



United Nations
Educational, Scientific and
Cultural Organization



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

ICHARM: Delivering best available knowledge to local practices

Hydrological Modeling Framework for Climate-resilient Water Resources and Disaster Managements under Changing Climate

On behalf of Water-related Hazard Team: Hydrology Division

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Senior Researcher,

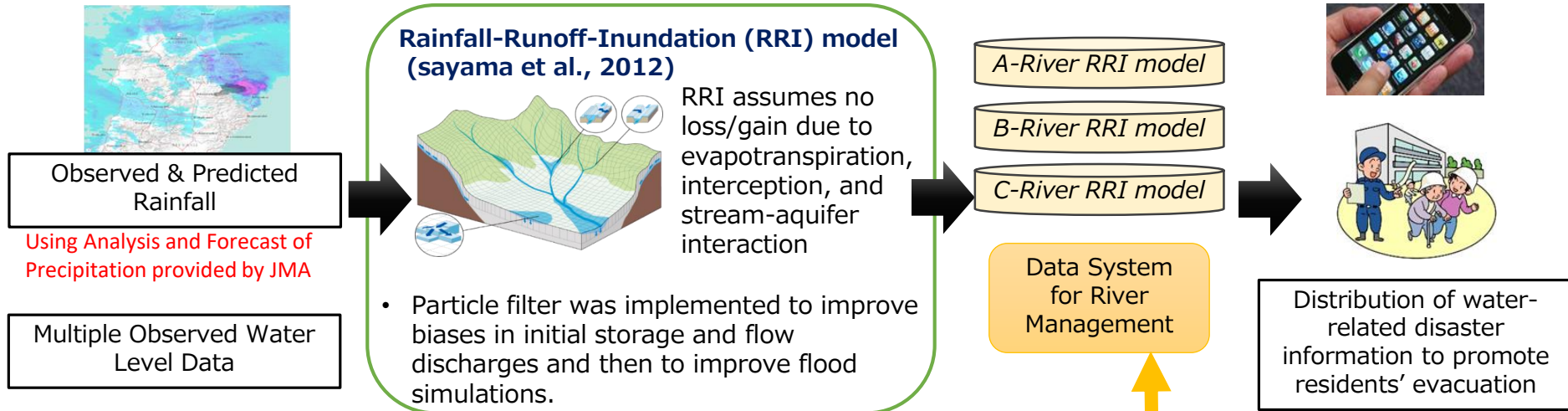
Water-related Hazard Team

Associate Professor, GRIPS

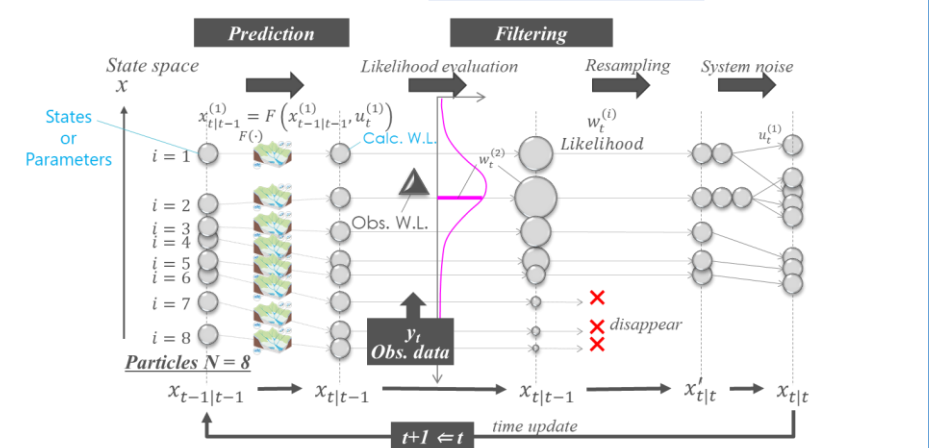
- Water-related disasters (i.e. floods and droughts) are on increasing trend, particularly the lower-middle income countries become more vulnerable.
- Reliable and timely information on water-related disasters and water availability is a key
 - To develop an affordable and proactive IWRM plans and Disaster Risk Reduction (DRR) strategies
 - To ensure the security of water availability and food productions
 - To achieve sustainable development goals and prosperity for all !
- ICHARM's hydrology team is developing several cutting-edge tools and systems for implementing integrated approaches for climate-resilient IWRM & disaster managements under changing climate

Development of a Simple, Inexpensive Flood Forecasting System for Small and Medium Rivers

- ◆ **Real-time flood prediction models** focusing on **“Information on the river water levels that required evacuation”** to support the evacuation of residents during floods in small and medium rivers in Japan.
- ◆ Develop and provide a tool that enables prefectural river managers to handle and predict timely water-level, easily.

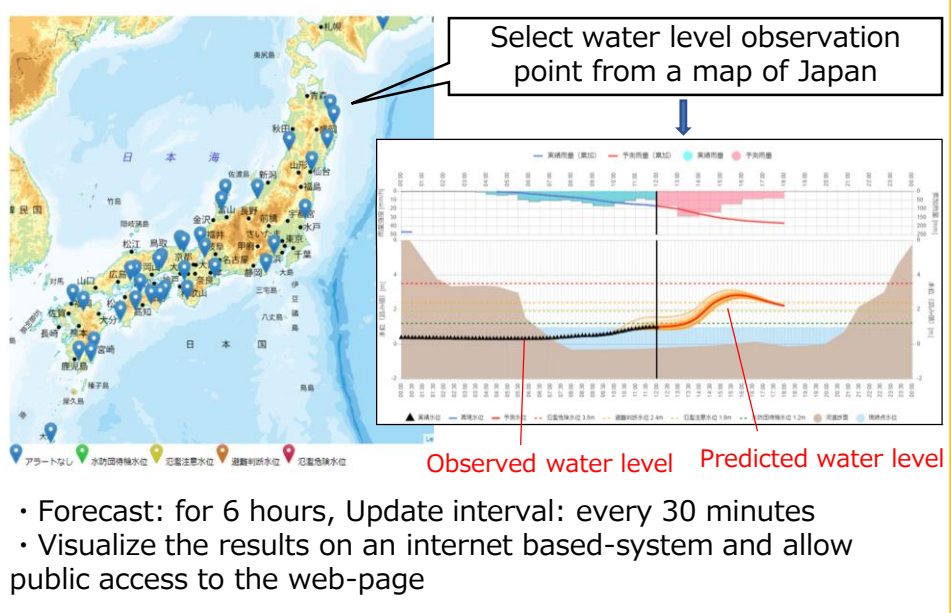


Particle filter



- Since PF can handle non-linear models, we don't need rewrite hydrological model linear-equation like a Kalman Filter (KF).
- PF estimates state-space/parameters (water-level on slope and in rivers).

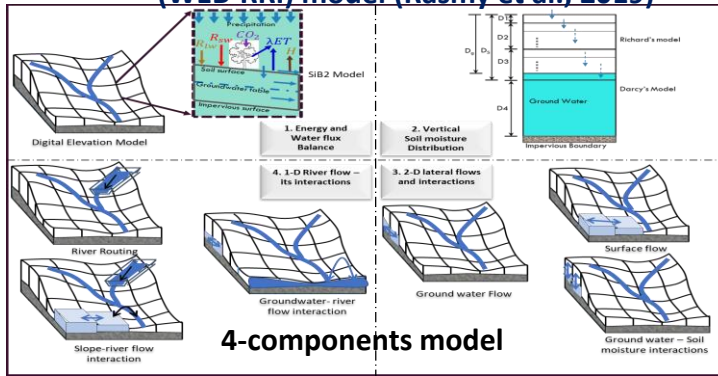
Real time flood forecasting system



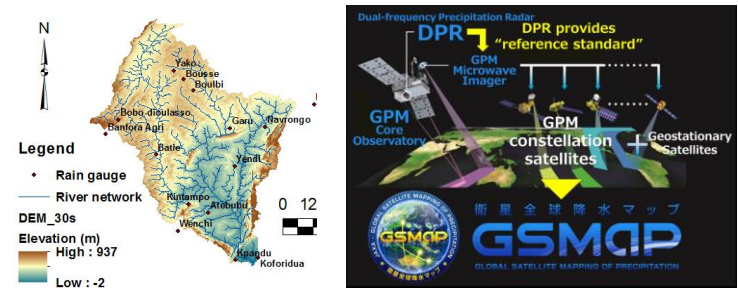
Seamless Modeling Approach : IWRM under changing climate

- ICHARM has developed a highly reliable hydrological model for addressing various water-related issues, to strengthening water-related disaster resilience, water resources management and then enabling sustainable development under climate change:

Water and Energy Budget based Rainfall-Runoff-Inundation (WEB-RII) model (Rasmy et al., 2019)



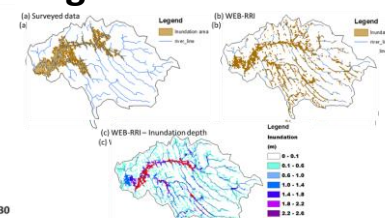
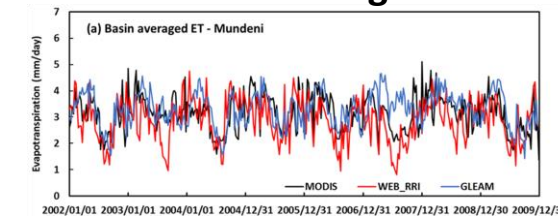
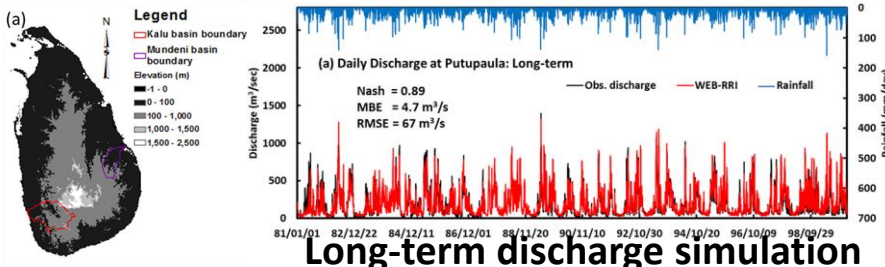
Application 1: West- Africa(Niger & Volta basins)



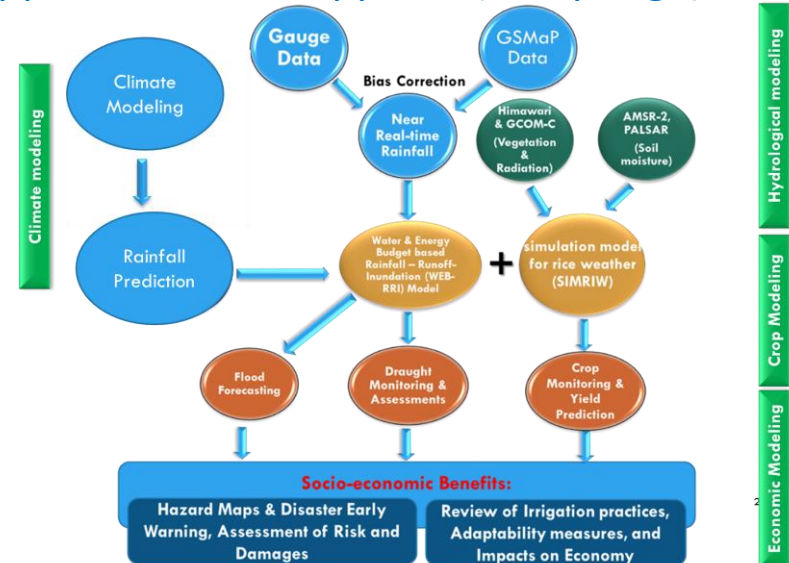
Predictions in Ungauged Basins (PUB)

- Physical formulations for ET and soil moisture dynamics for reliable of flood and drought related risk assessments

Verification in Kalu basin, Sri Lanka



Application 2: Philippines (Pampanga)



Seamless Modeling Approach

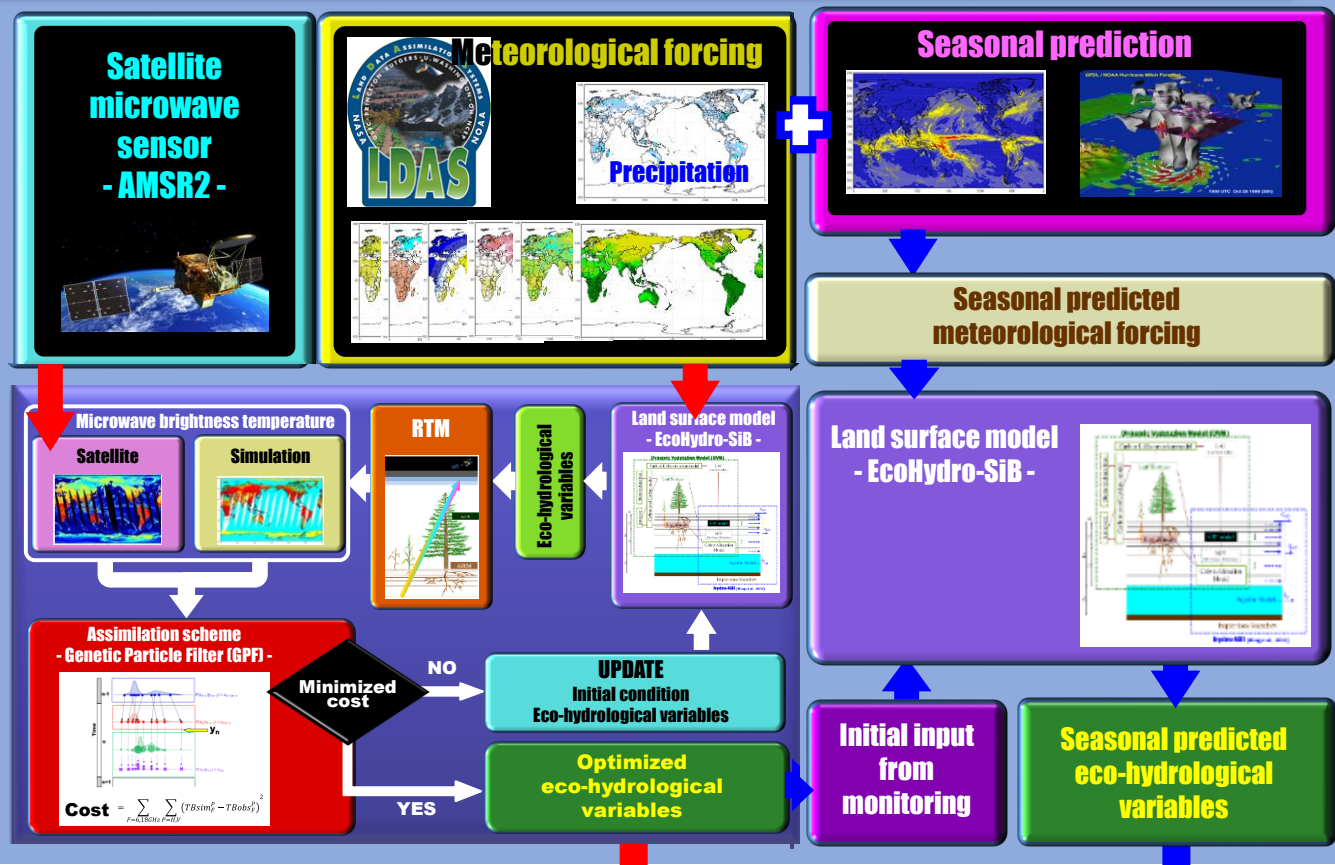
Evapotranspiration estimation

Inundation

Hydrological modeling
Crop Modeling
Economic Modeling

Drought monitoring & seasonal prediction system

Drought monitoring & seasonal prediction system



Brazilian Northeast.

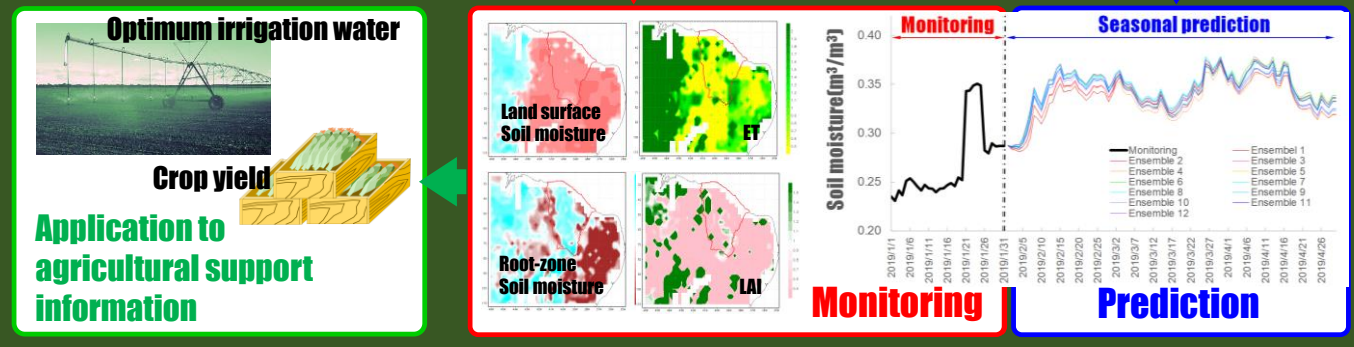
-System monitors soil moisture profiles and crop growth and predict them for up to approximately three months ahead.

-It can also estimate water requirement to maximize crop yields.

-Locally, drought status is determined through monitoring and seasonal prediction from this system, and the results are used to formulate farming plans.

-it will be further improved to provide information useful for farming.

OUTPUT



Thank you for your kind attention !!!