important for analyzing drought process.

Hydrometeorology-Agriculture Droughts Prediction System

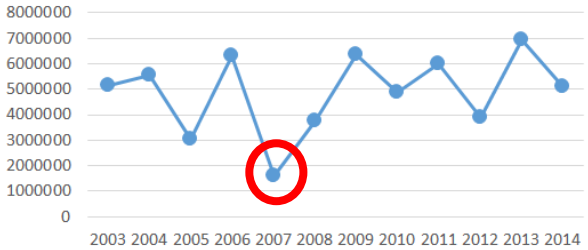


Drought analysis

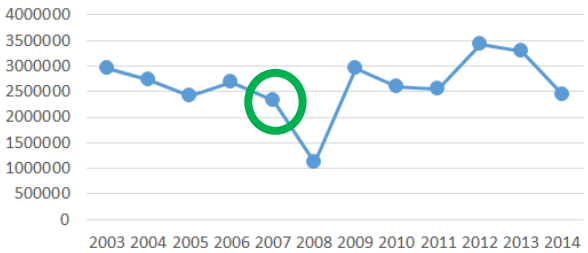
Wheat production

2007 Morocco Drought

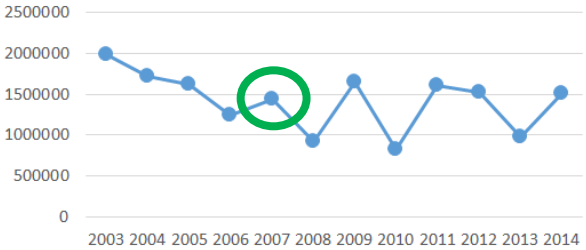
Morocco



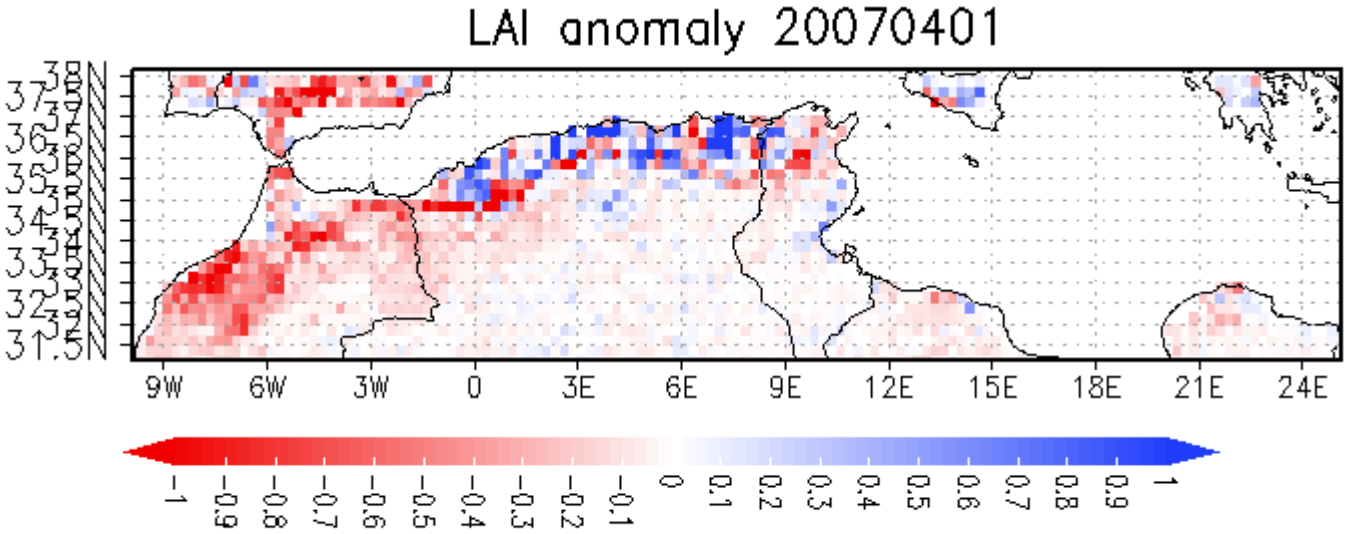
Algeria



Tunisia

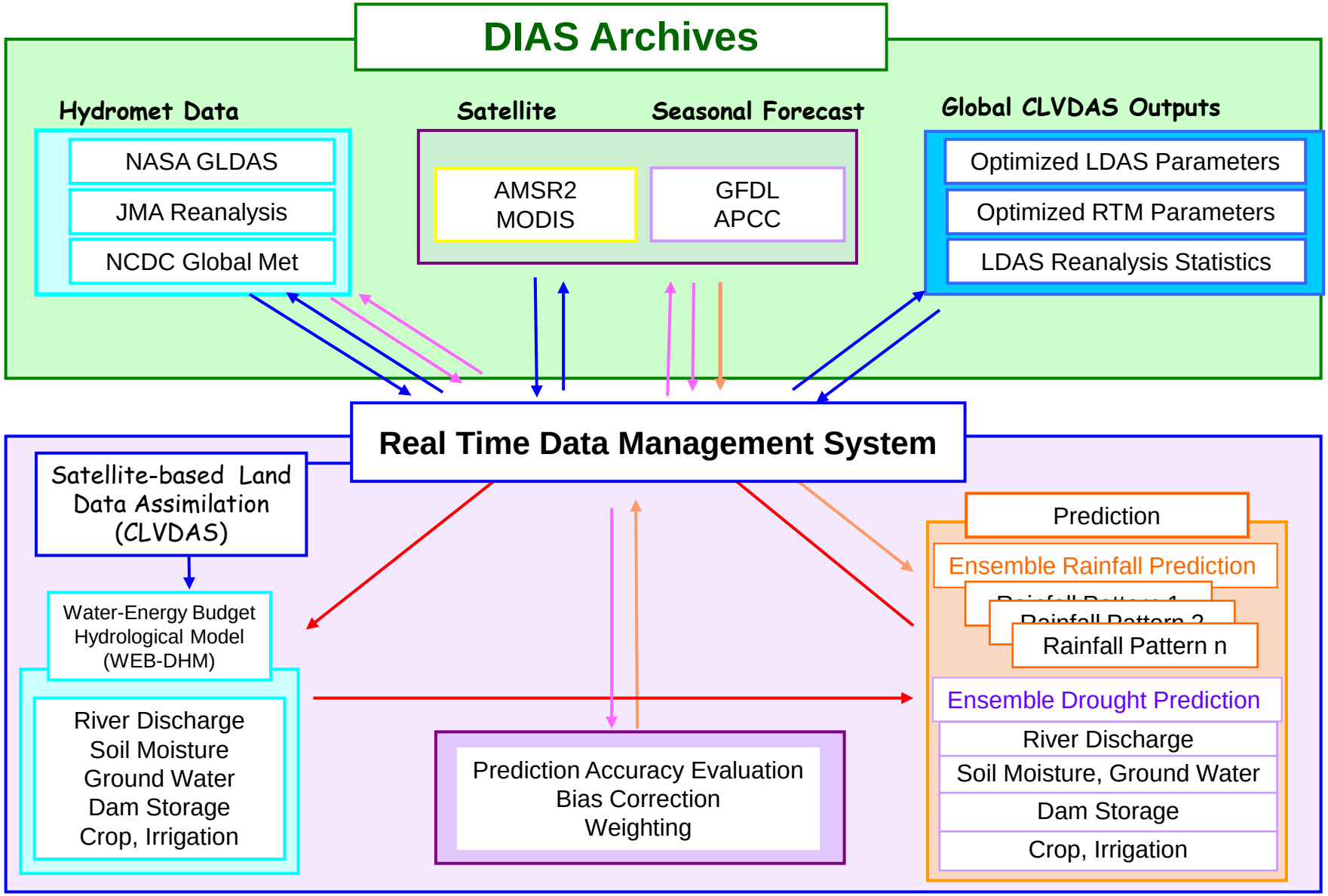


LAI anomaly from CLVDAS



from Sawada & Ikoma

Hydrometeorology-Agriculture Droughts Prediction System



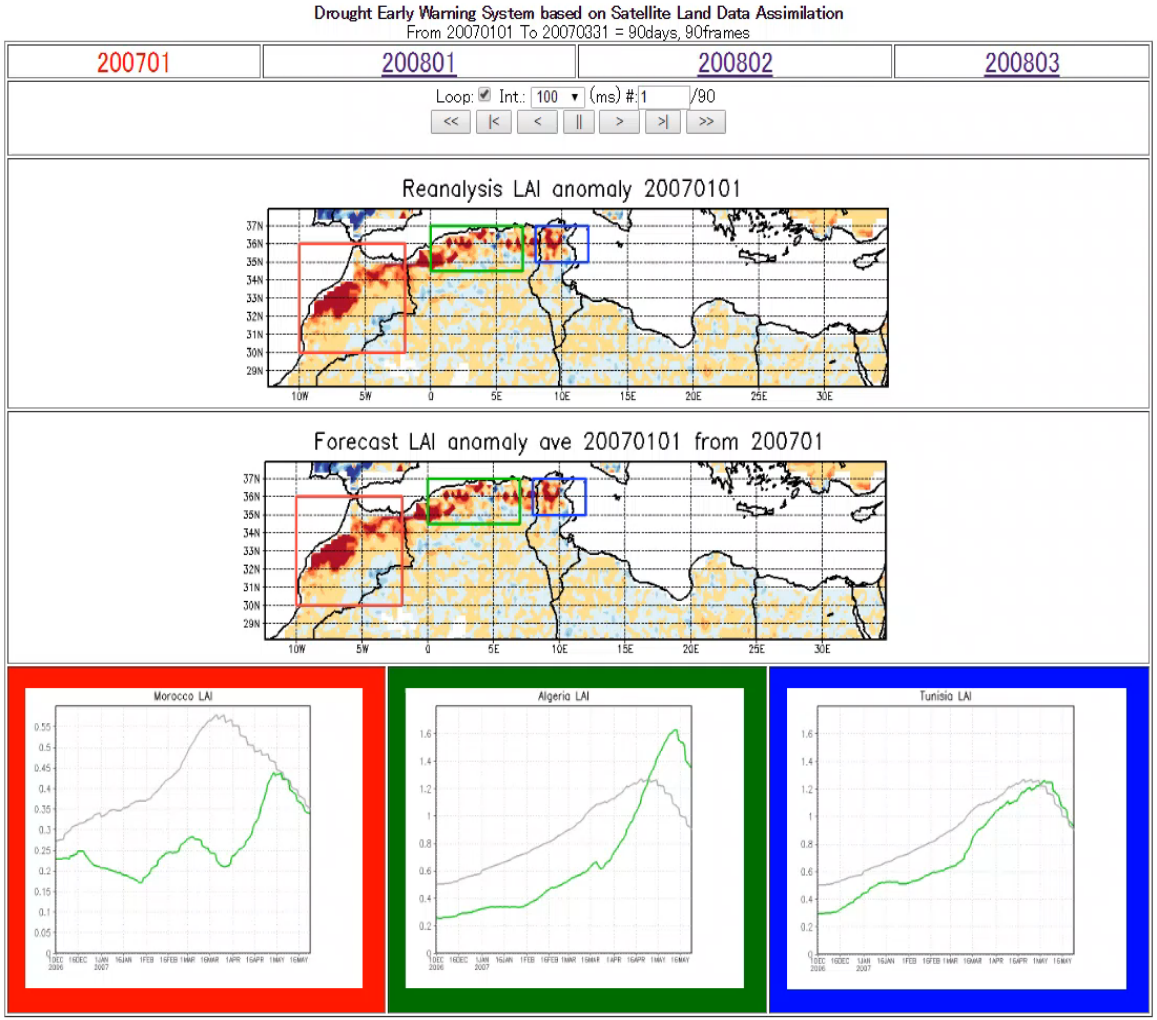
Agricultural Drought Monitoring-Prediction

WORLD BANK GROUP
Water

2 ZERO HUNGER
6 CLEAN WATER AND SANITATION
11 SUSTAINABLE CITIES AND COMMUNITIES
13 CLIMATE ACTION

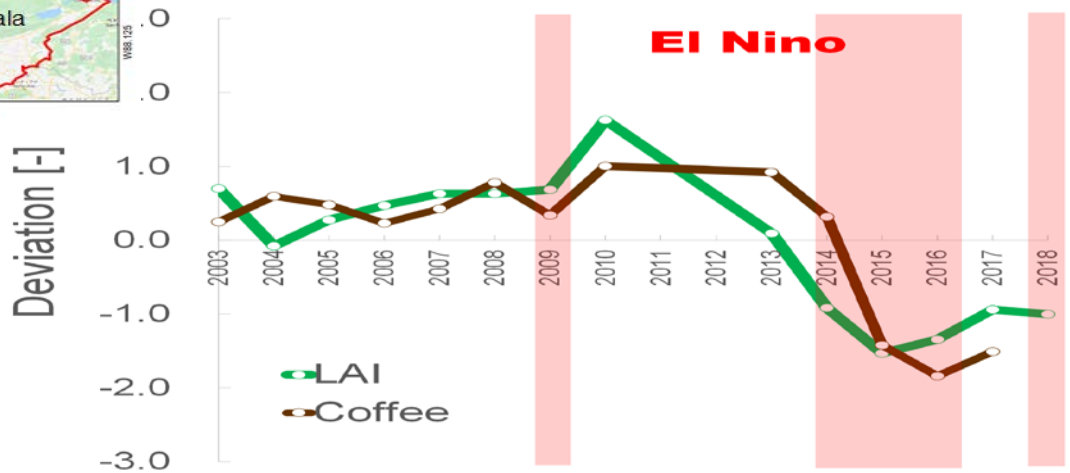
Aqua AMSR-E

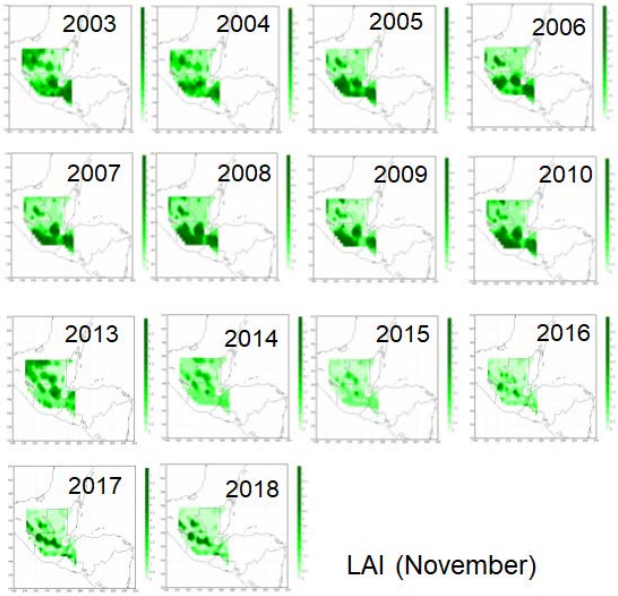
North Africa



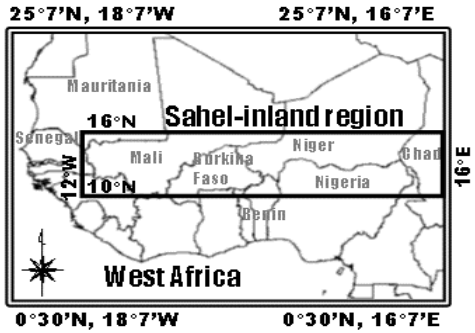
Applicability of the Coupled Land and Vegetation Data Assimilation System (CLVDAS) to various drought regions

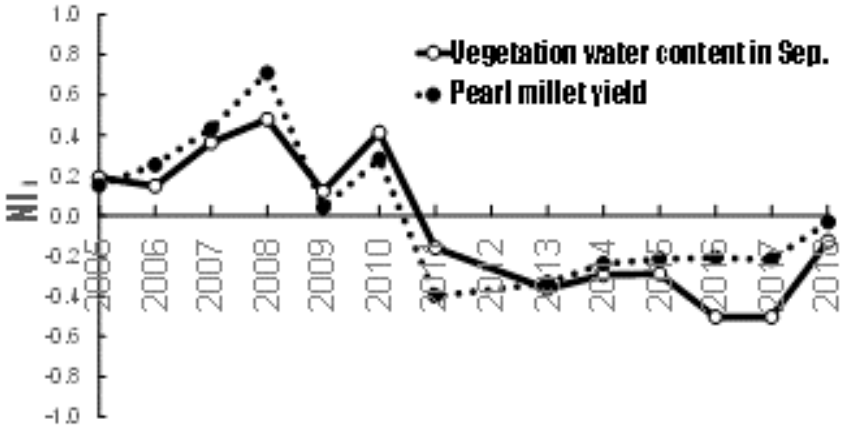
Gautemala

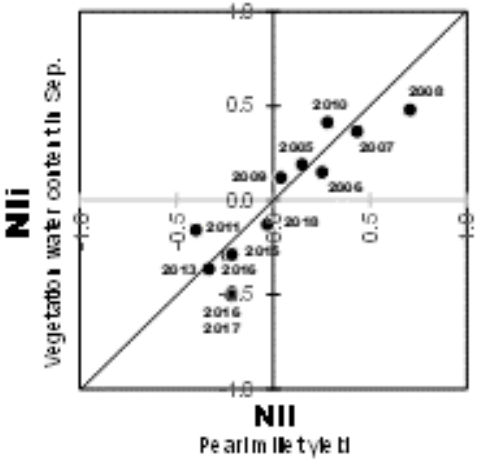




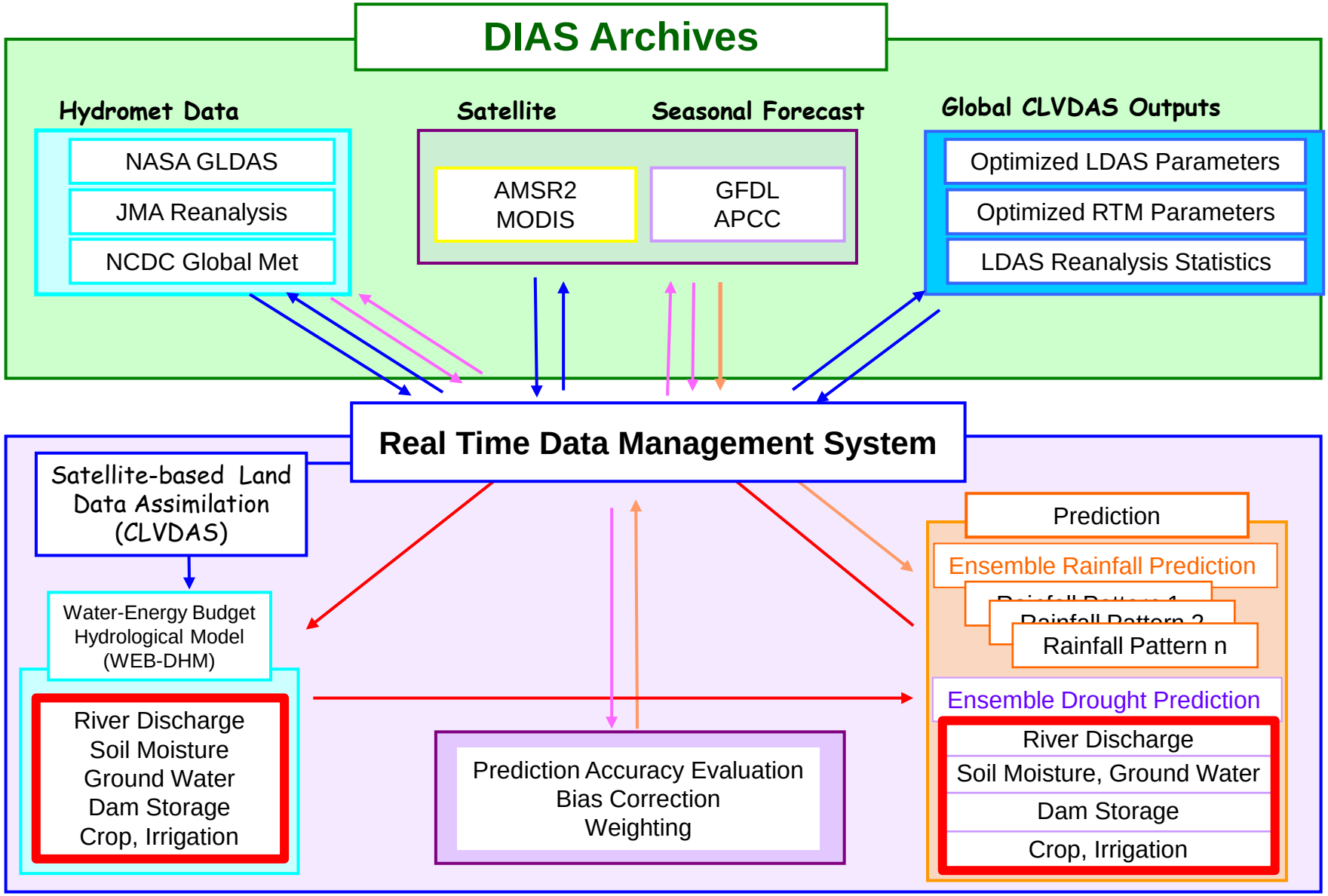
West Africa





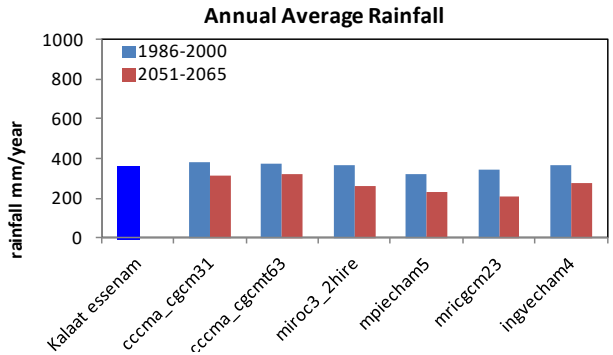


Hydrometeorology-Agriculture Droughts Prediction System

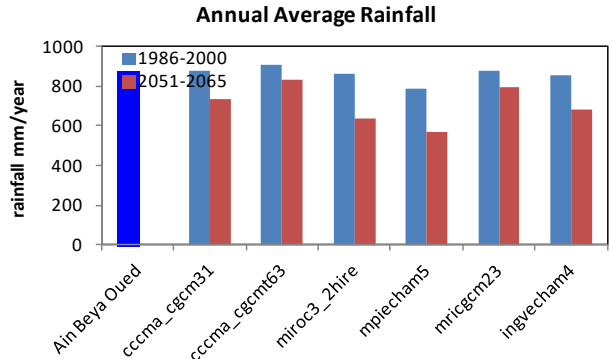


Mejerda River

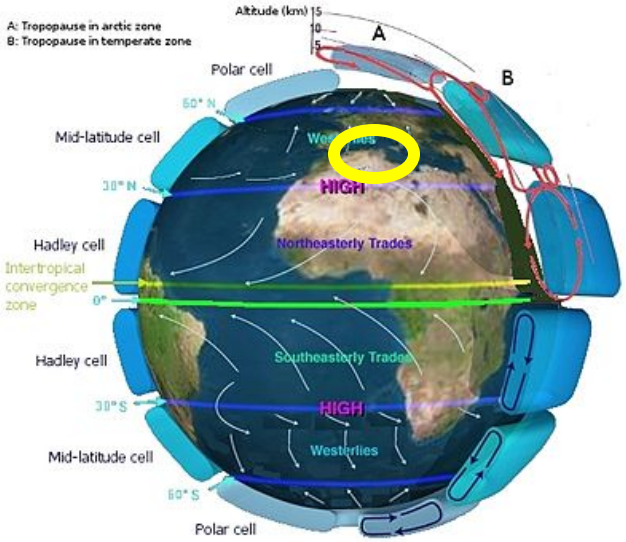
It is virtually certain that drought will become more severe.

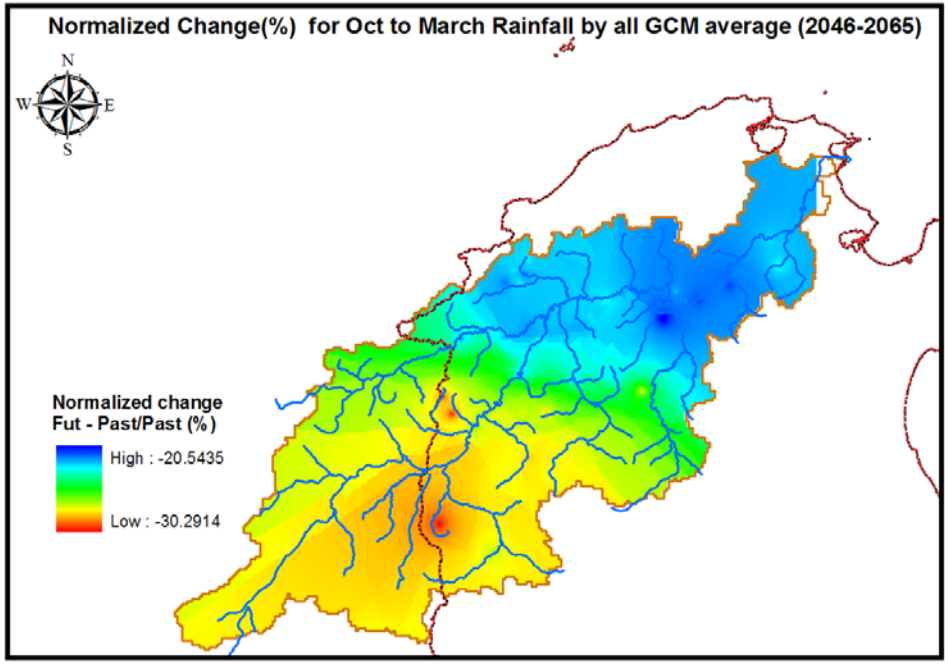


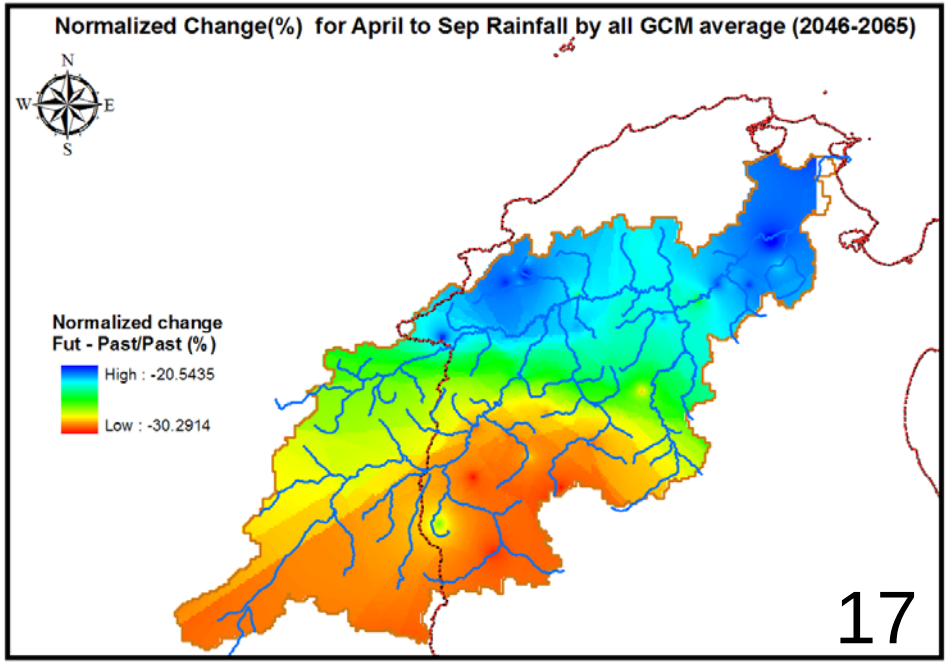
KALAAT ESSENAM

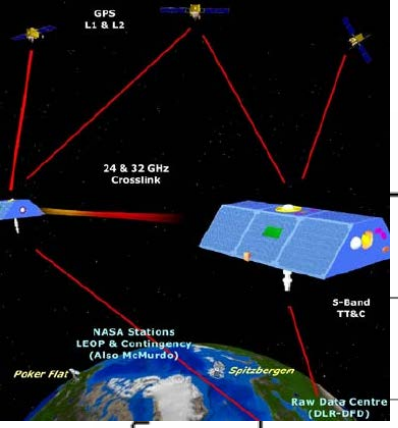


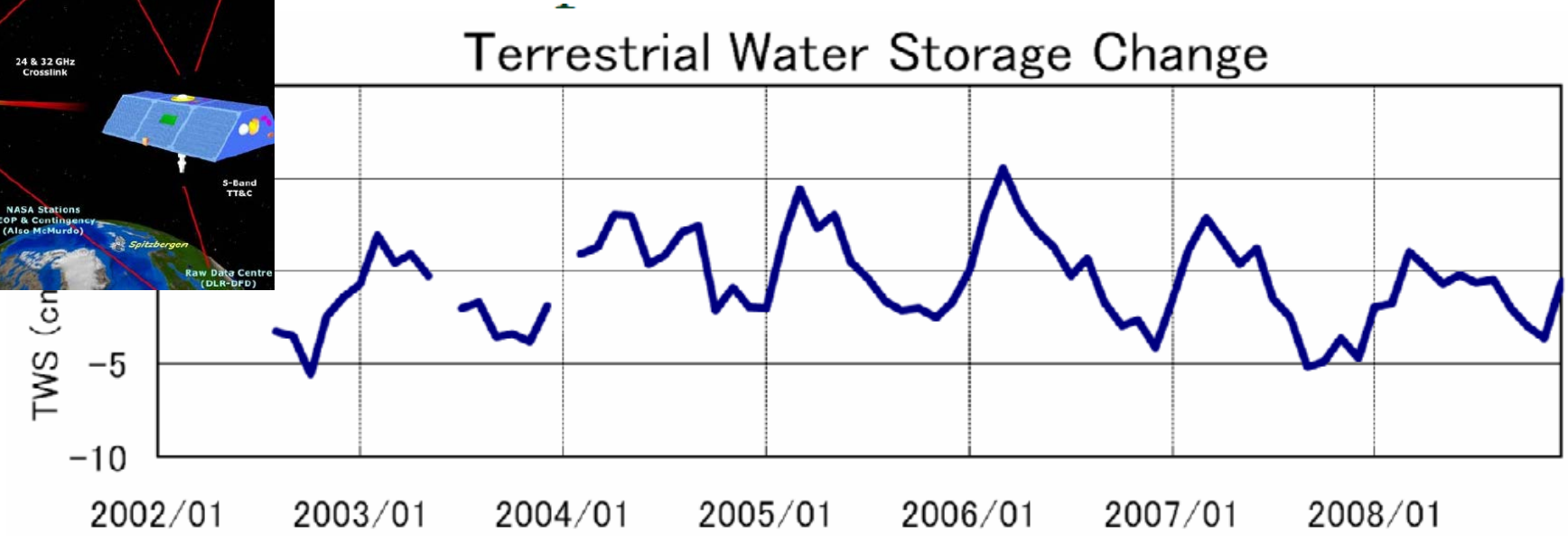
AIN BEYA OUED

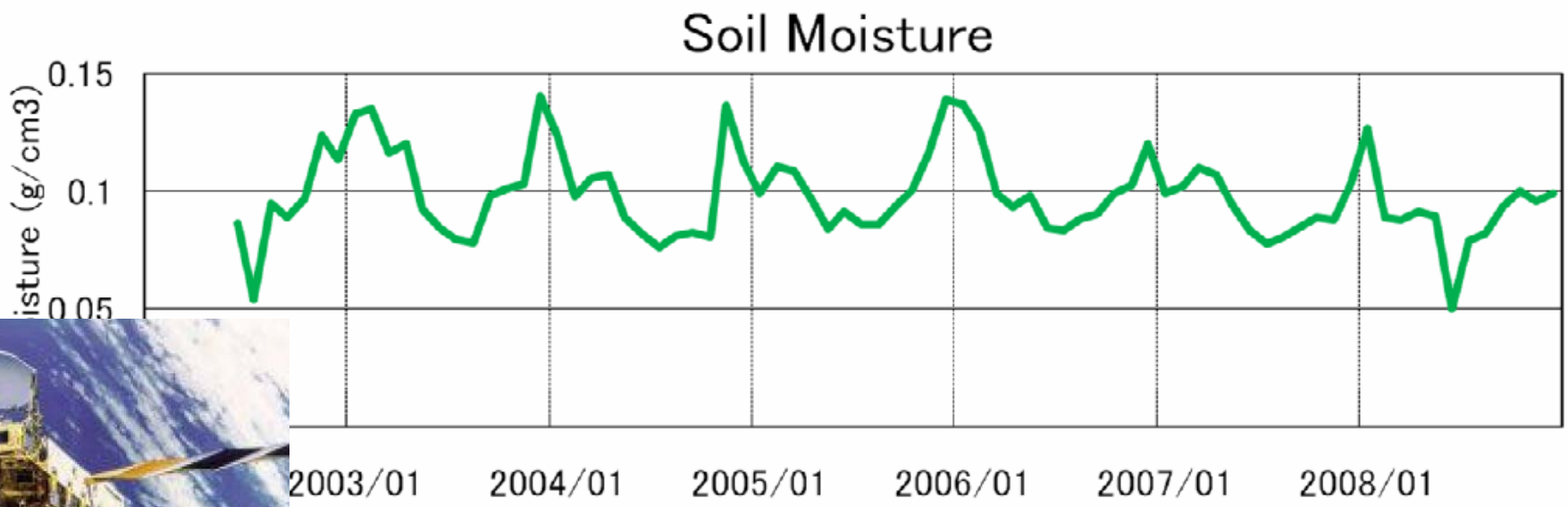


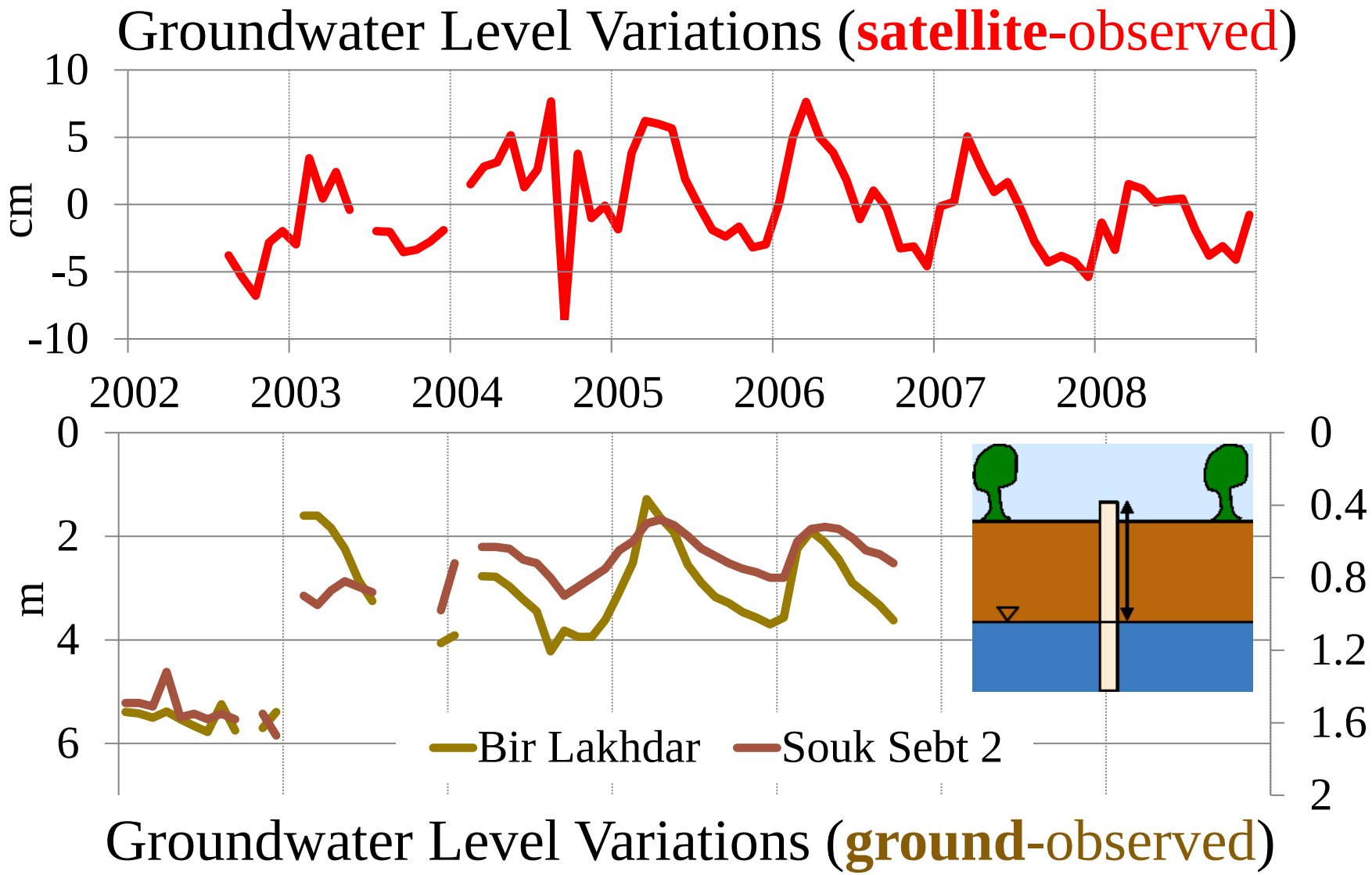




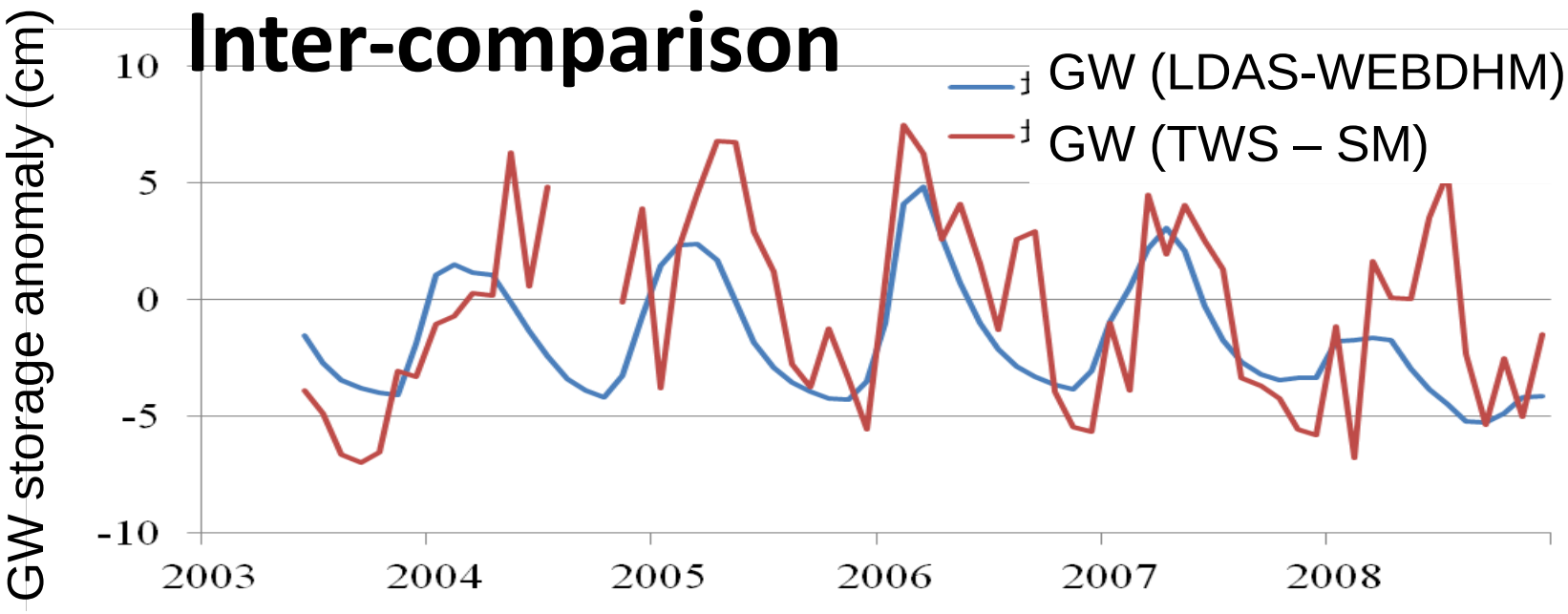

GPS
L1 & L2
24 & 32 GHz
Crosslink
S-Band
TT&C
NASA Stations
LEOP & Contingency
(Also McMurdo)
Poker Flat
Spitzbergen
Raw Data Centre
(DLR-DFD)


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

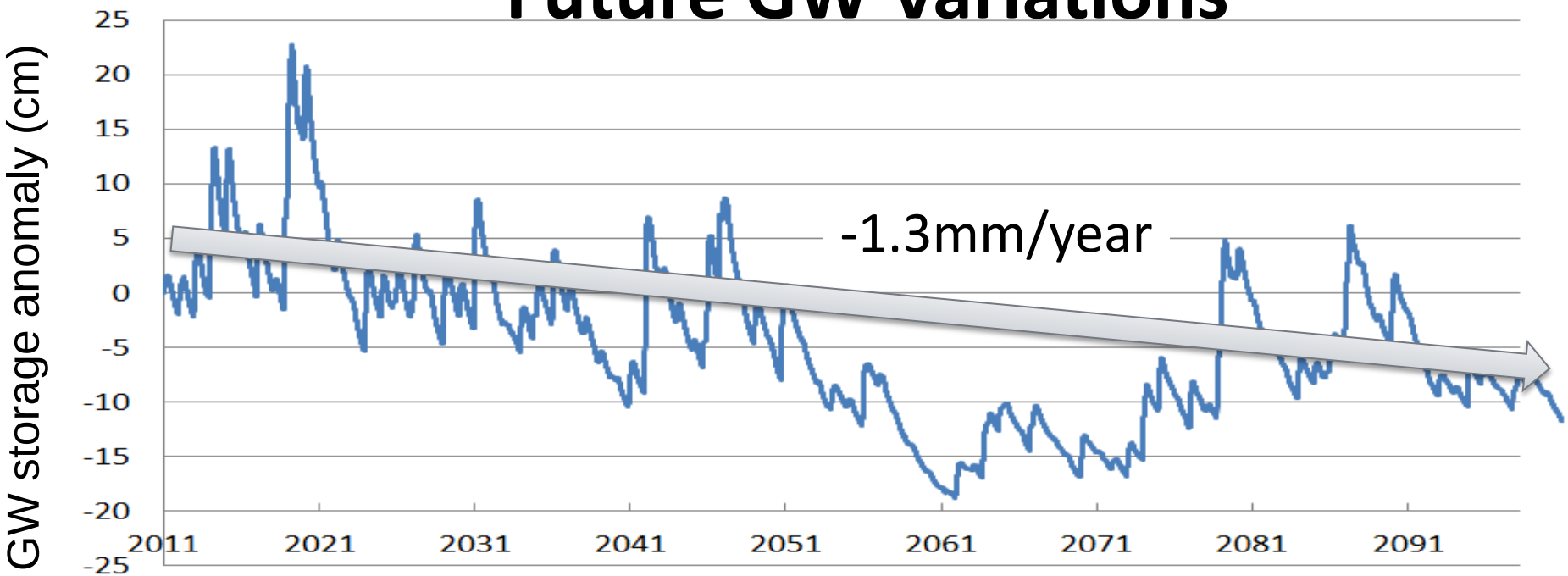

Soil Moisture
isture (g/cm3)
0.15
0.1
0.05
2003/01
2004/01
2005/01
2006/01
2007/01
2008/01


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

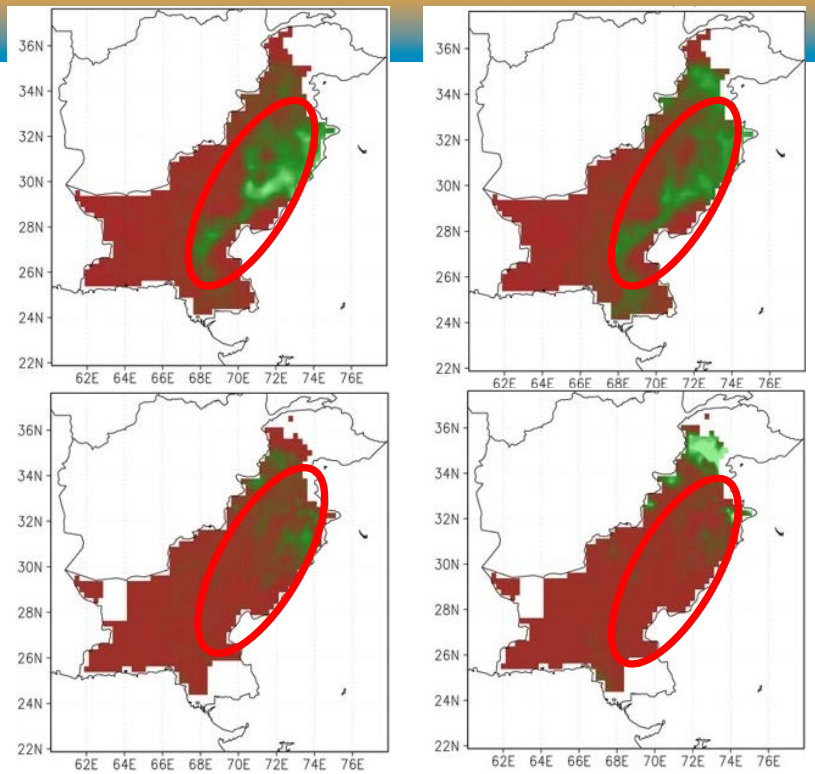


Agriculture

Winter, 2007 **Summer, 2007**

Satellite

Preliminary



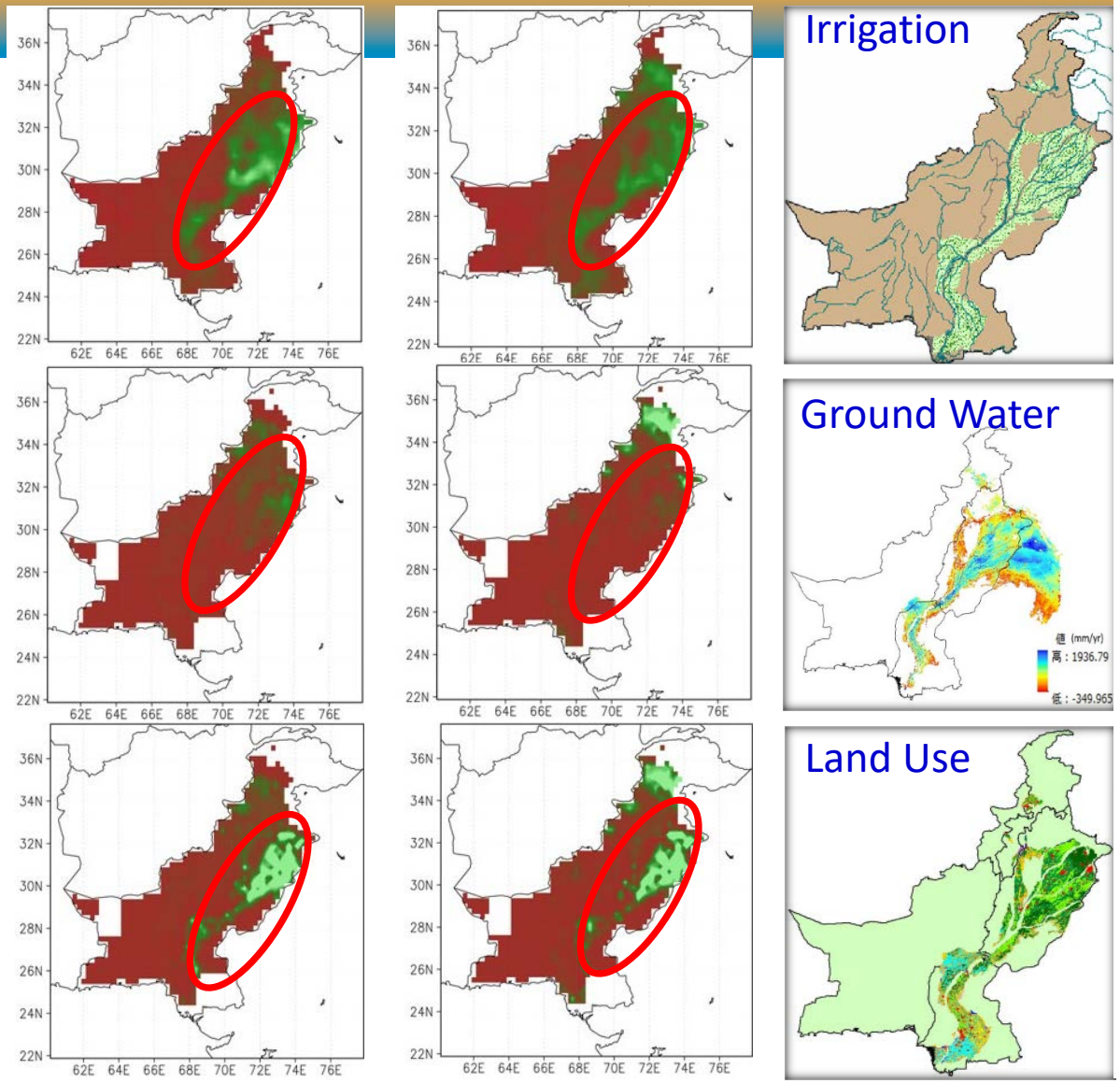
Agriculture

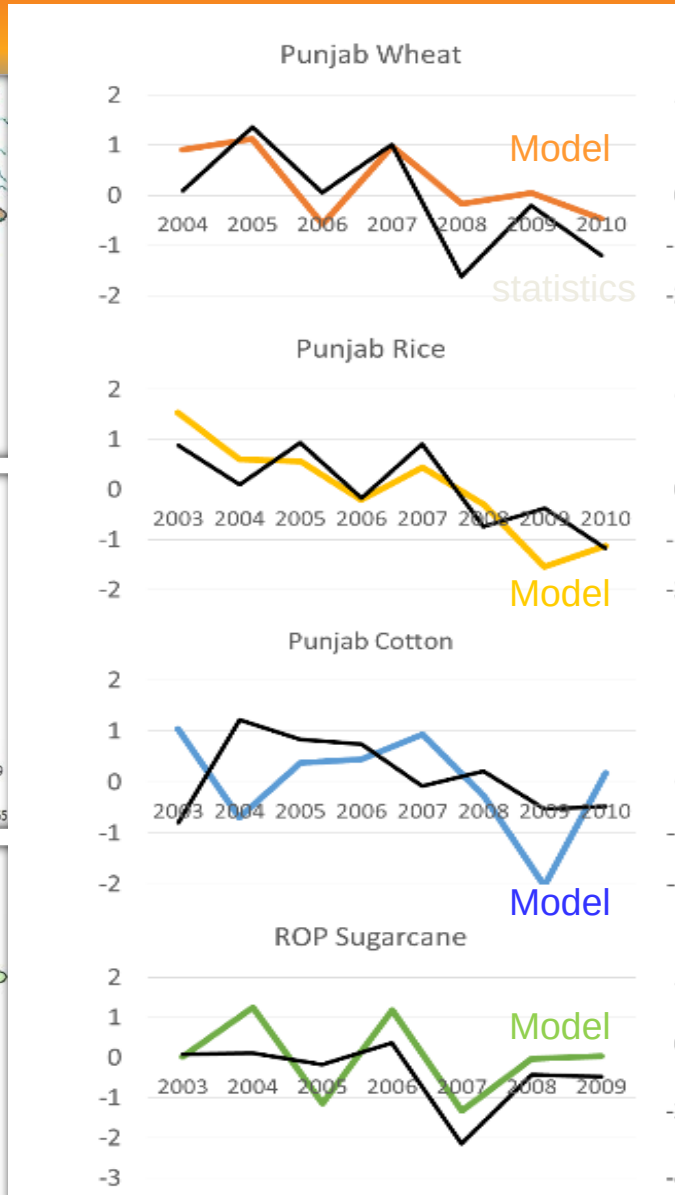
Winter, 2007 **Summer, 2007**

Satellite

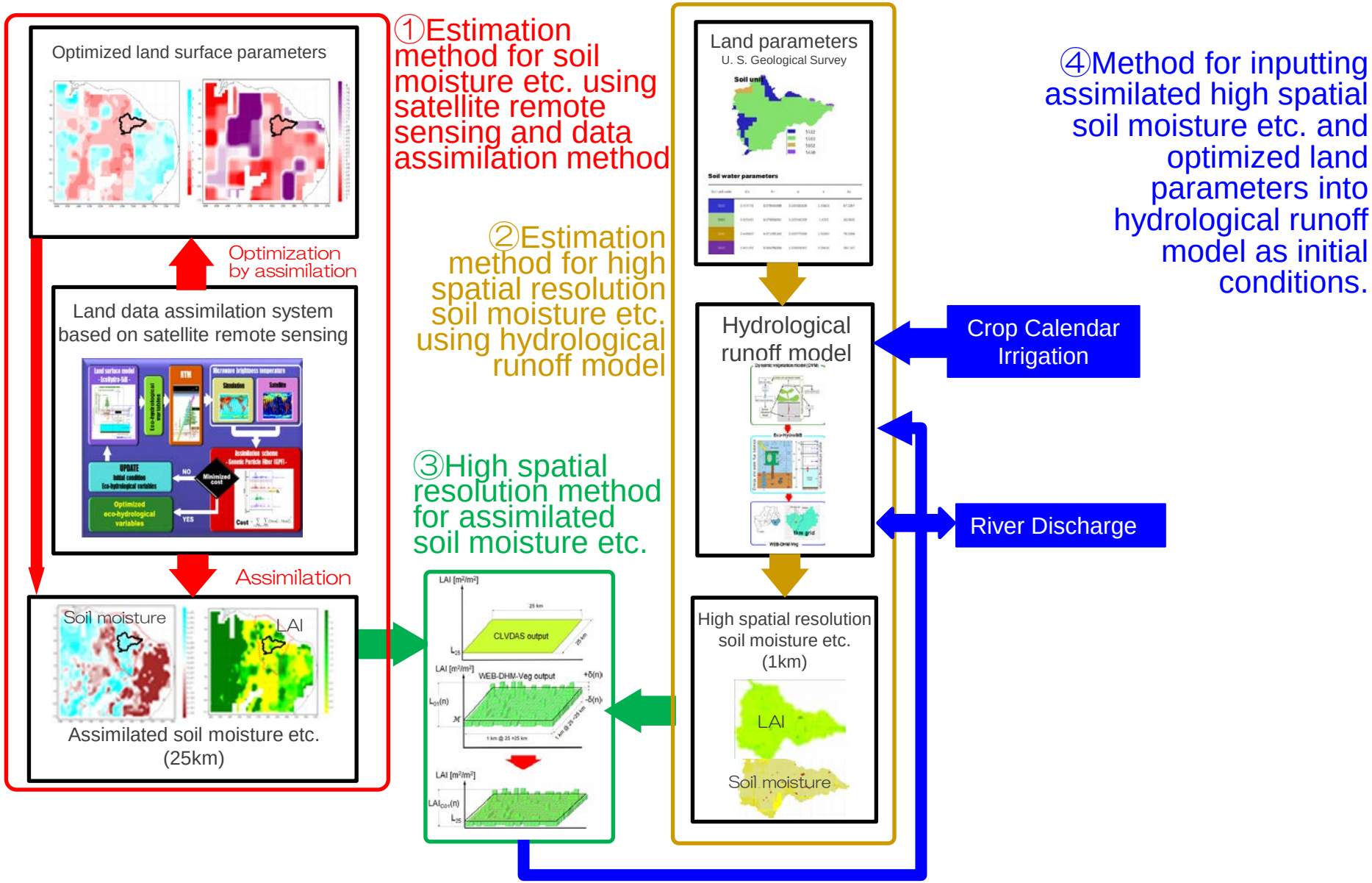
Preliminary

Improved

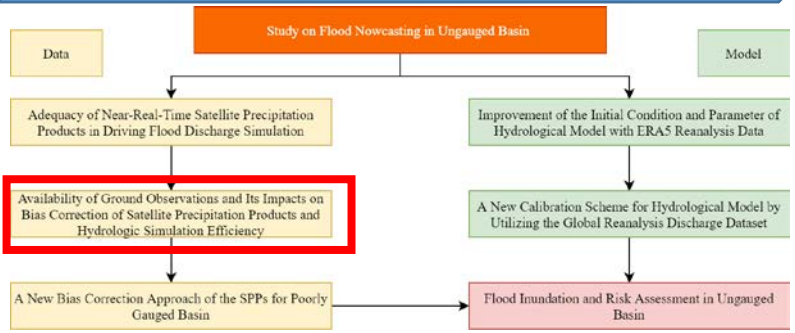


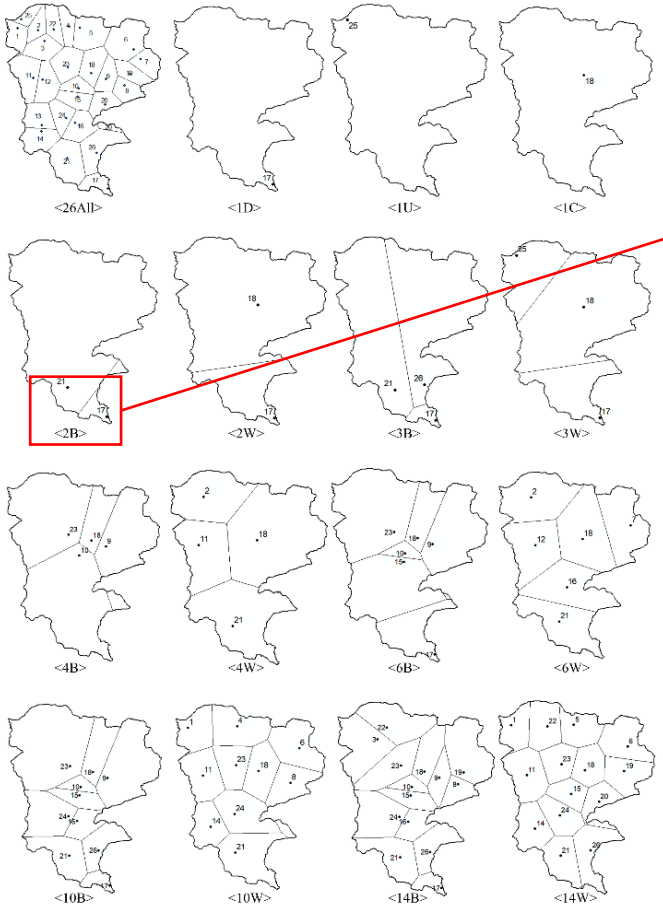


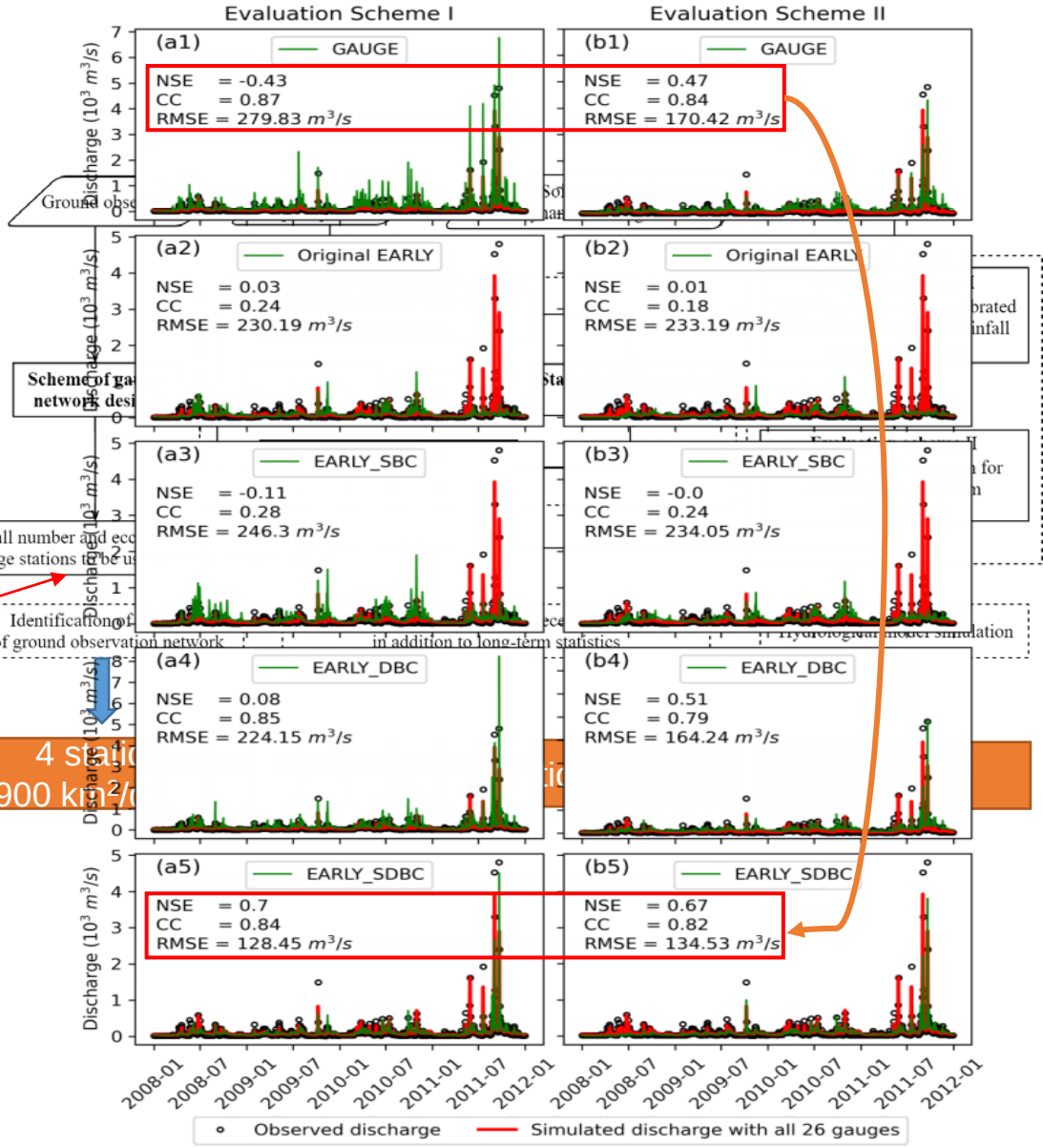
Study a method to use initial condition obtained from the CLVDAS in hydrological runoff model



Availability of Gauges and Bias Correction of SPPs

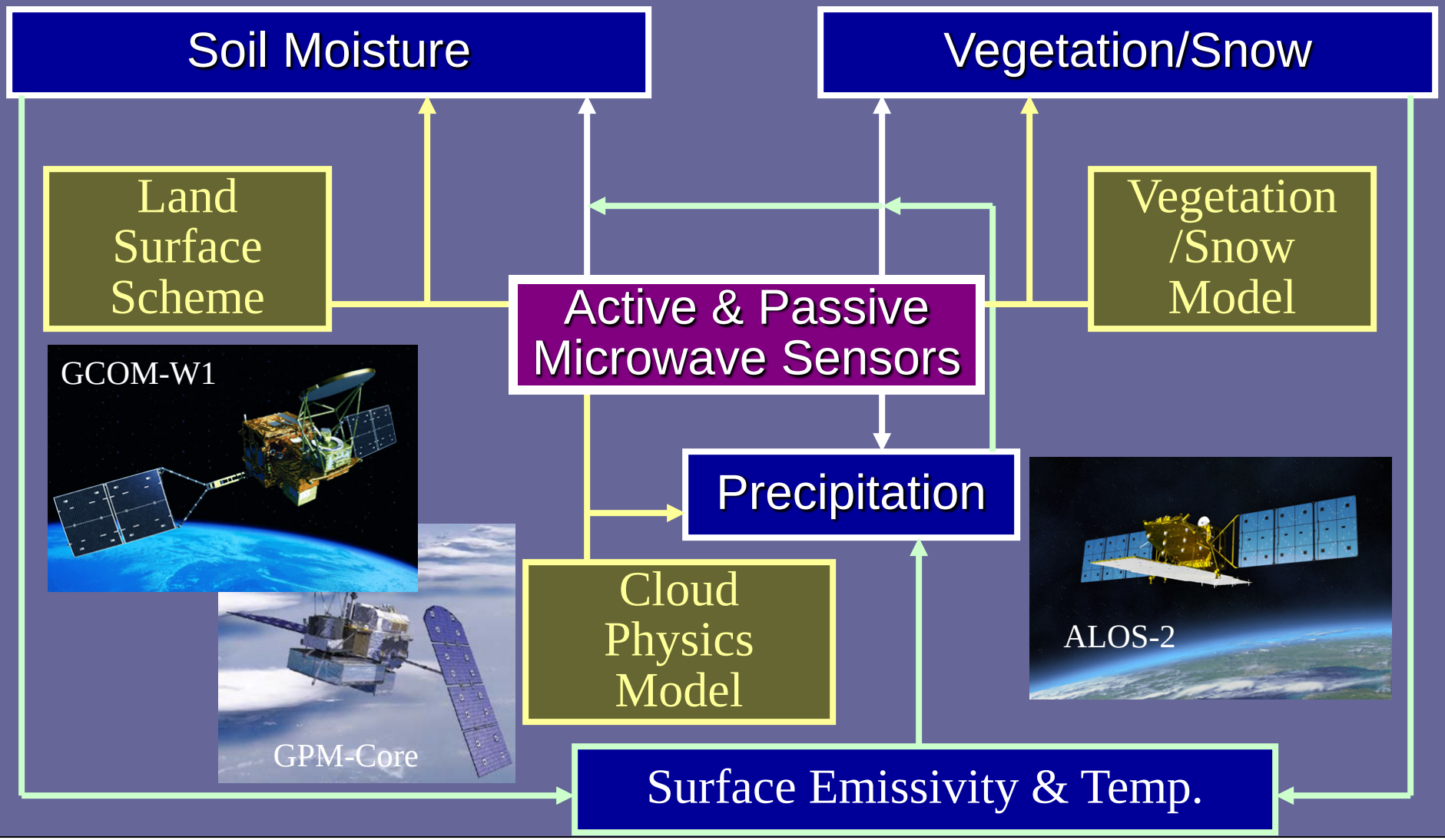






Zhou, L.; Koike, T.; Takeuchi, K.; Rasmy, M.; Onuma, K.; Ito, H.; Selvarajah, H.; Li, X.; Liu, L.; Ao, T. Availability of Ground Observations and Its Impacts on Bias Correction of Satellite Precipitation Products and Hydrologic Simulation Efficiency

Microwave Remote Sensing of Land Hydrology



Data: Rainfall, River Discharge, Crop, Irrigation, Ground Water, Dam Storage, Soil Moisture