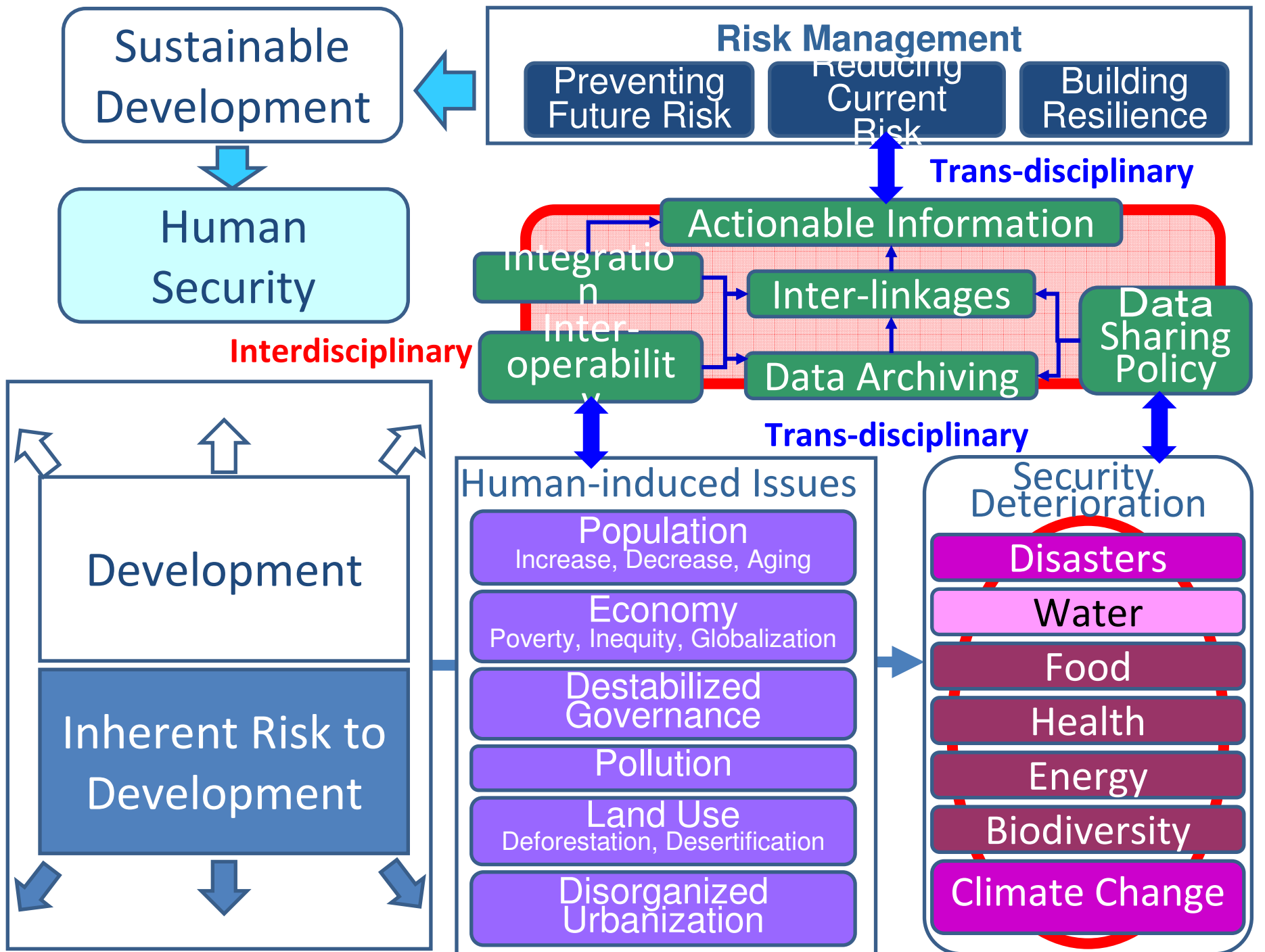


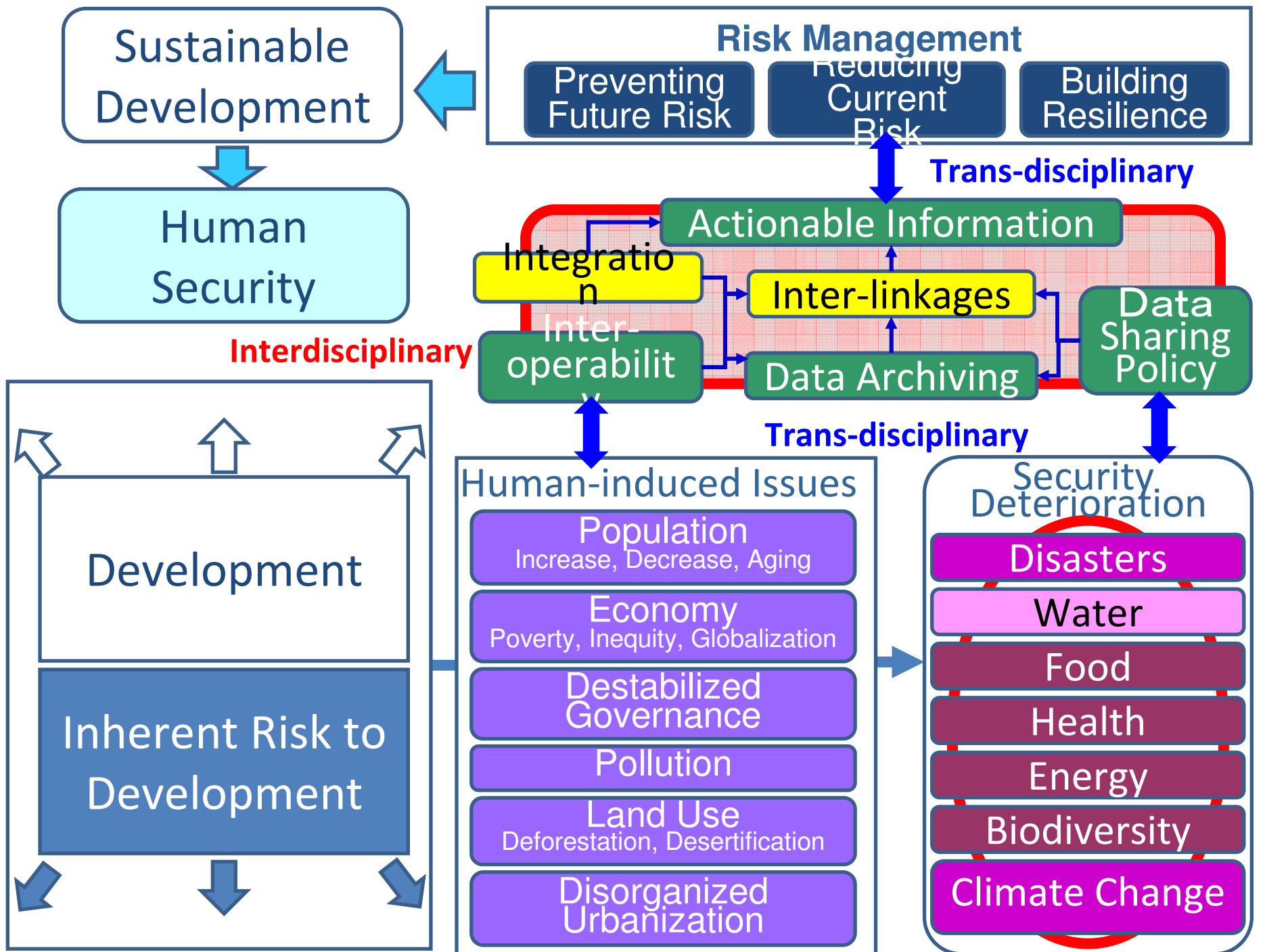
The AWCI Training Workshop on
Assessment of Climate Change Impact on a Watershed Hydrology
including Hydrological Modeling in Cold Region Basins
Islamabad, 15-17 September 2014

Expansion and Linkages of Water Cycle Initiative

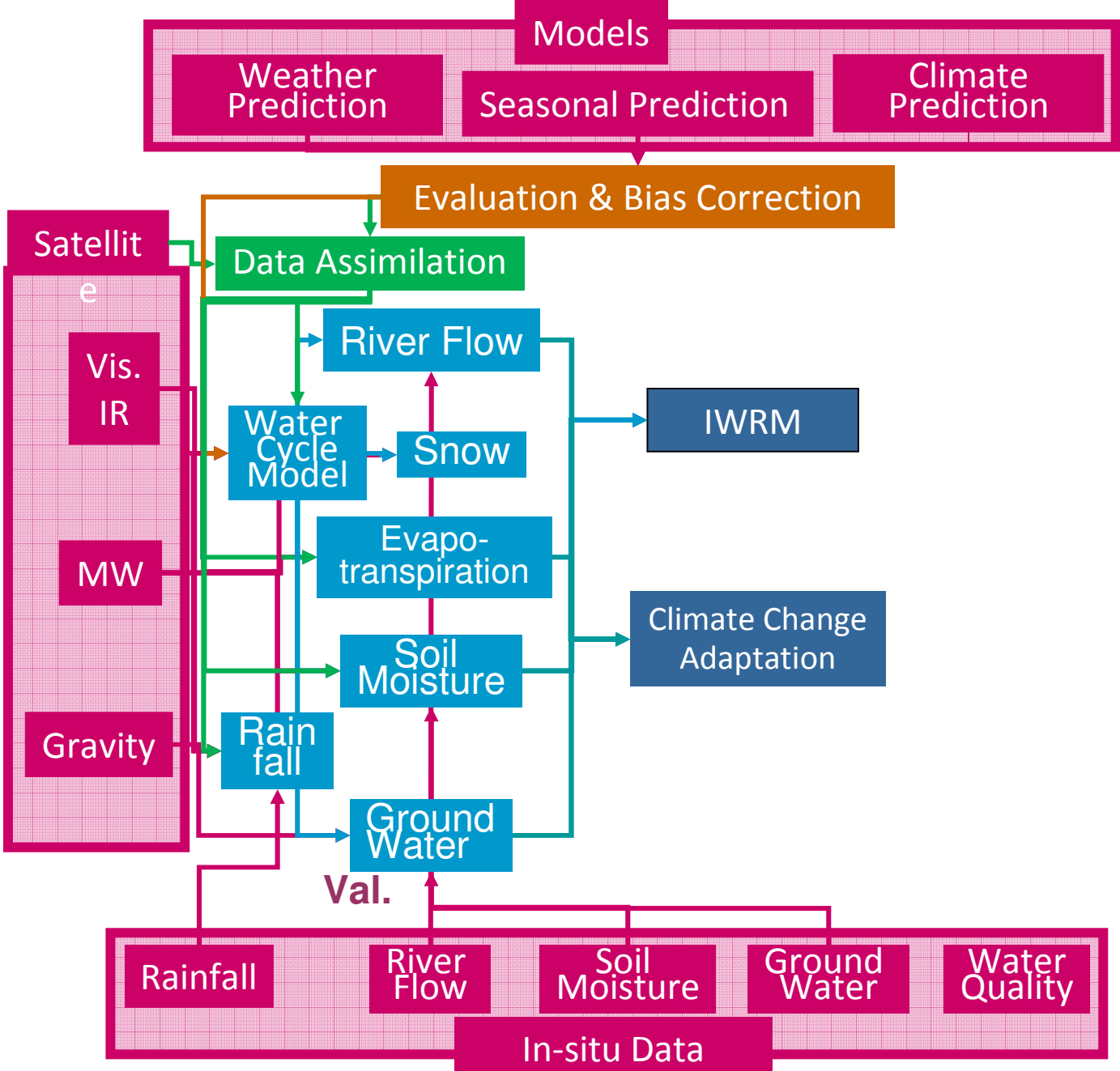
Toshio Koike
The University of Tokyo



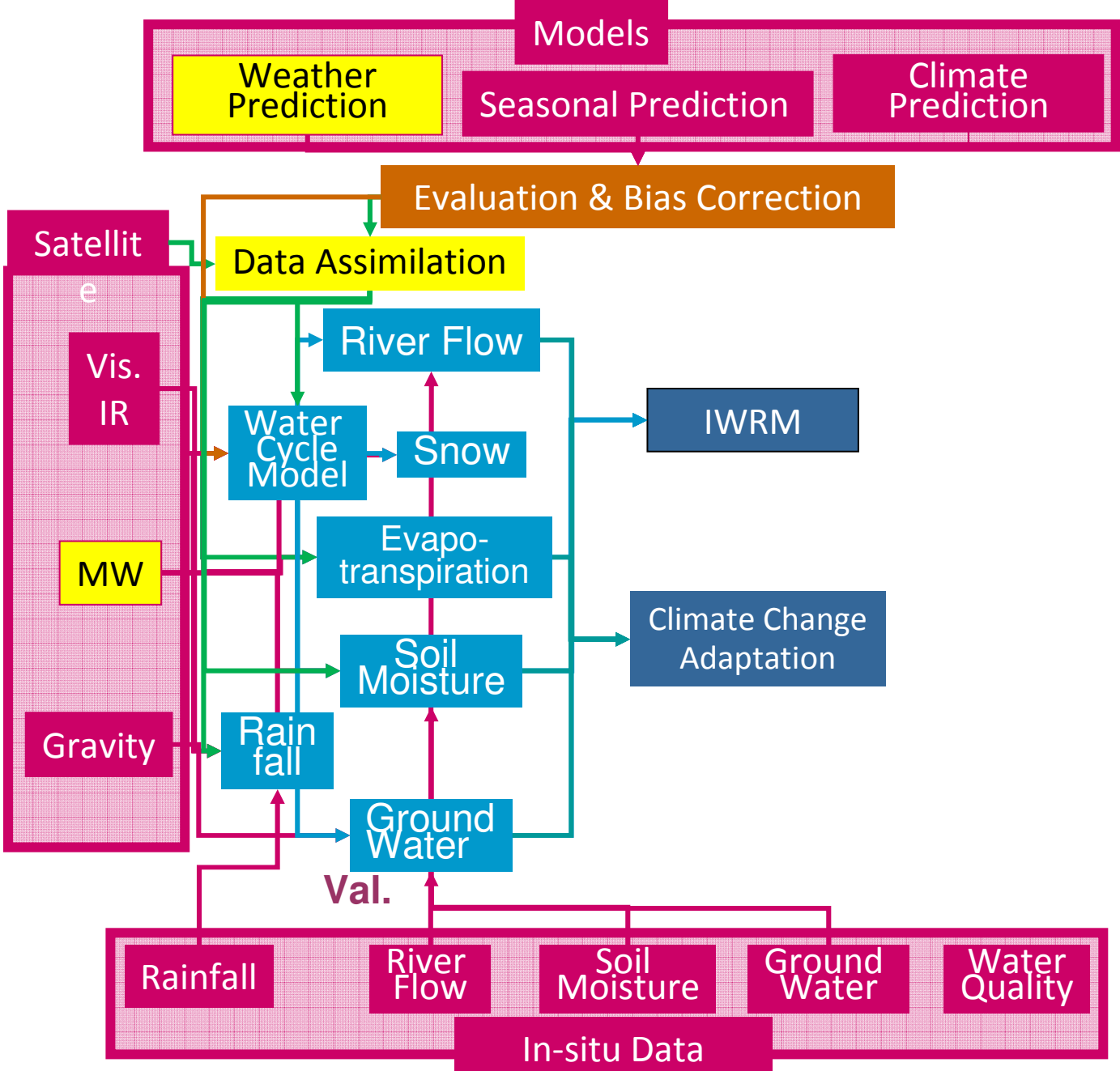




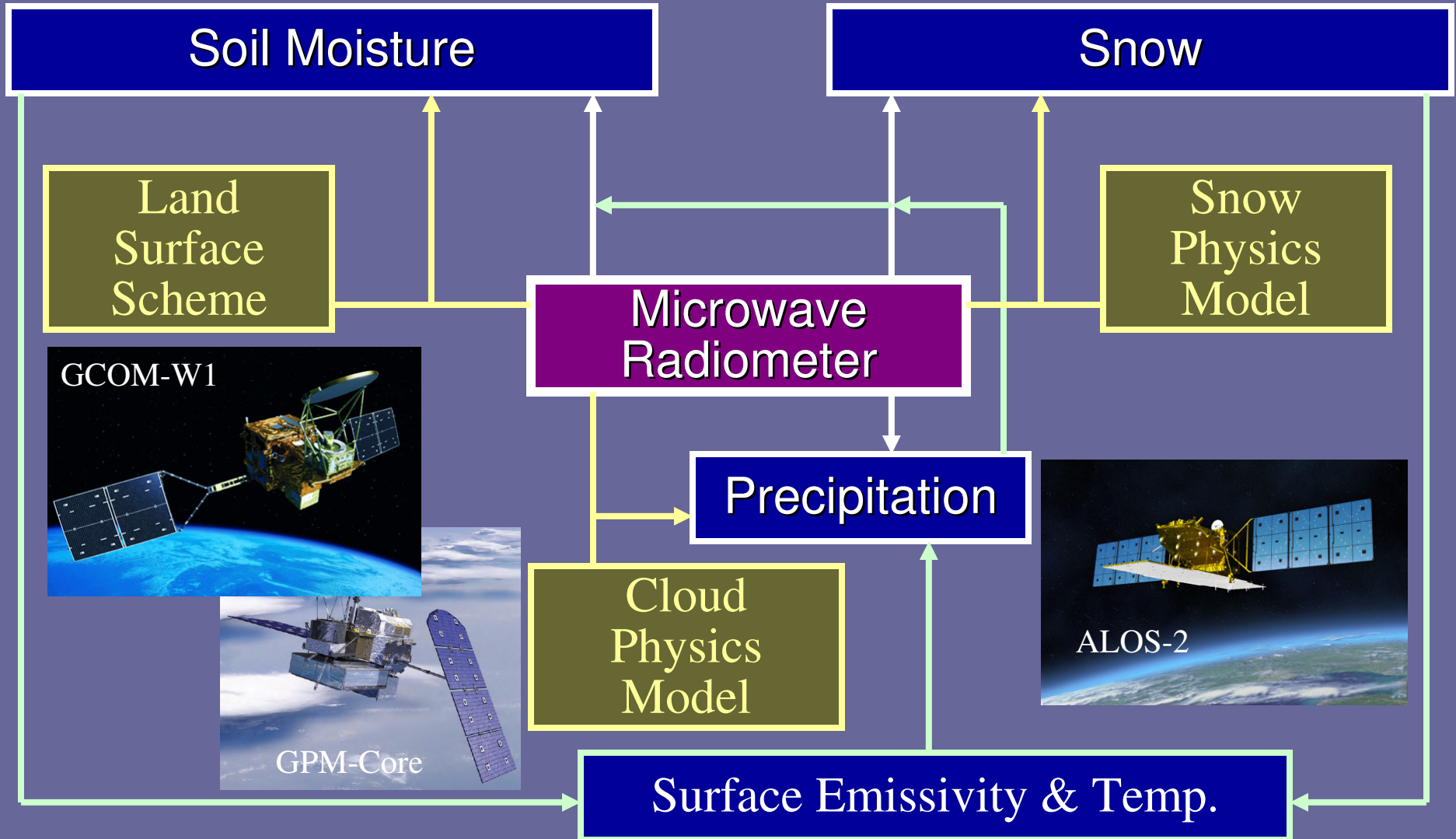
Water Cycle Integrator



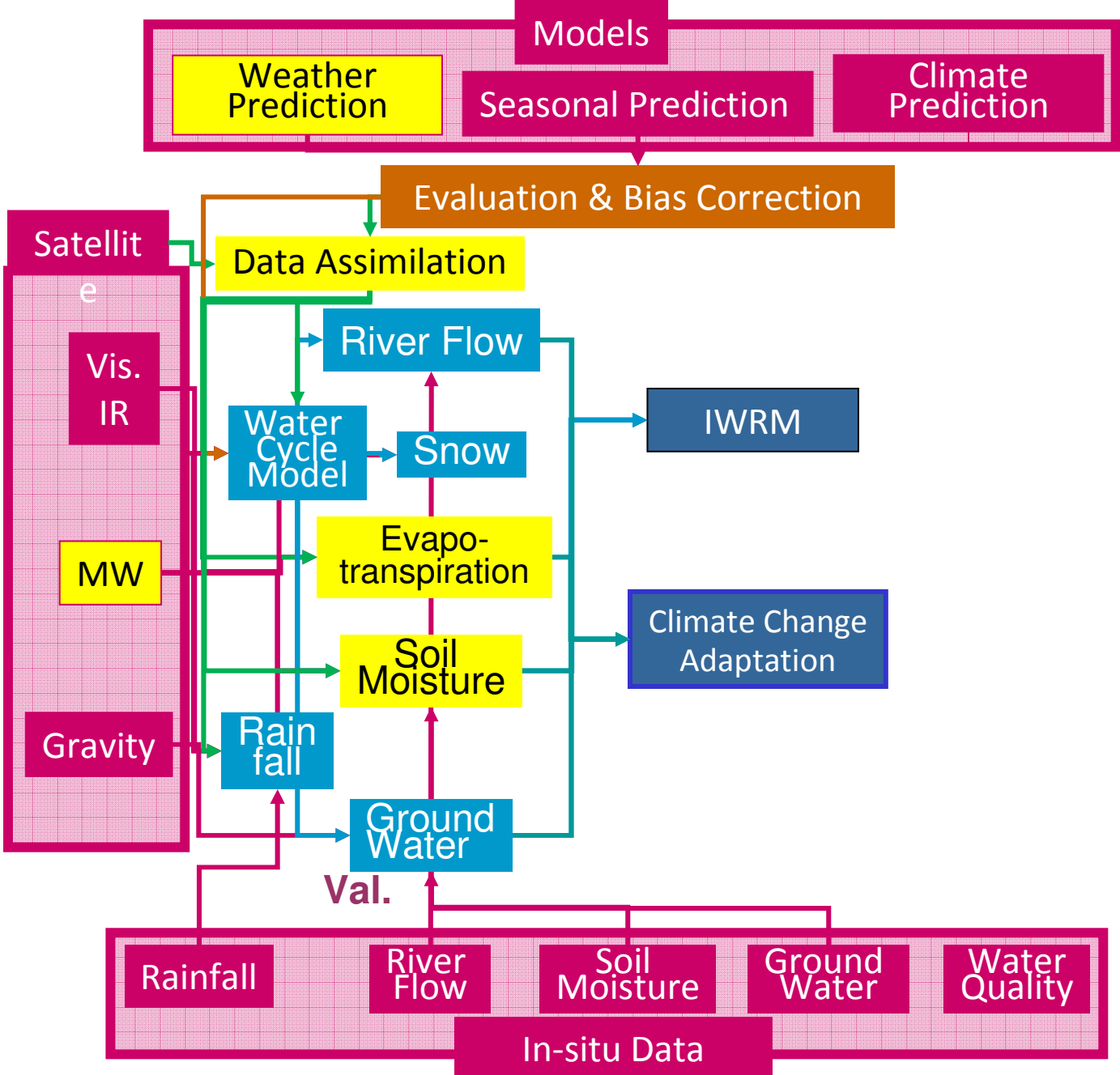
Water Cycle Integrator

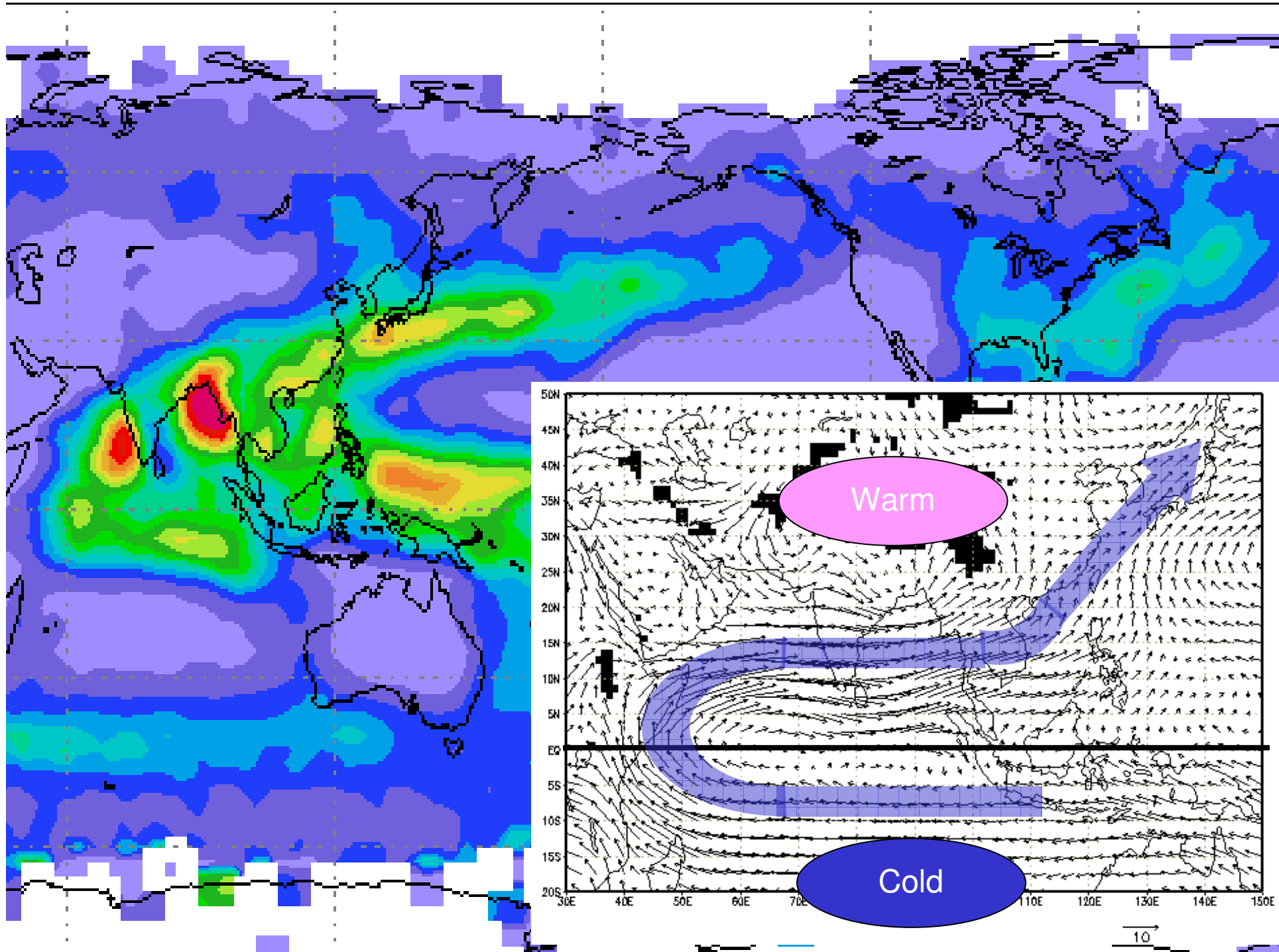


Microwave Remote Sensing

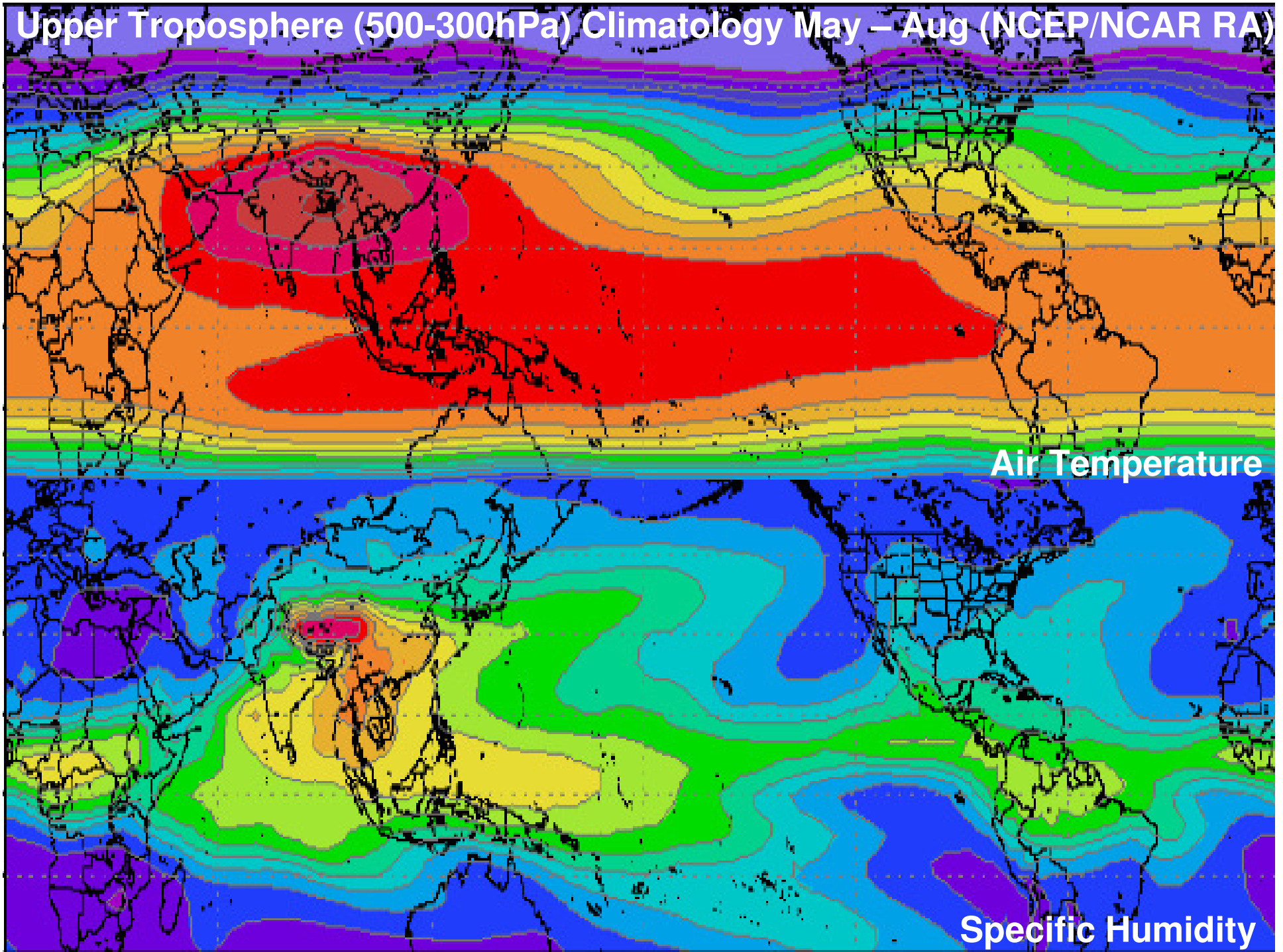


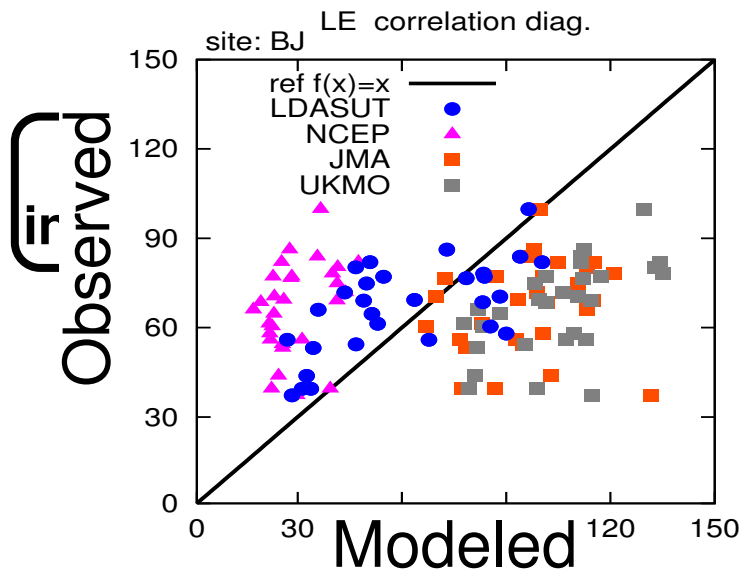
Water Cycle Integrator



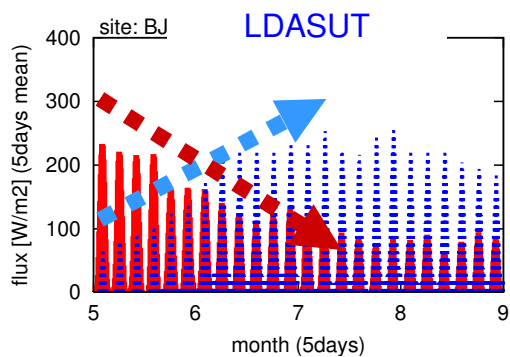
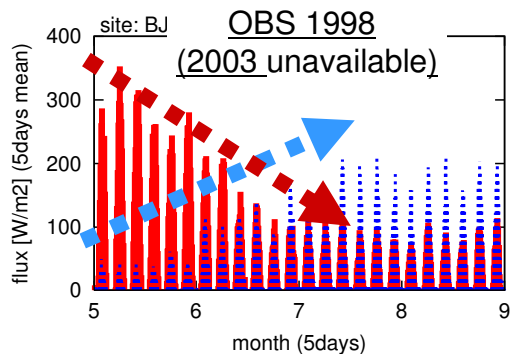


Upper Troposphere (500-300hPa) Climatology May – Aug (NCEP/NCAR RA)

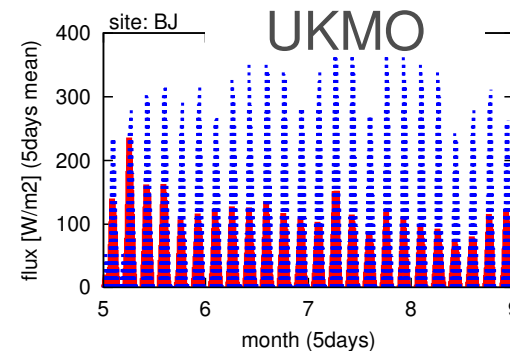
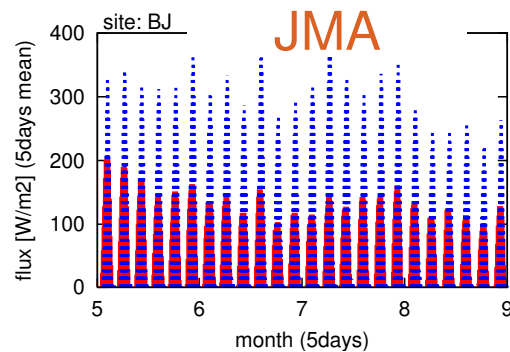
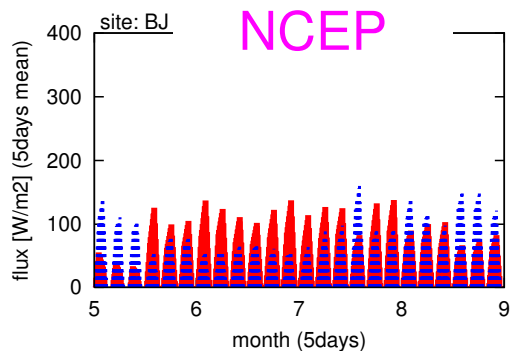




	H RMSE [W/m ²]	LE RMSE [W/m ²]
NCEP	40.2	68.4
JMA	32.3	79.8
UKMO	35.3	80.1



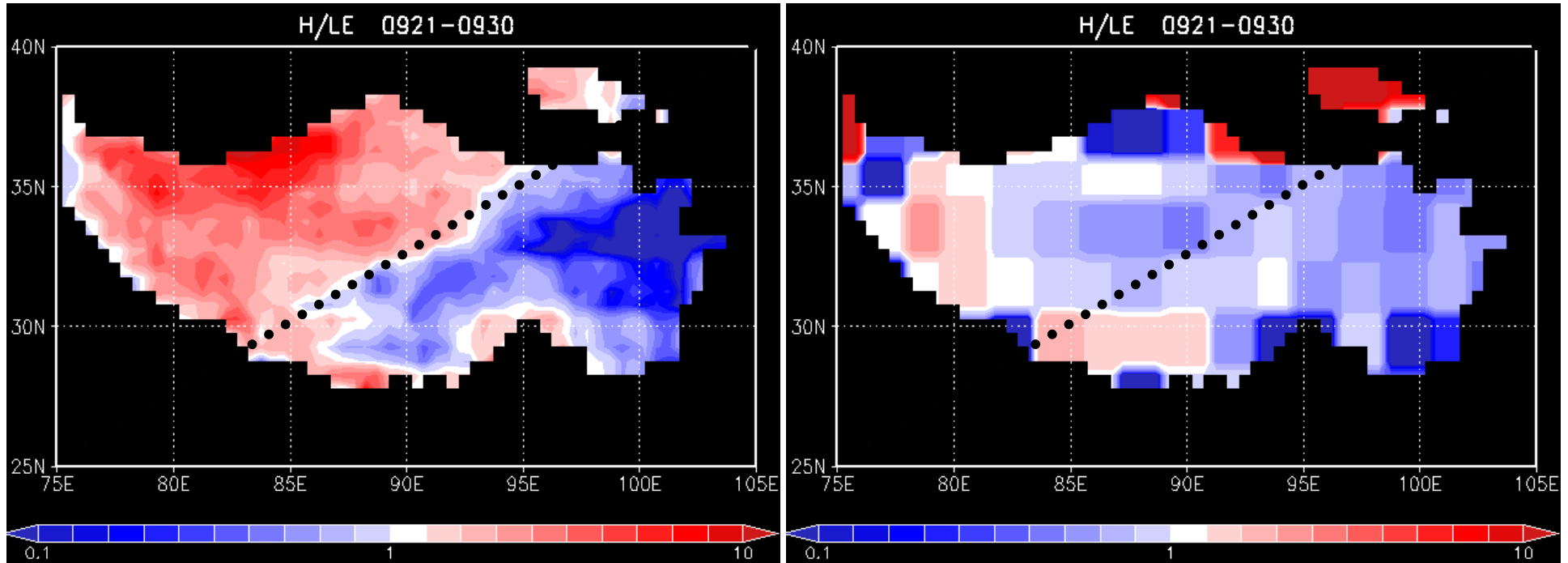
radiation
Sensible (H) —
Latent (LE) —



Seasonality of distributed Bowen Ratio: Sensible Heat Flux/Latent Heat Flux

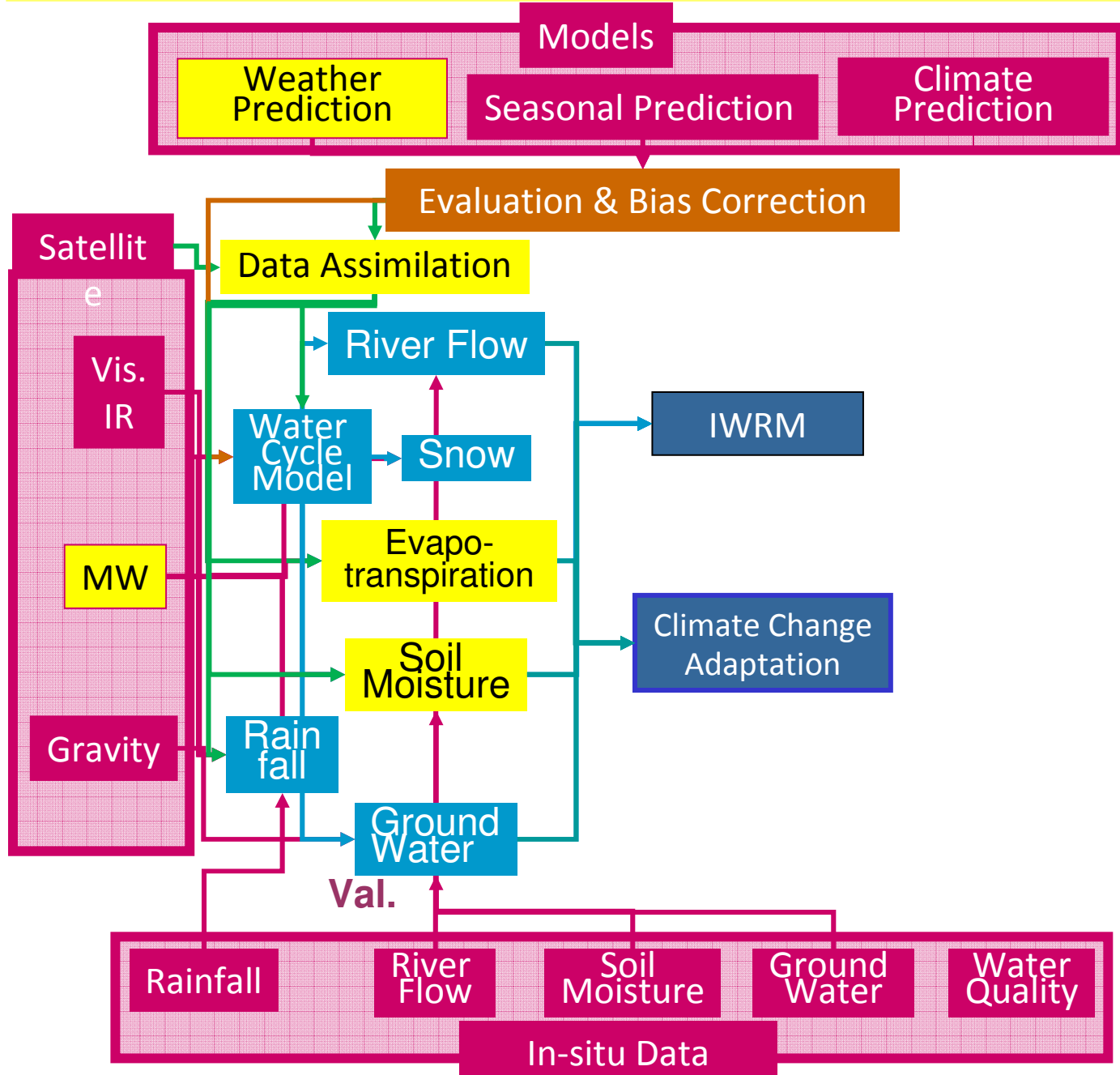
LDASUT

NCEP

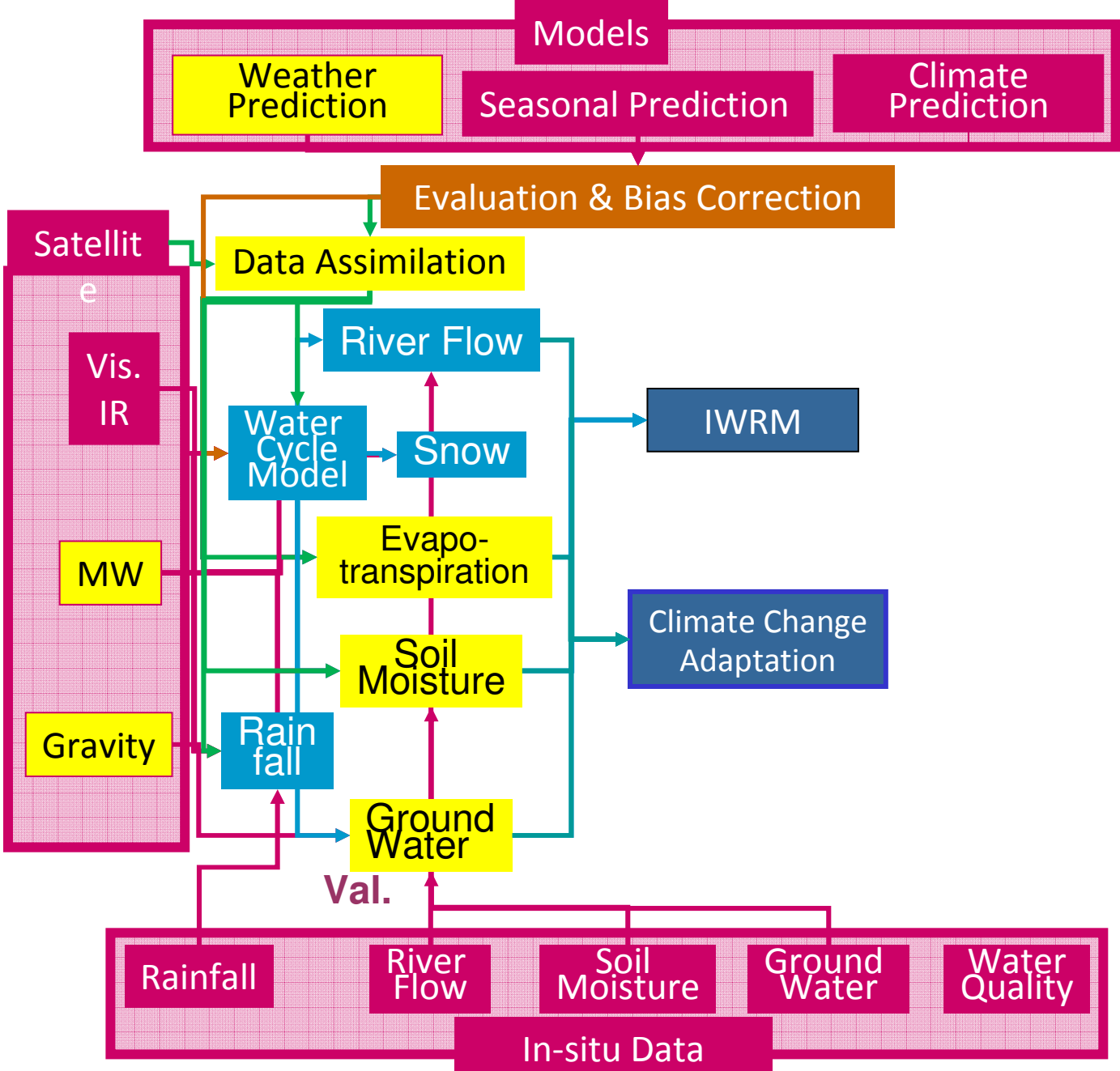


LDAS Seasonality: May~Mid June, $H > LE$; Mid June~Aug; $LE > H$
LDAS Regionality: H is dominant in N.W. TP, LE is dominant in S.E. TP

Water Cycle Integrator

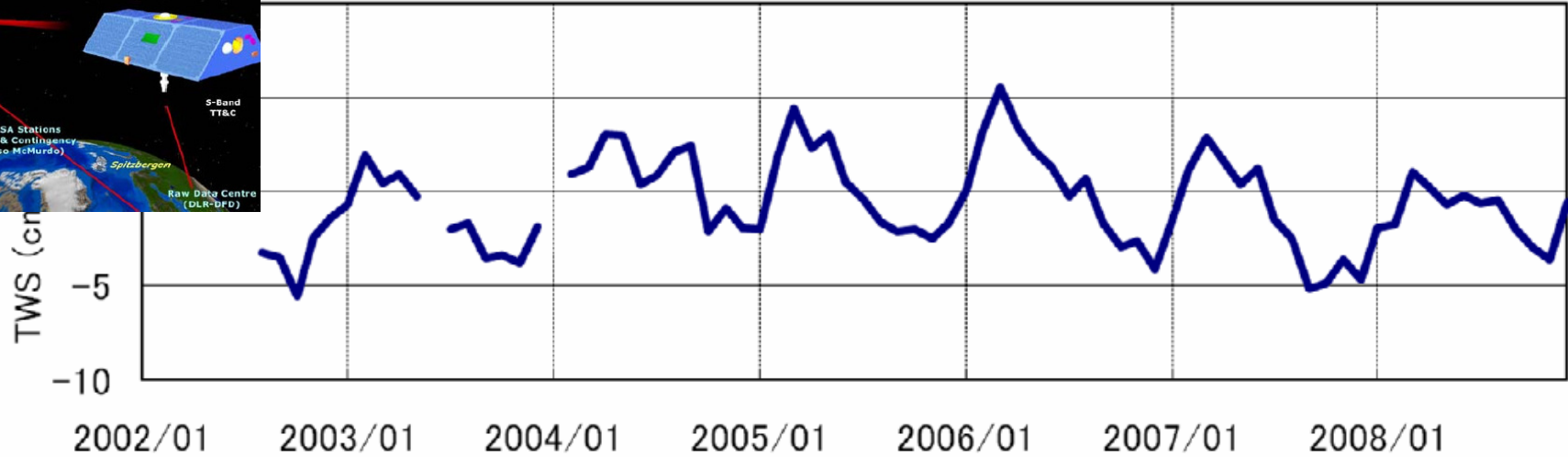
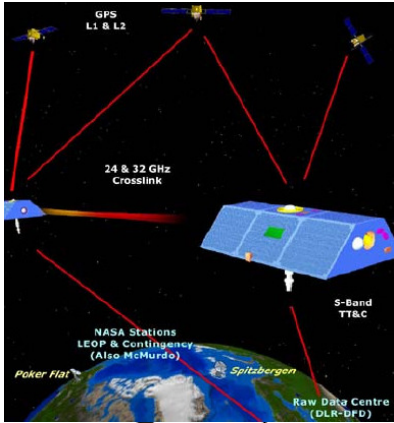


Water Cycle Integrator

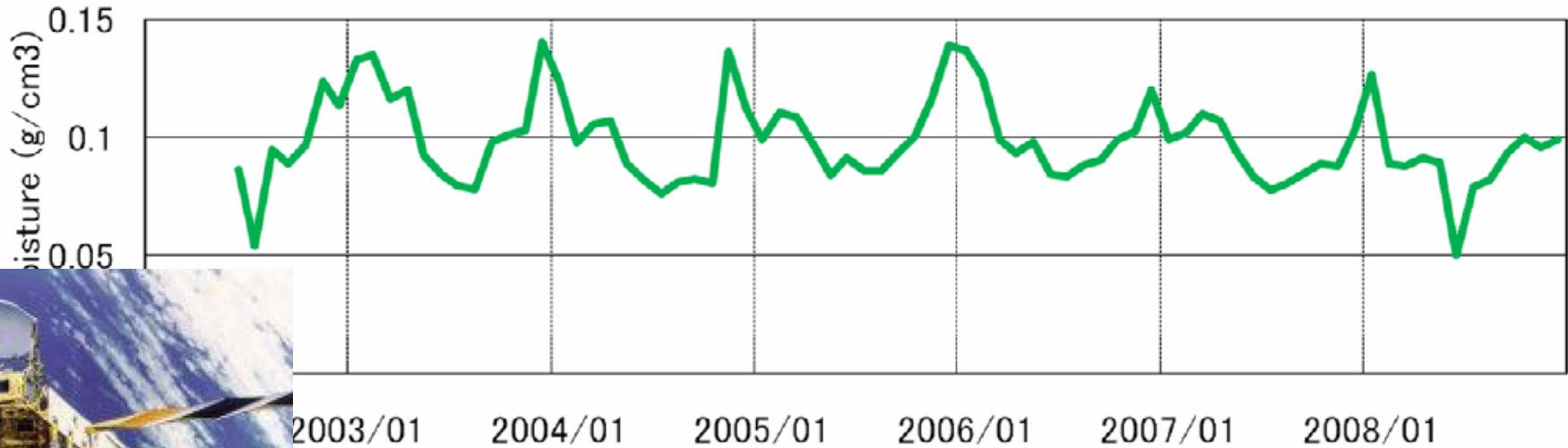


Soil Moisture + Ground Water

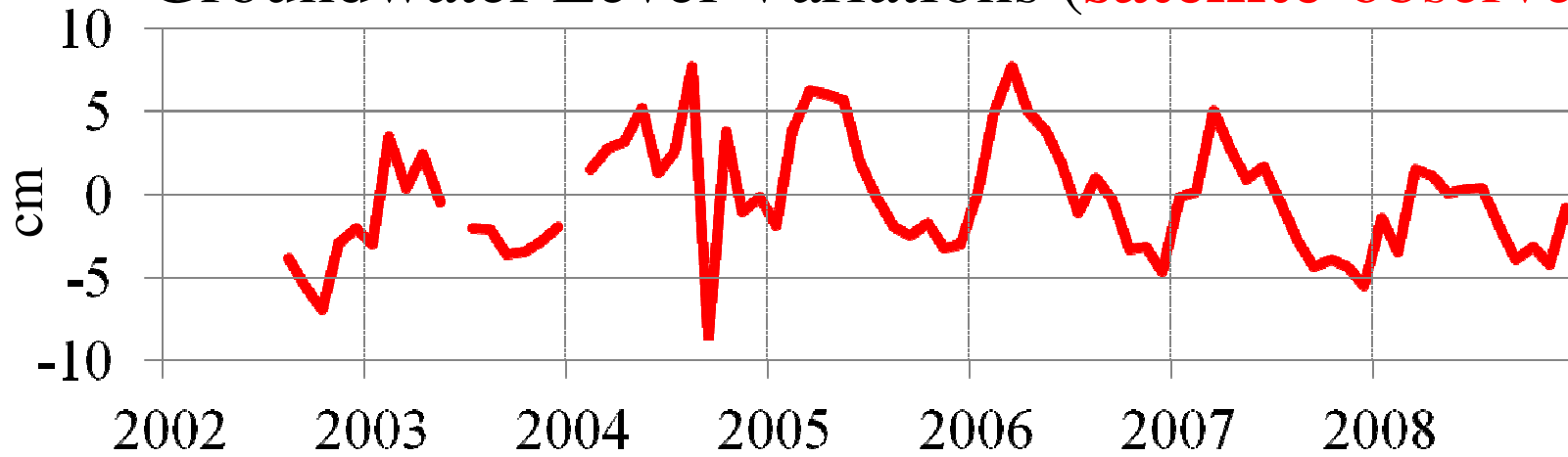
Terrestrial Water Storage Change



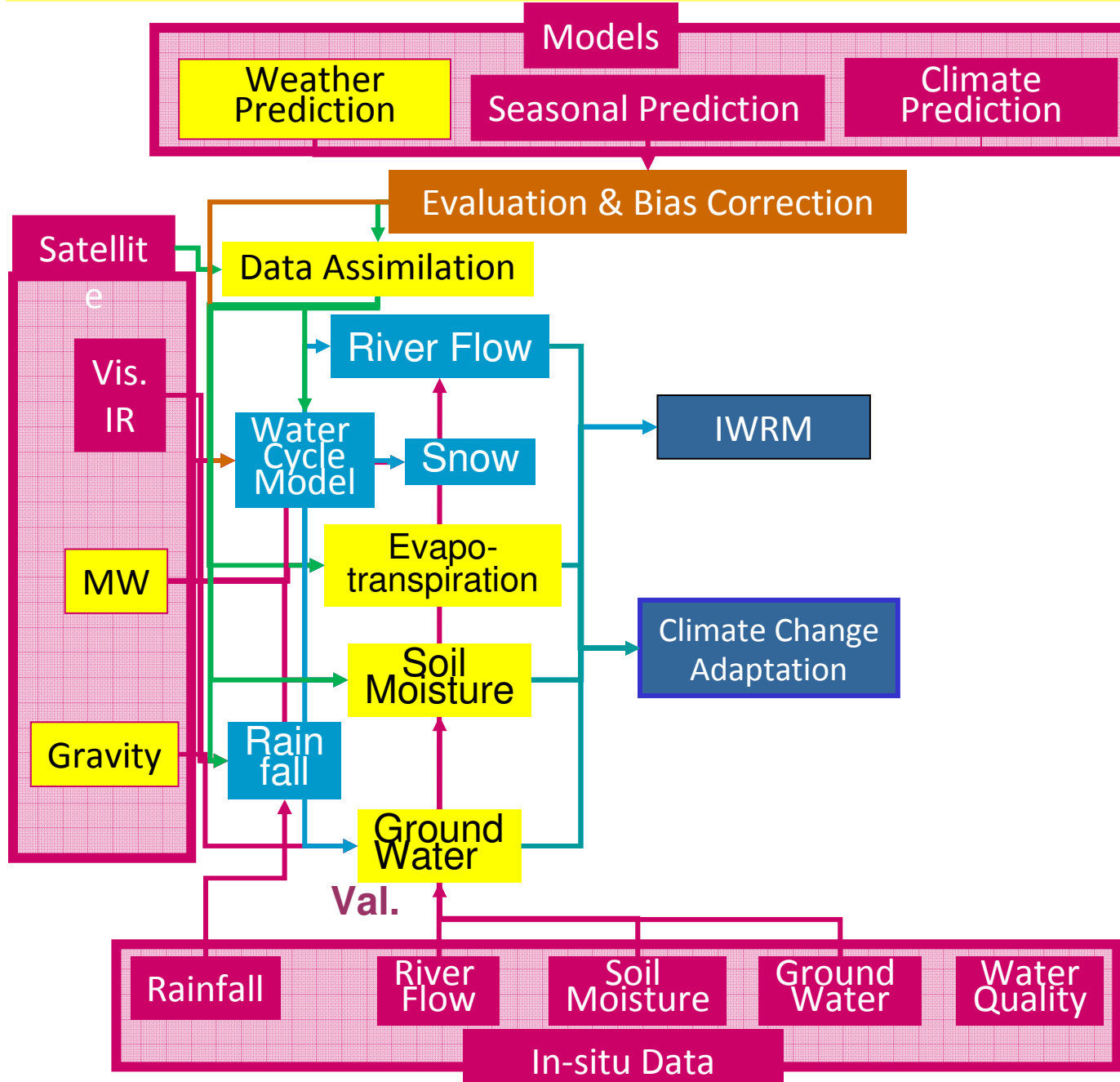
Soil Moisture



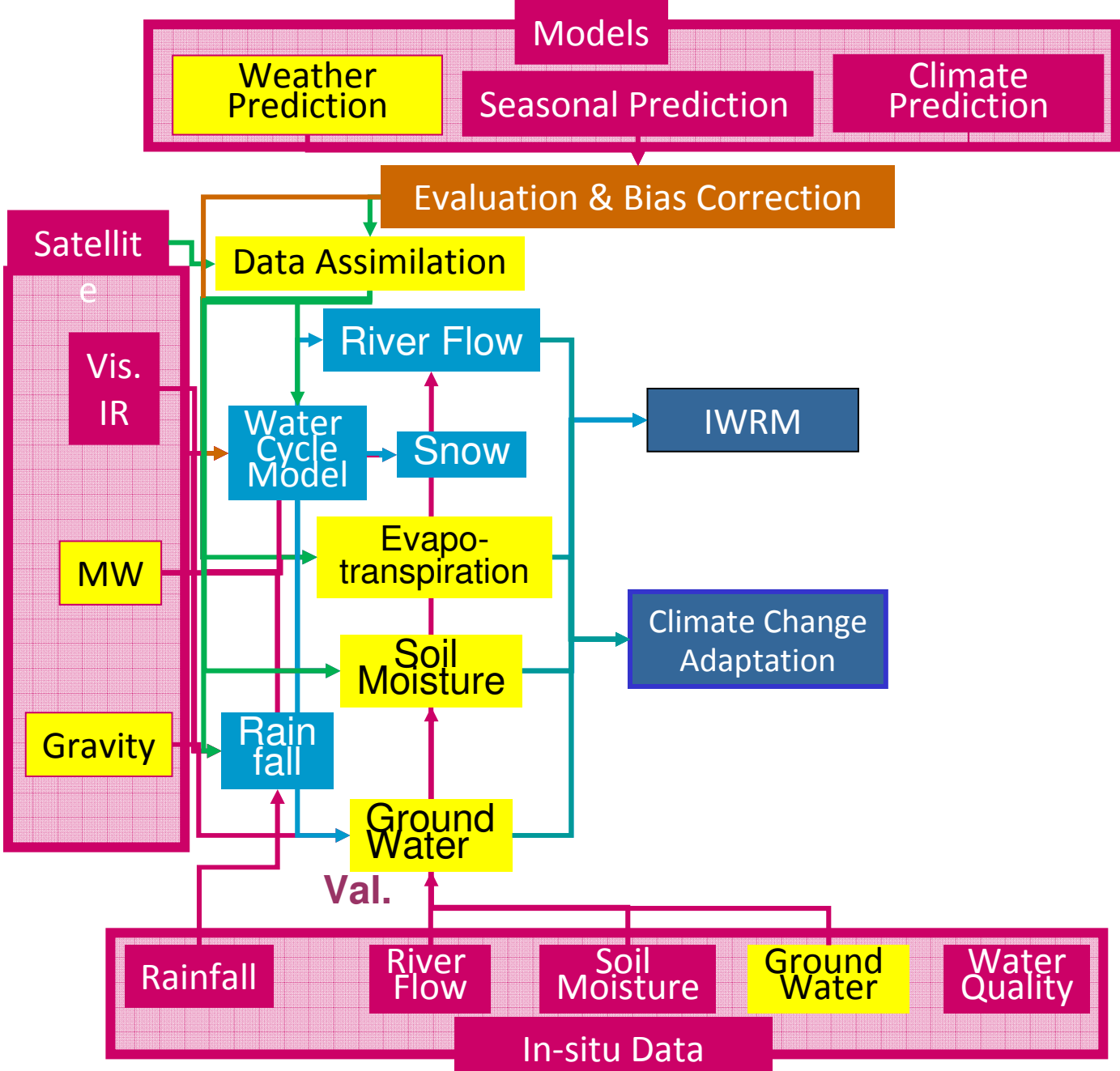
Groundwater Level Variations (**satellite-observed**)

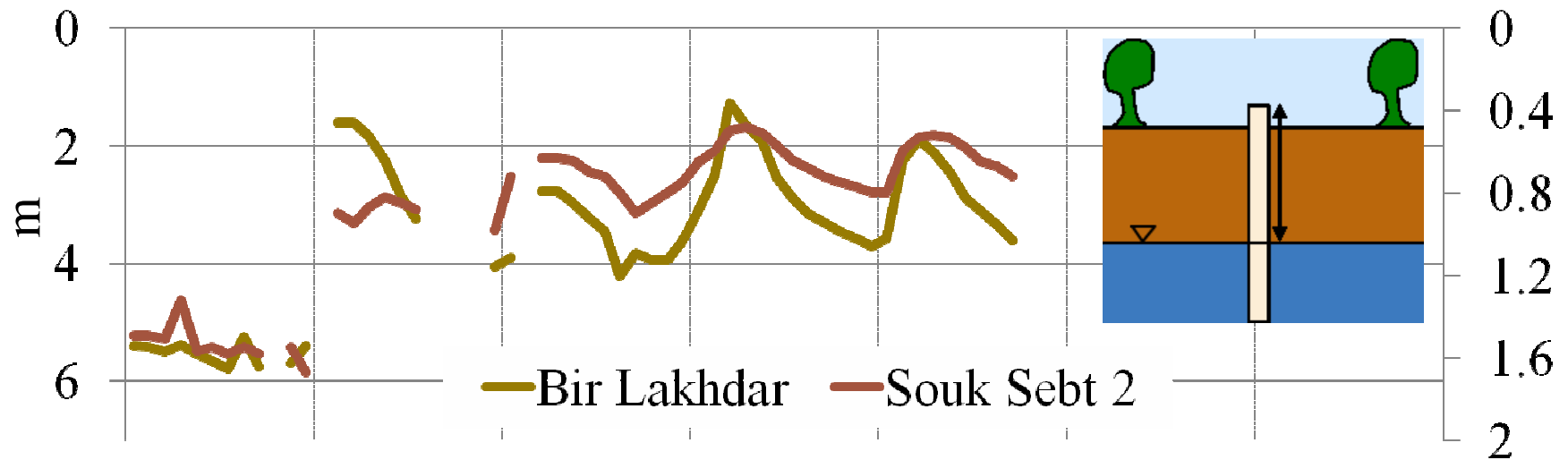
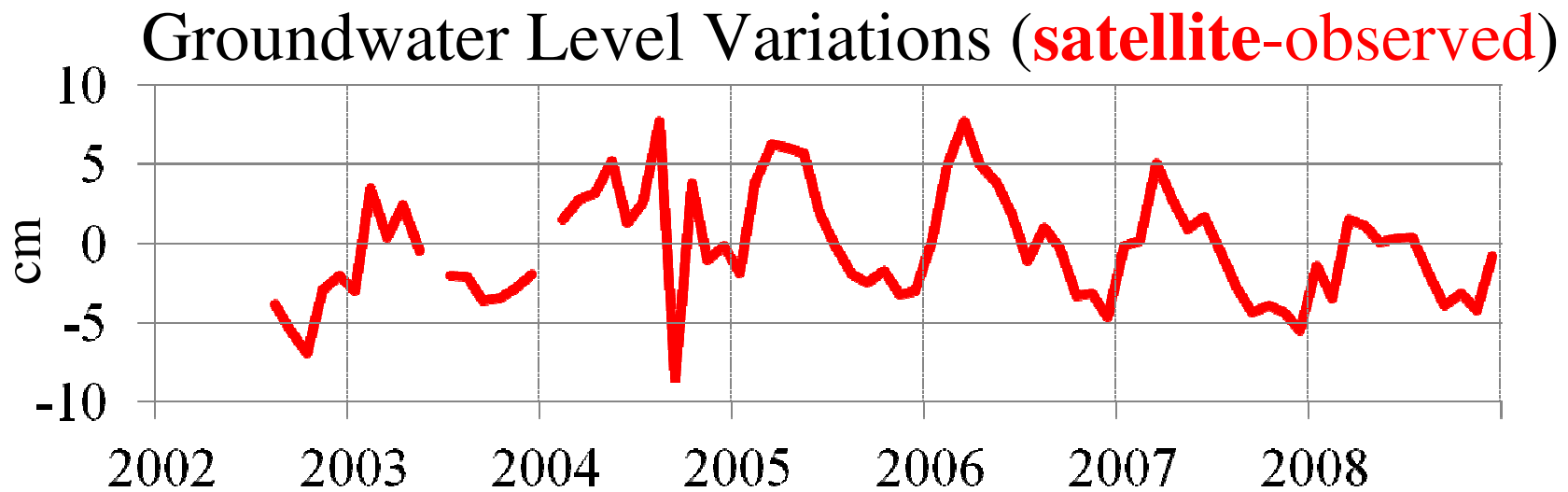


Water Cycle Integrator



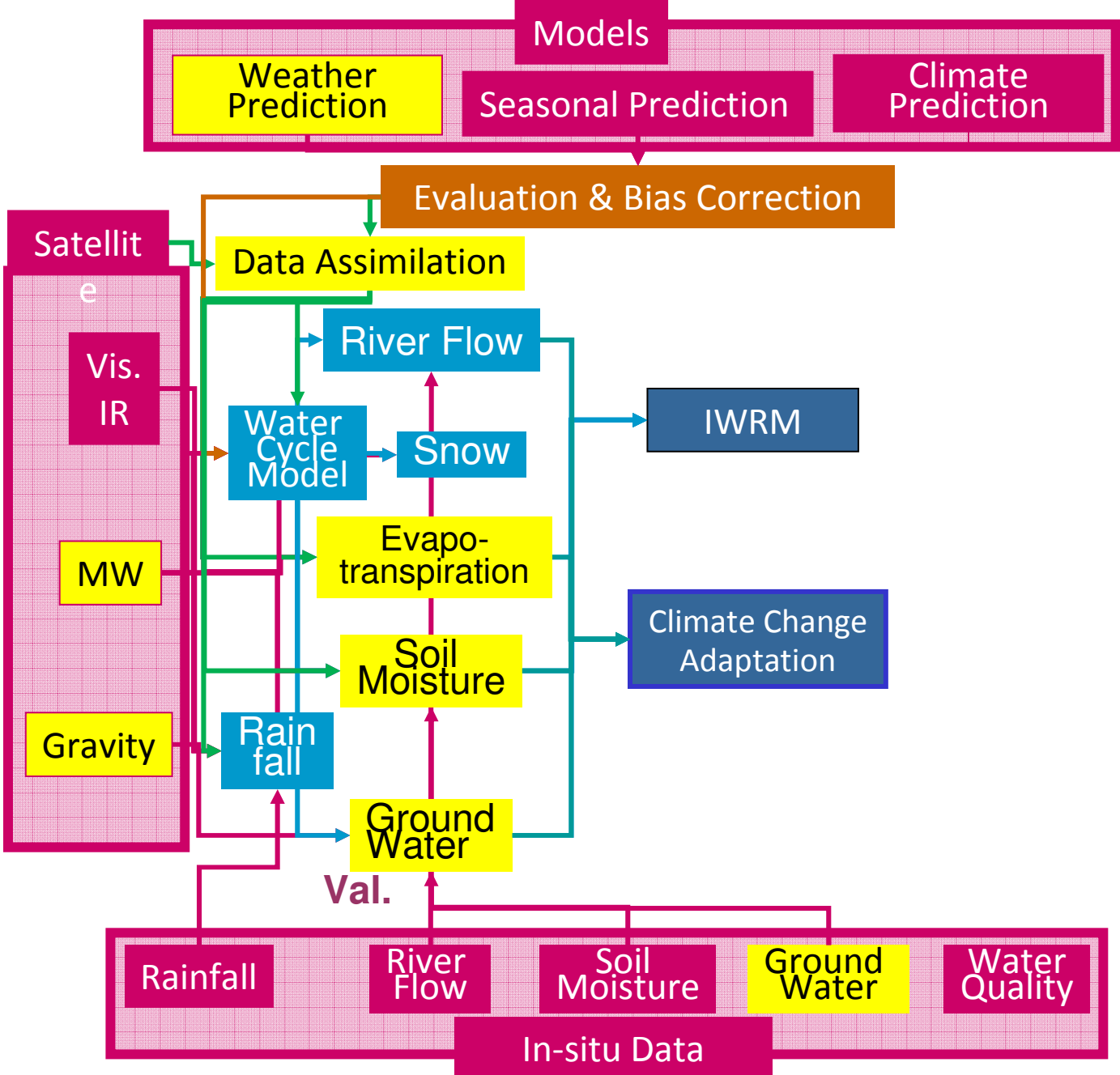
Water Cycle Integrator



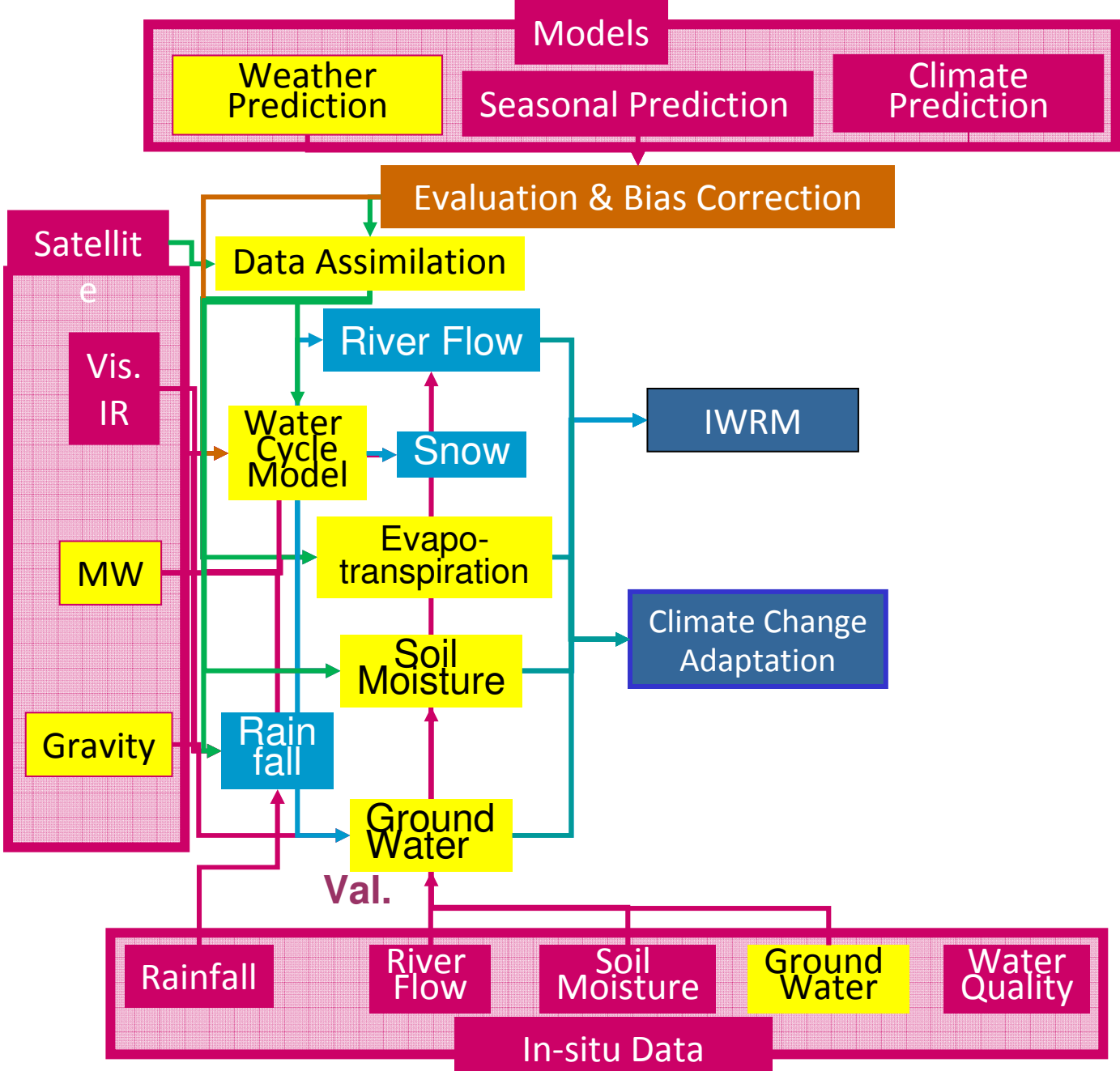


Groundwater Level Variations (**ground-observed**)

Water Cycle Integrator



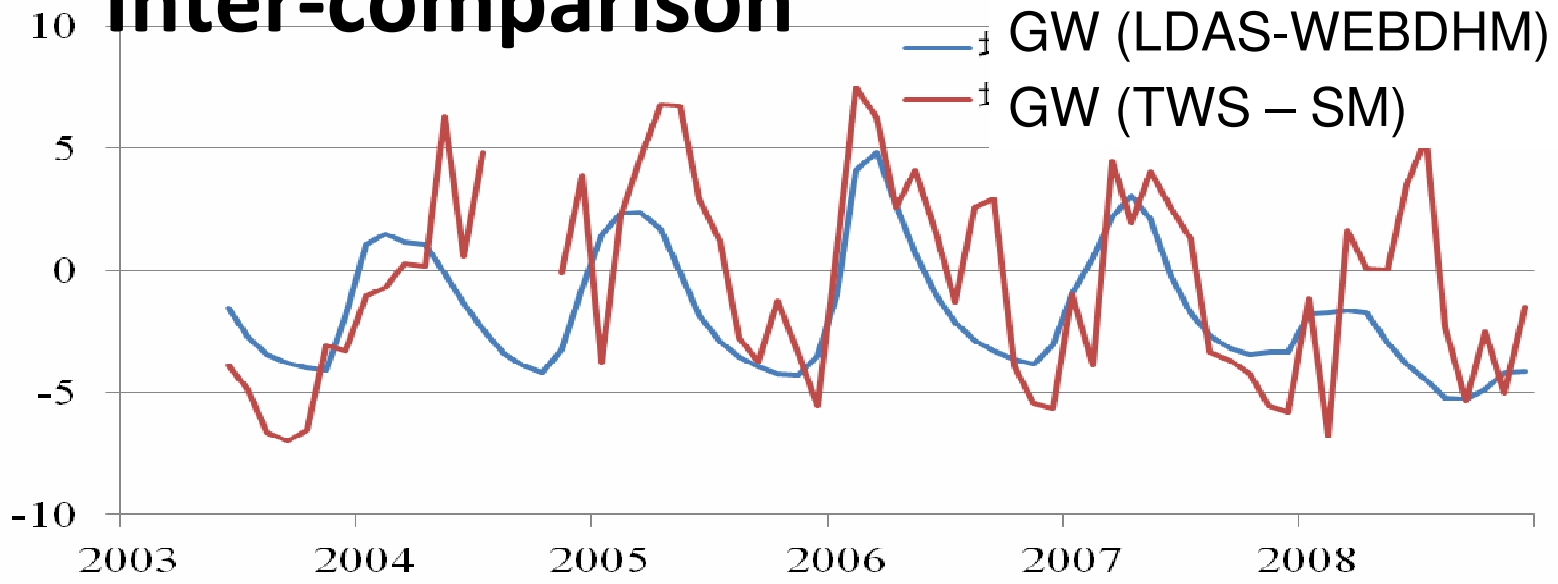
Water Cycle Integrator



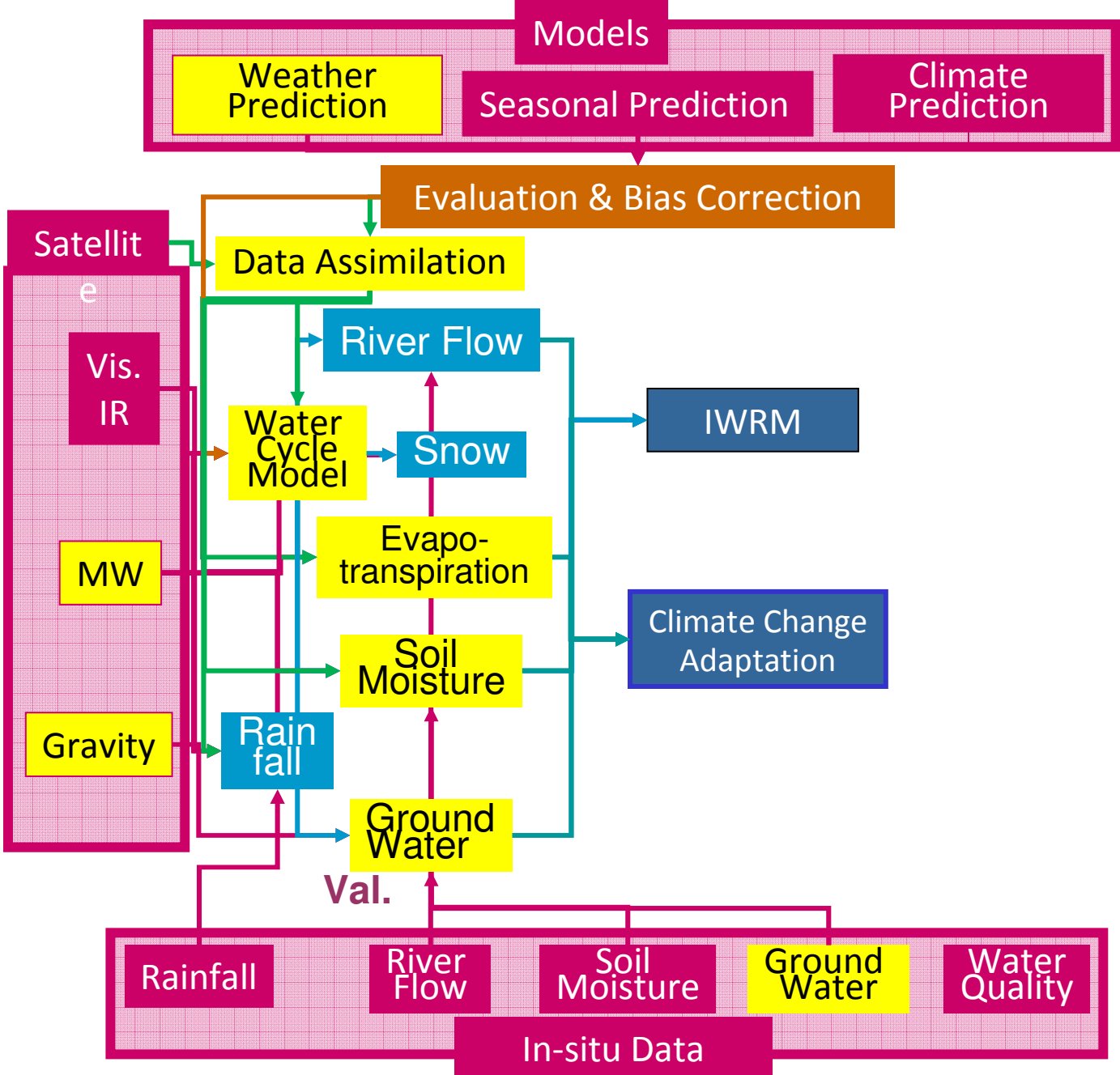
GW storage anomaly (cm)

Inter-comparison

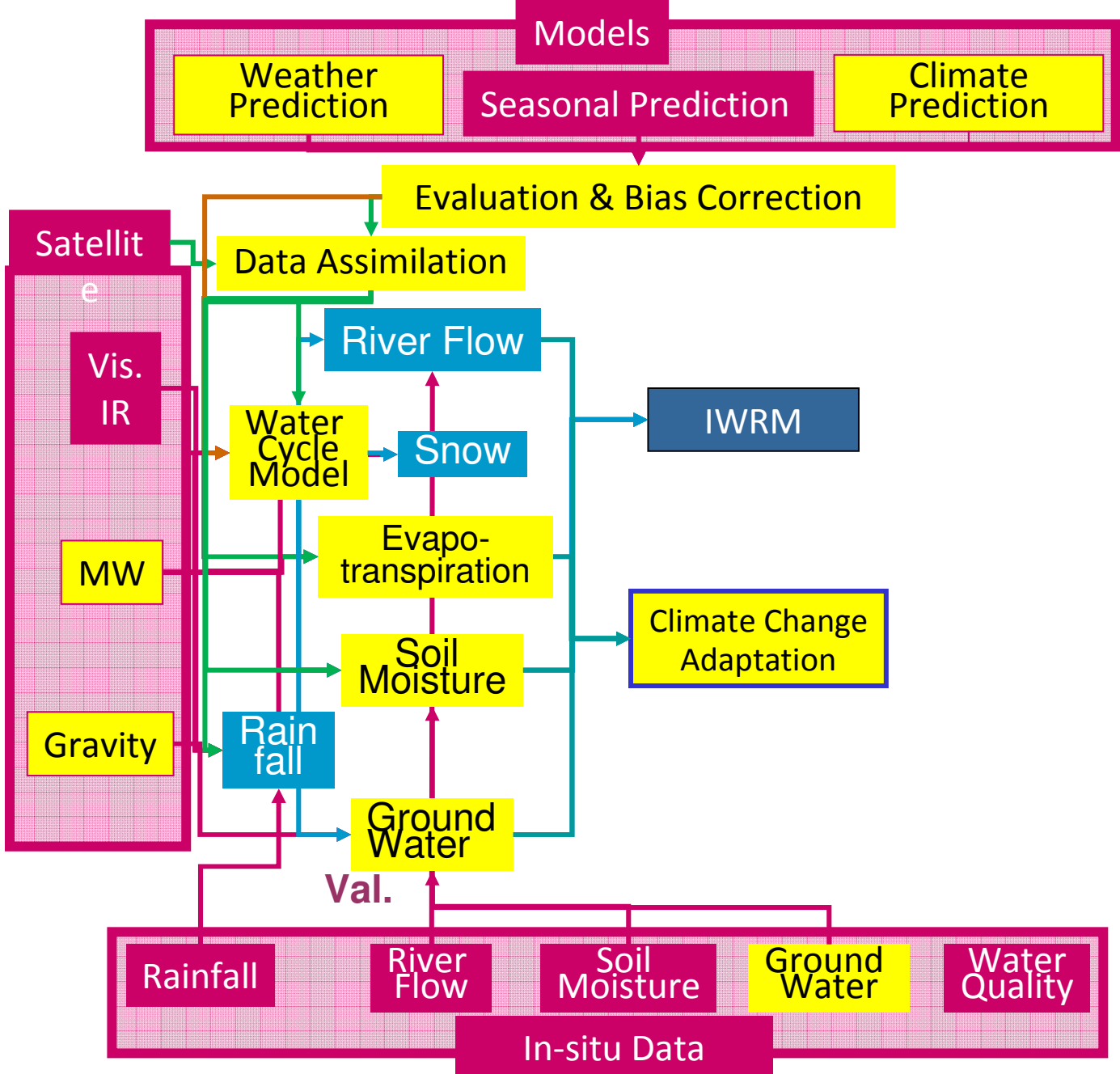
8/20

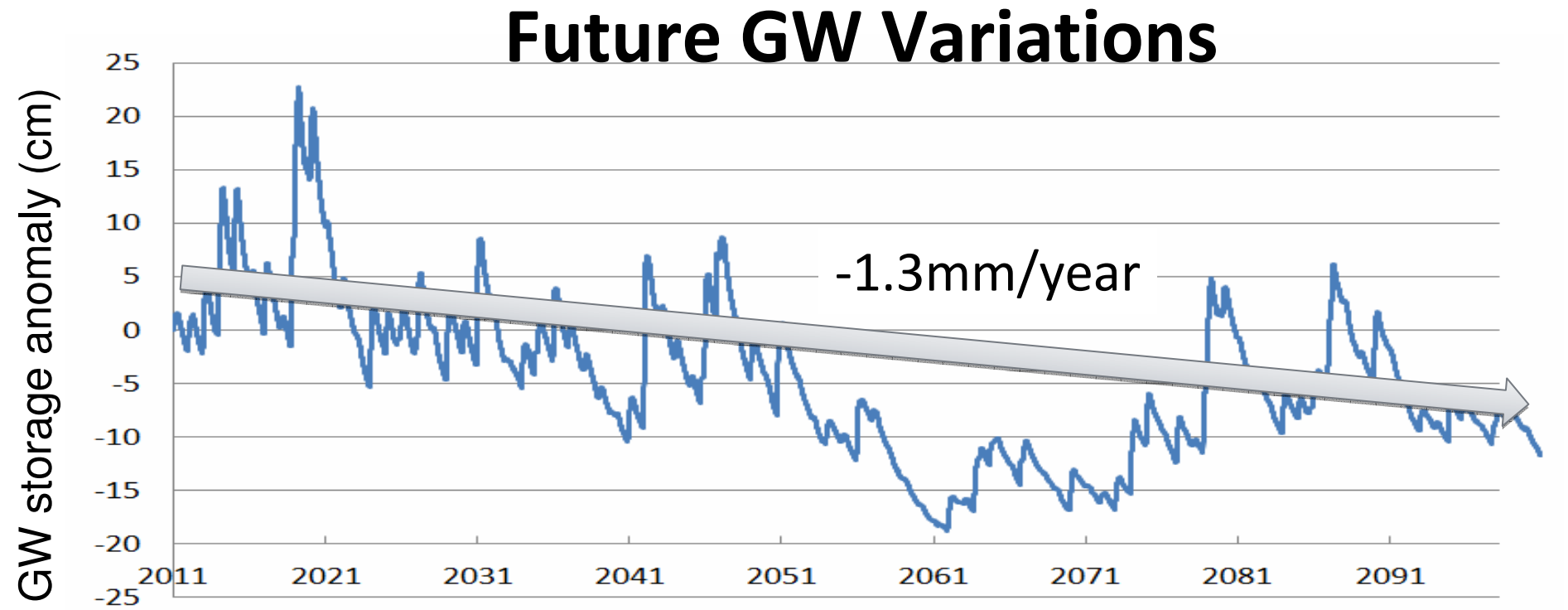
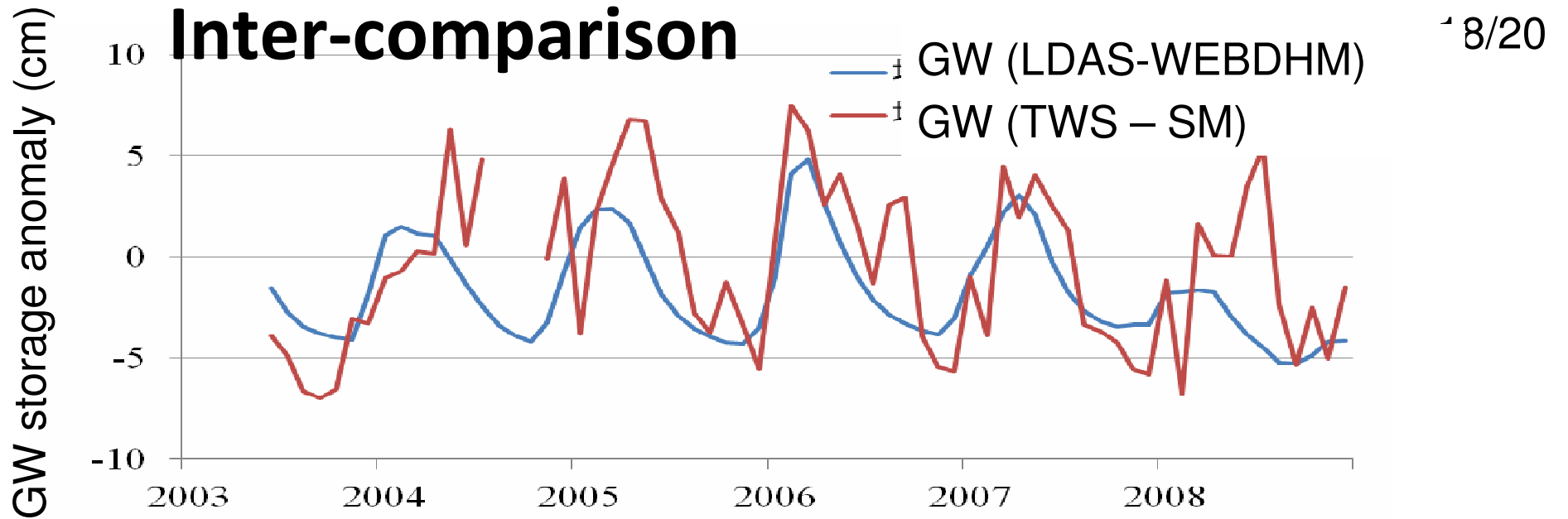


Water Cycle Integrator

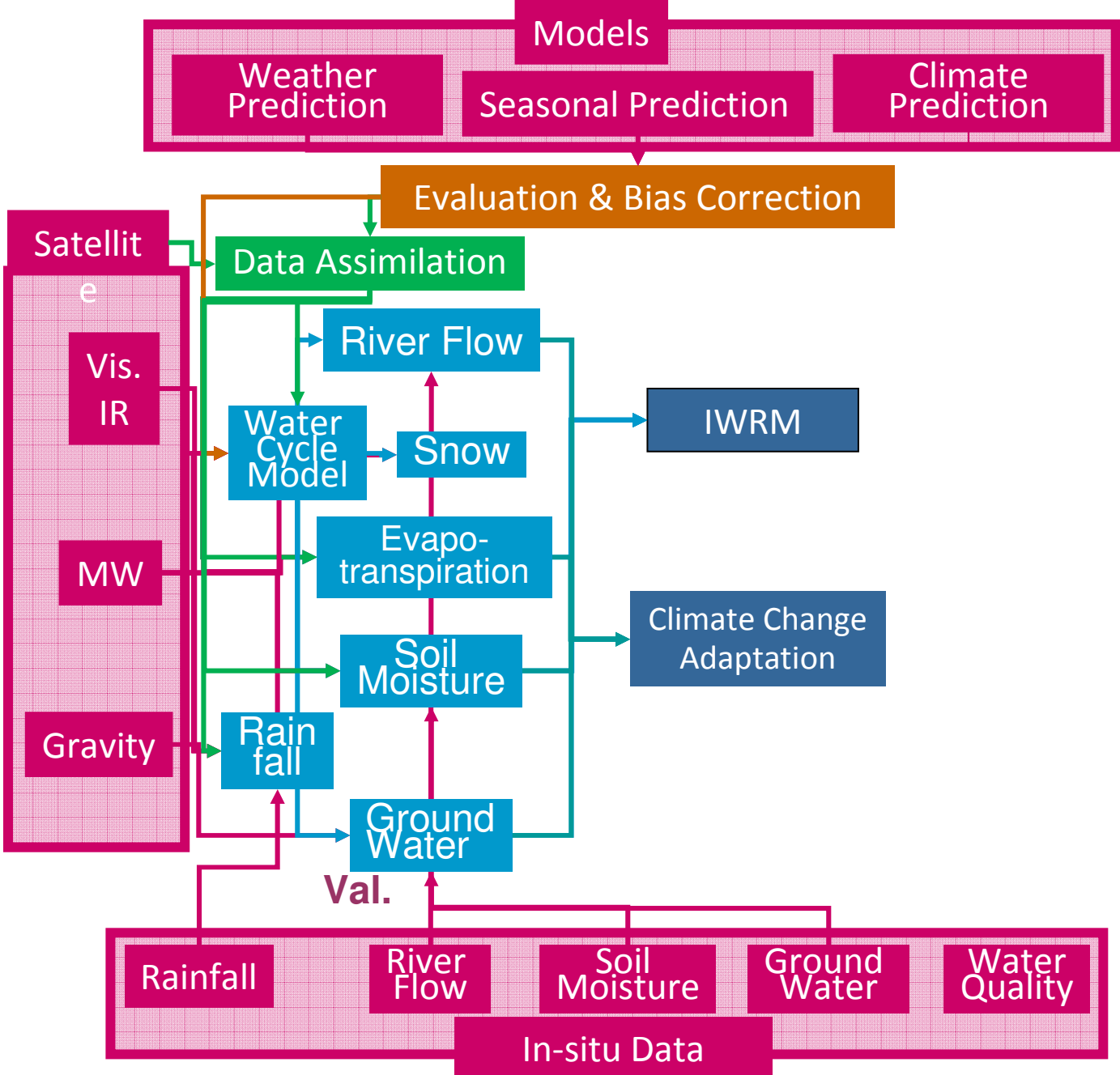


Water Cycle Integrator

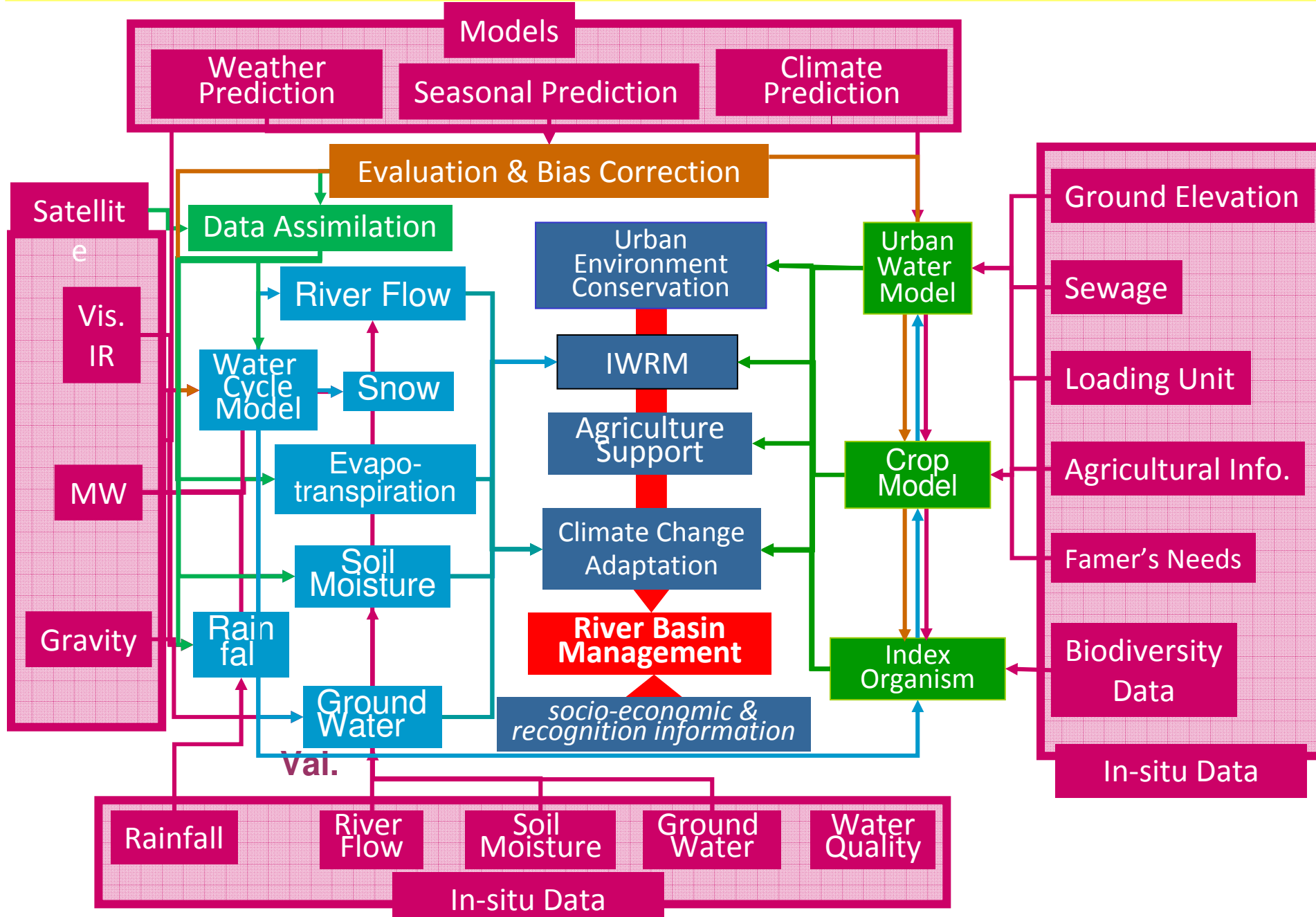




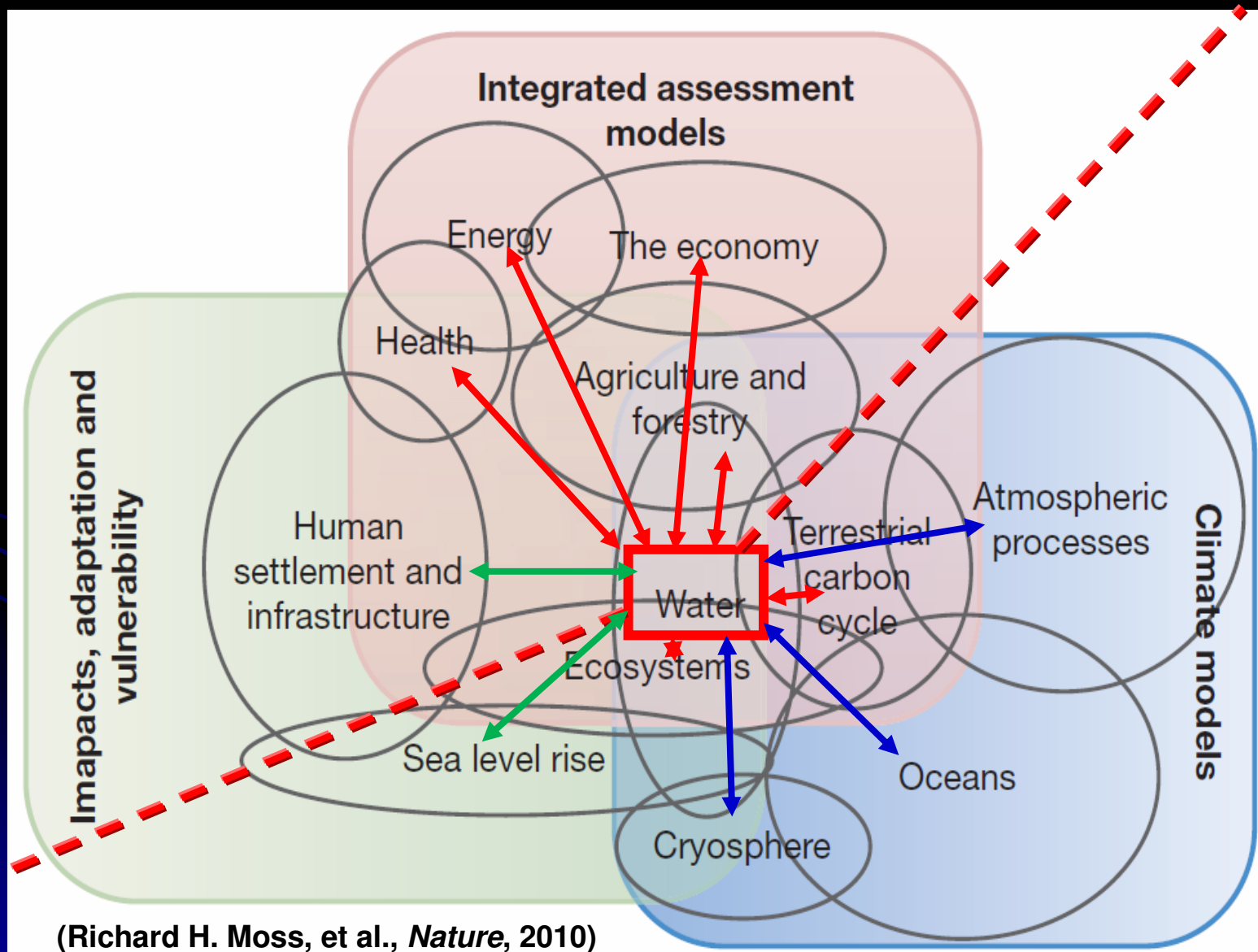
Water Cycle Integrator



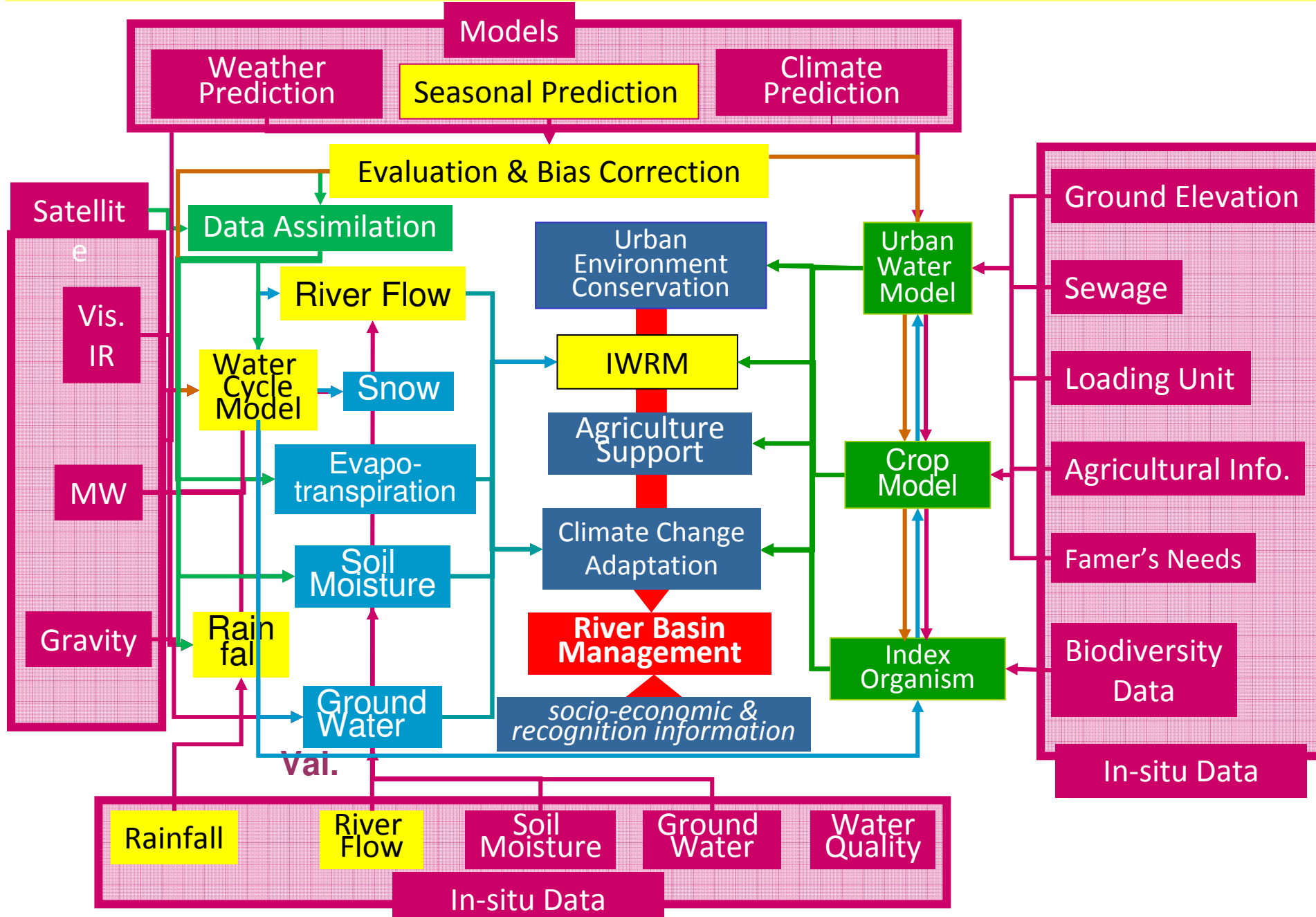
Water Cycle Integrator



Water is a Key bridging between climate processes and societal benefits.



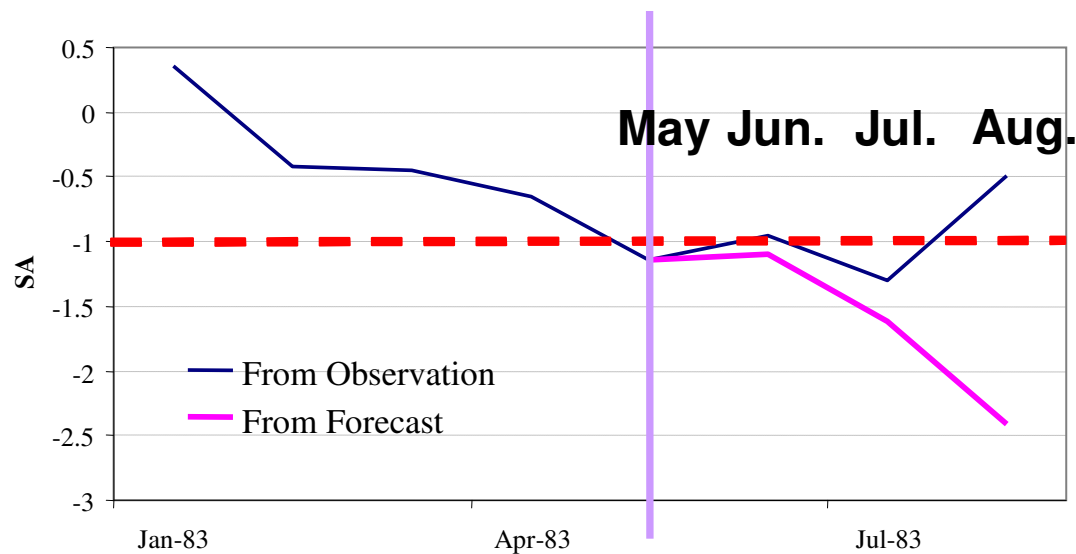
Water Cycle Integrator



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

} Close enough, drought conditions can be forecasted



Seasonal Drought Prediction

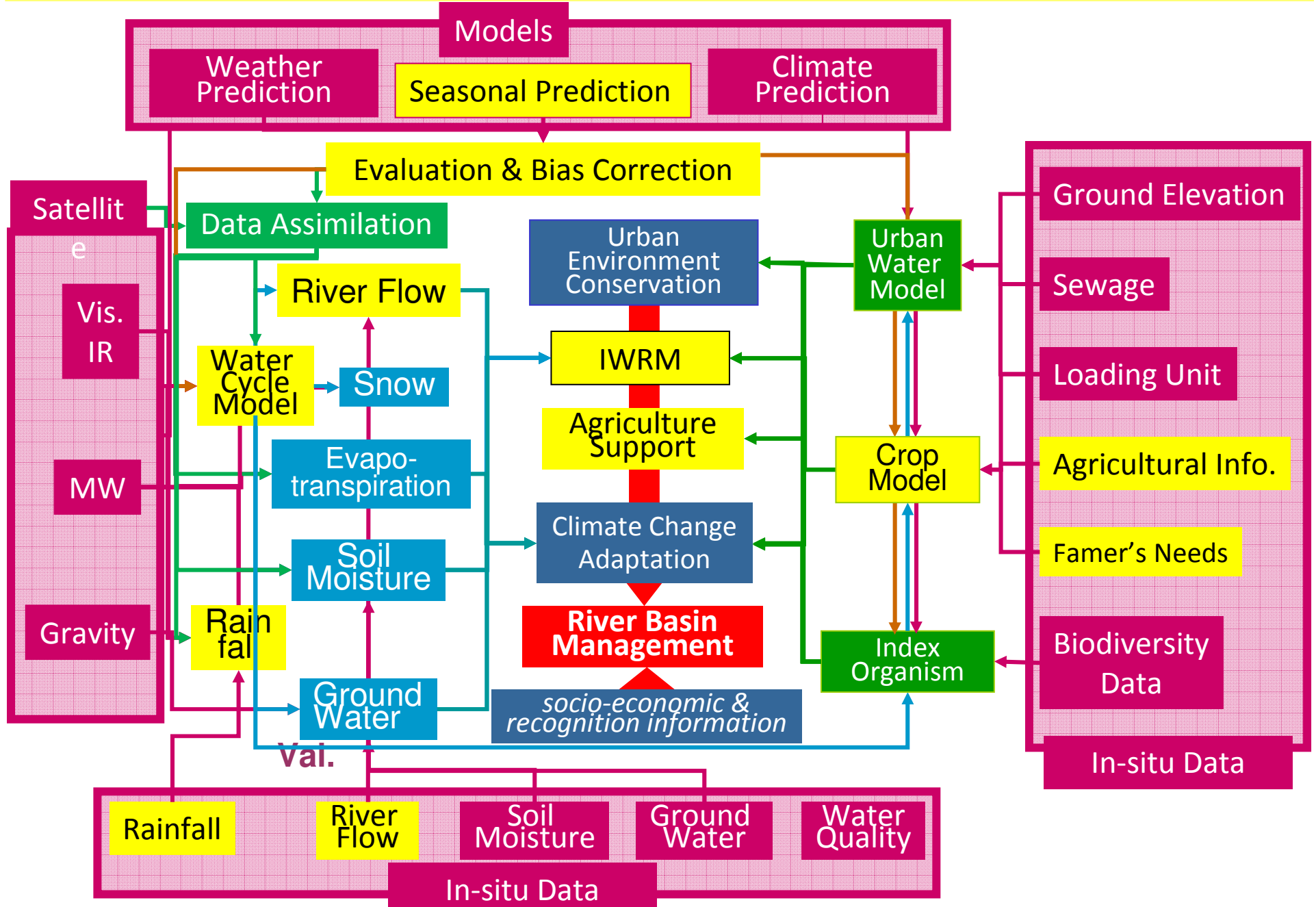
Months	1 st		2 nd		3 rd	
Year	Observed	SFC	Observed	SCF	Observed	SCF
1983						
1991						
1997						
1999-2000						

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

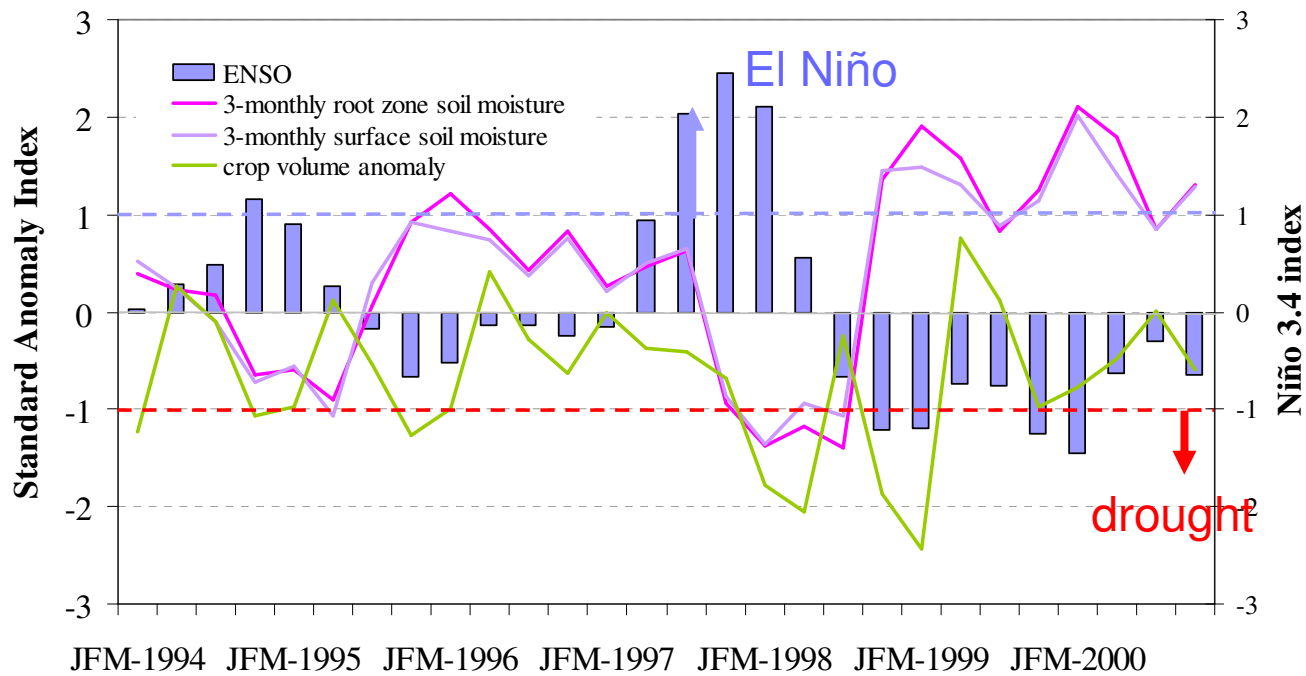
e.g. increase towards drought conditions



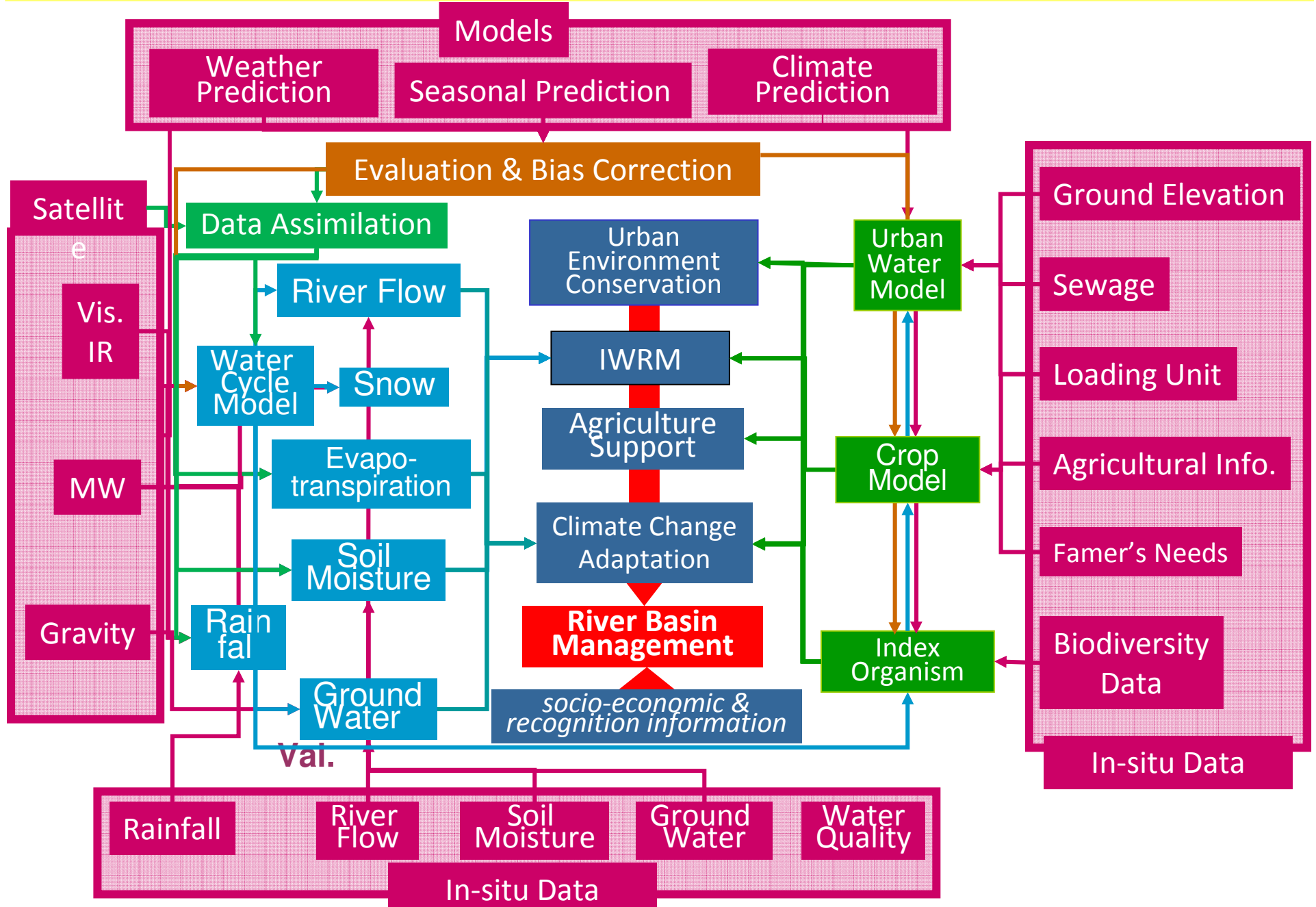
Water Cycle Integrator



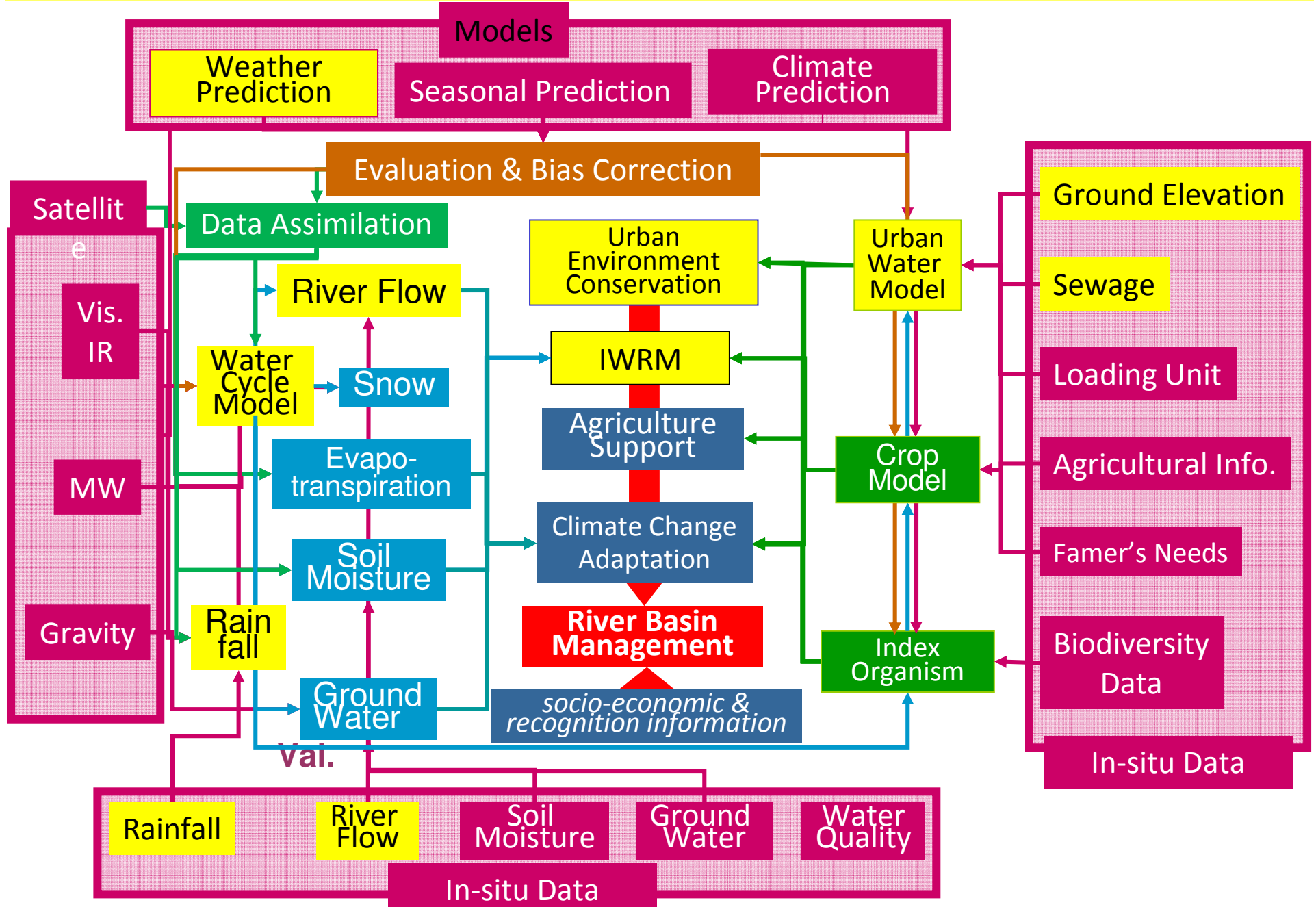
Impacts of Drought on Rice Production Philippines



Water Cycle Integrator



Water Cycle Integrator



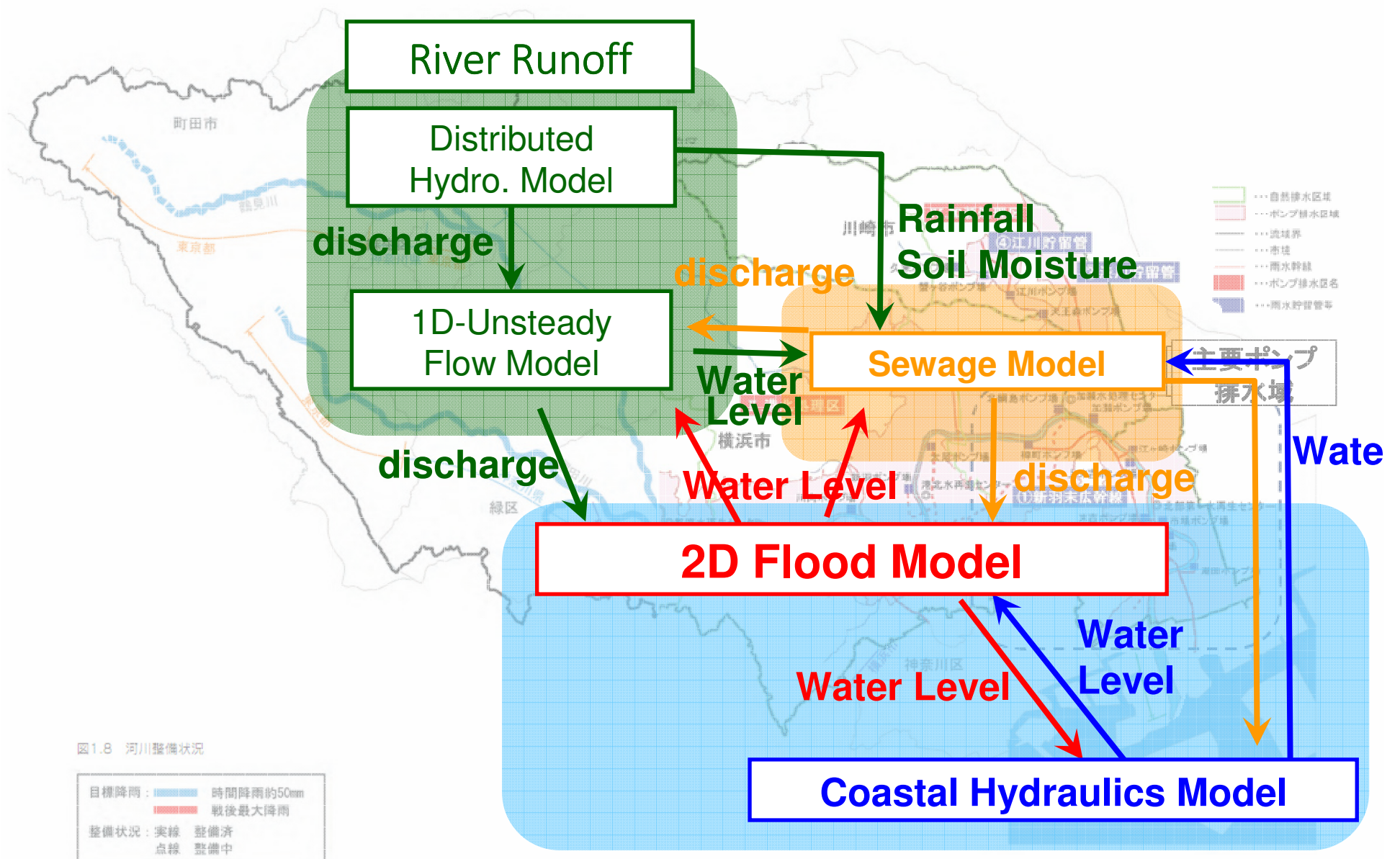
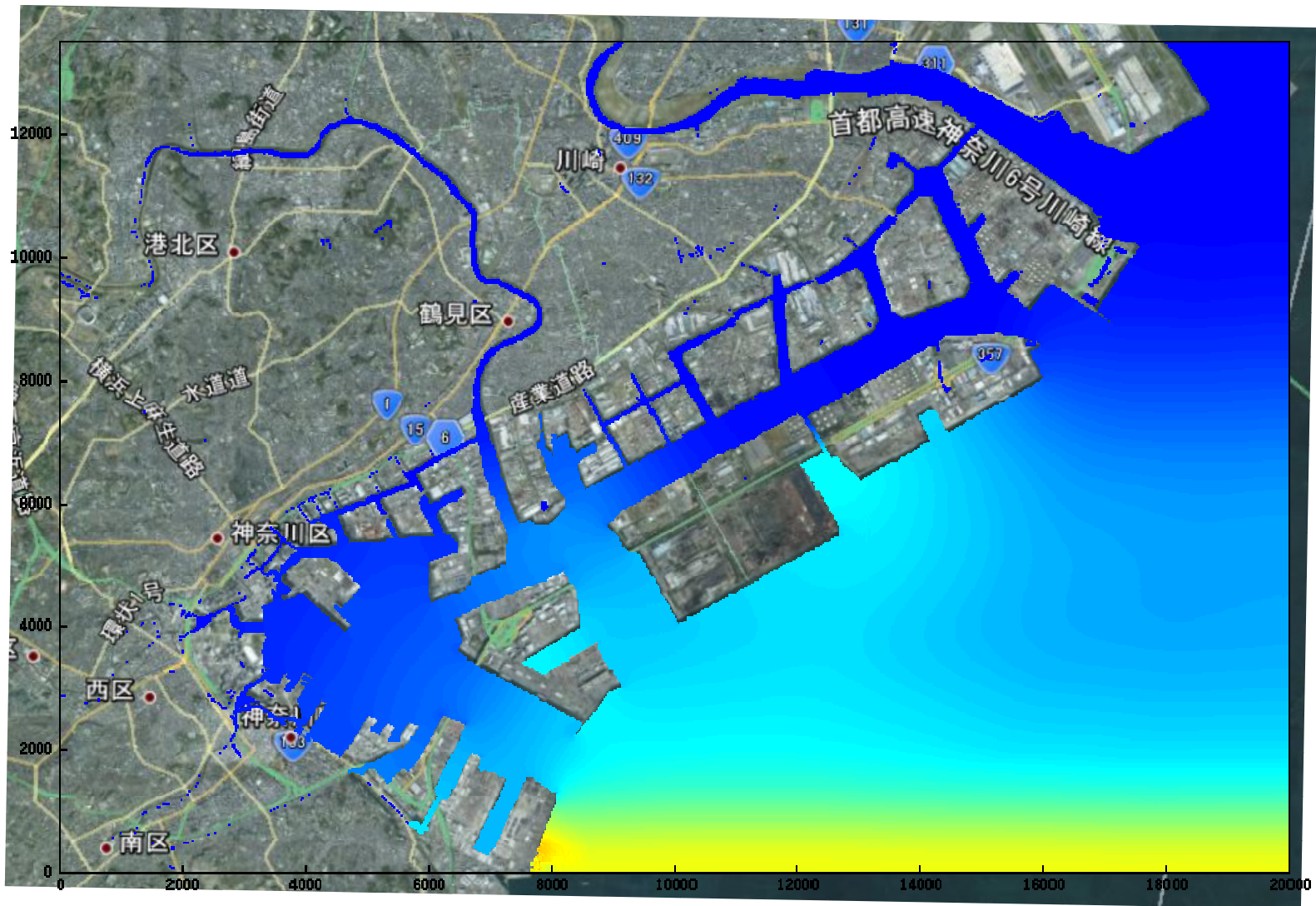


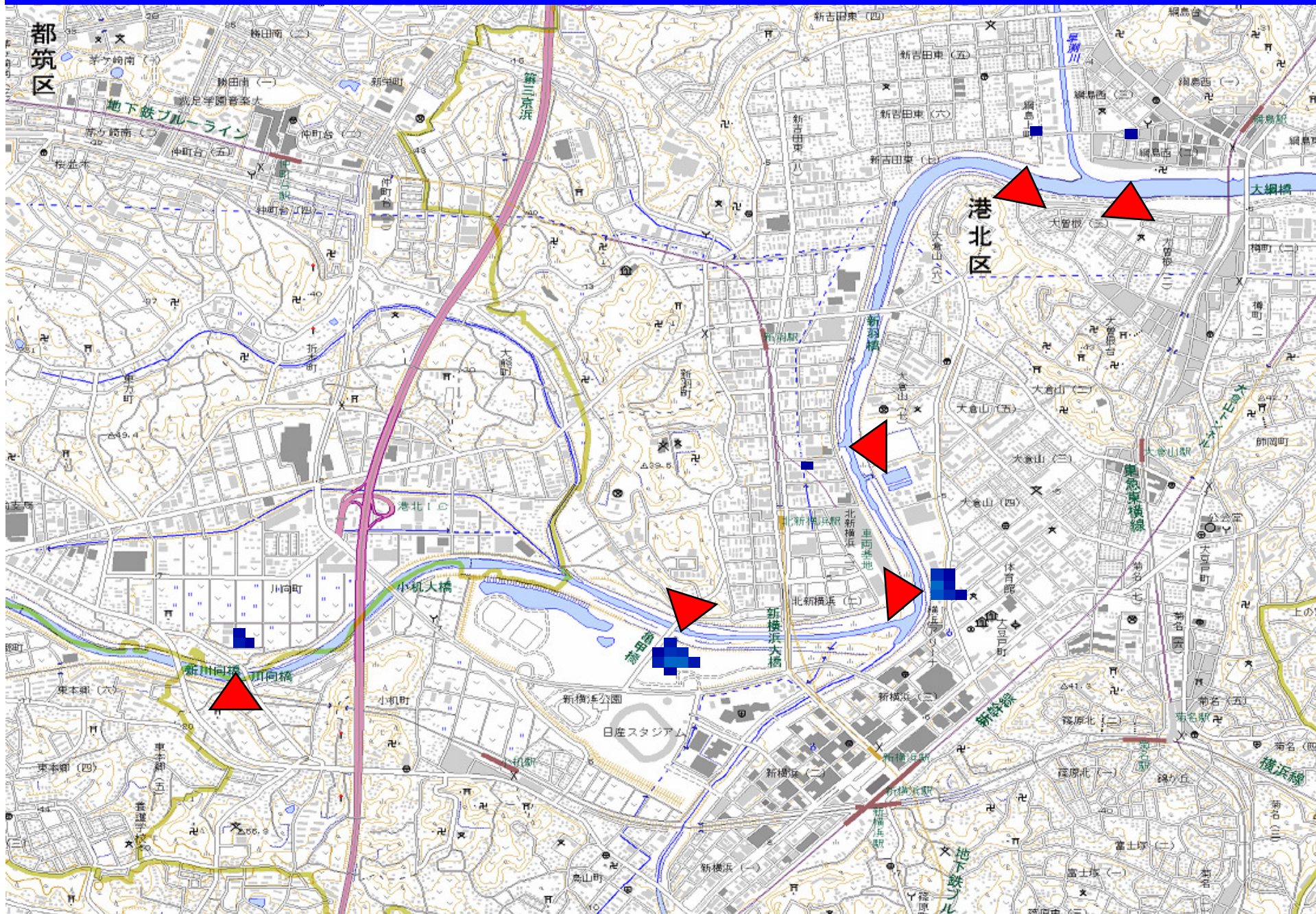
図1.8 河川整備状況

目標降雨:	時間降雨約50mm
	戦後最大降雨
整備状況:	実線 整備済
	点線 整備中

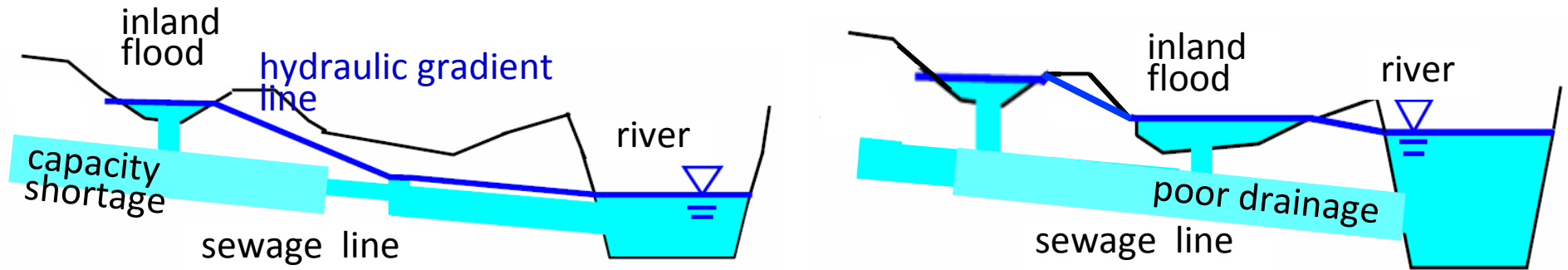
■ Tsunami Simulation



2D Floding from River

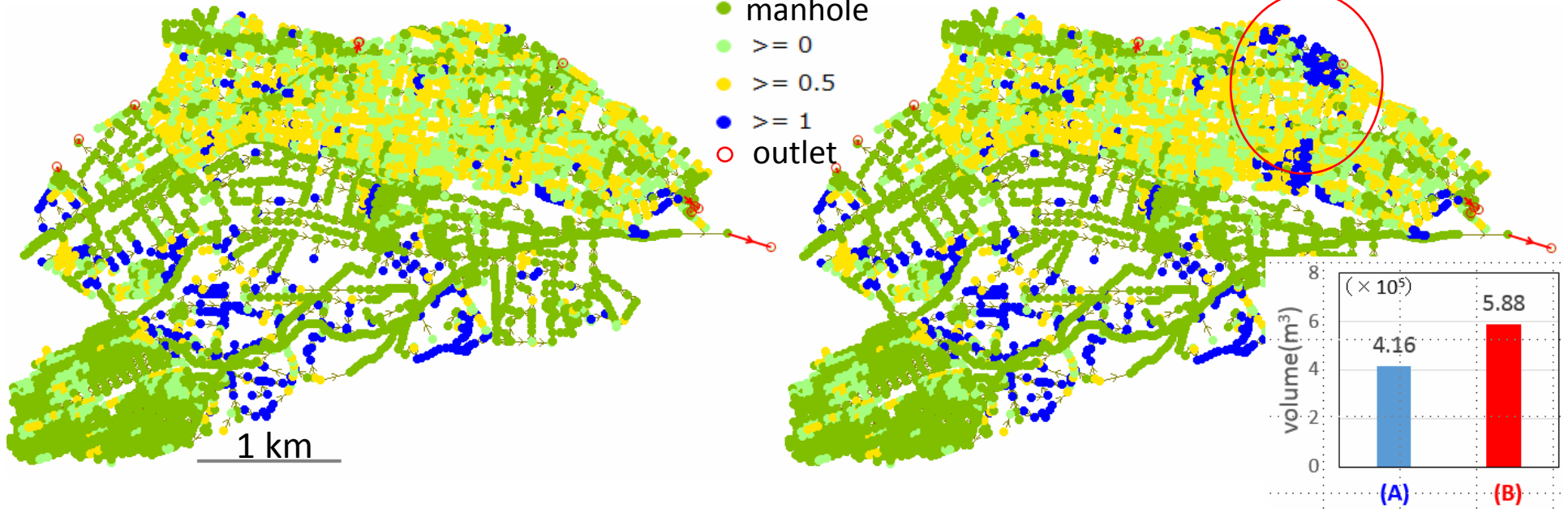


River-Sewage Combined Modeling System



Flood depth (m)

- manhole
- ≥ 0
- ≥ 0.5
- ≥ 1
- outlet



Sharing Data and Information
Exchanging Knowledge, Experiences and Ideas
Working Together
Workbench

