

High resolution monitoring system of hydrological cycle in Japan

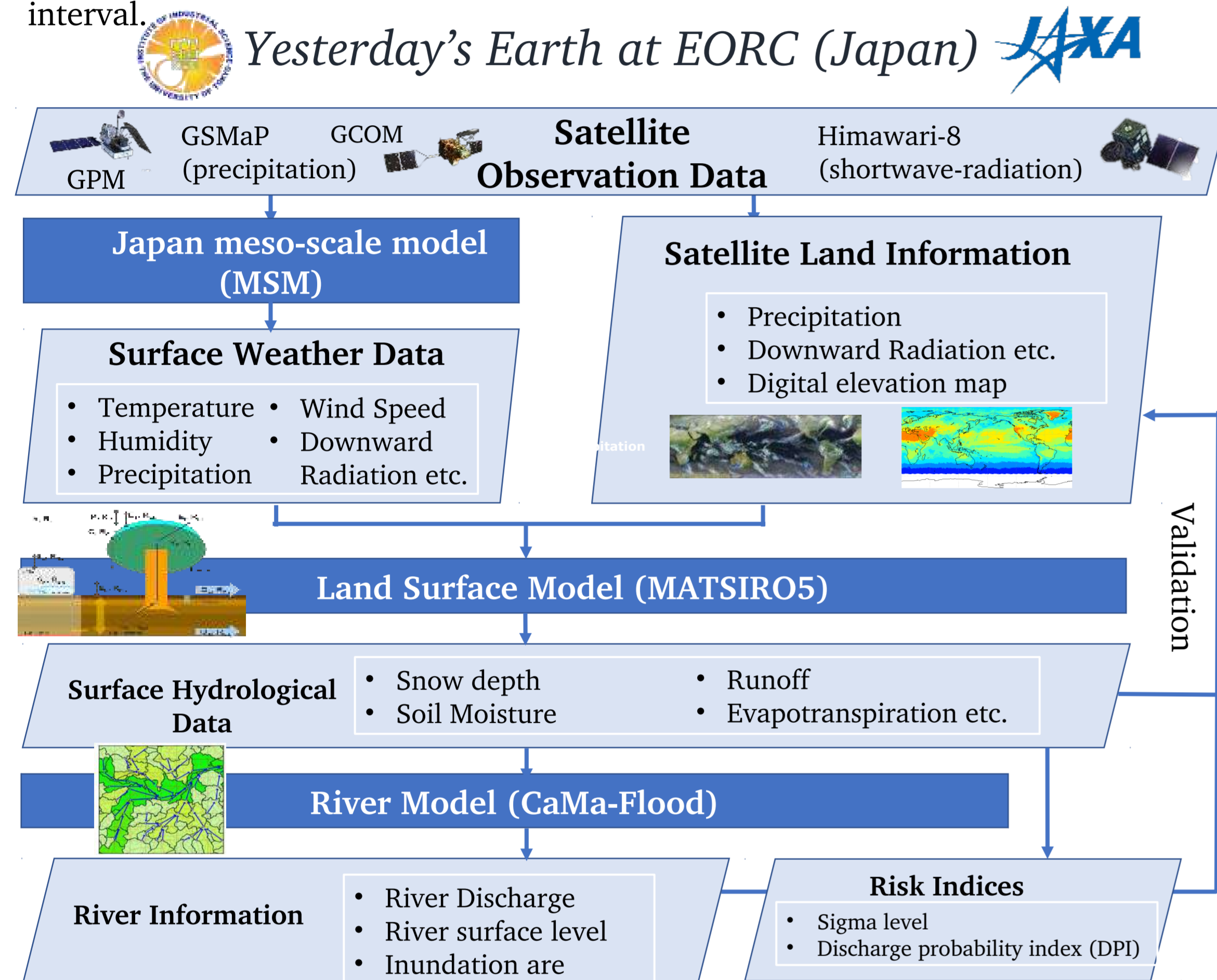
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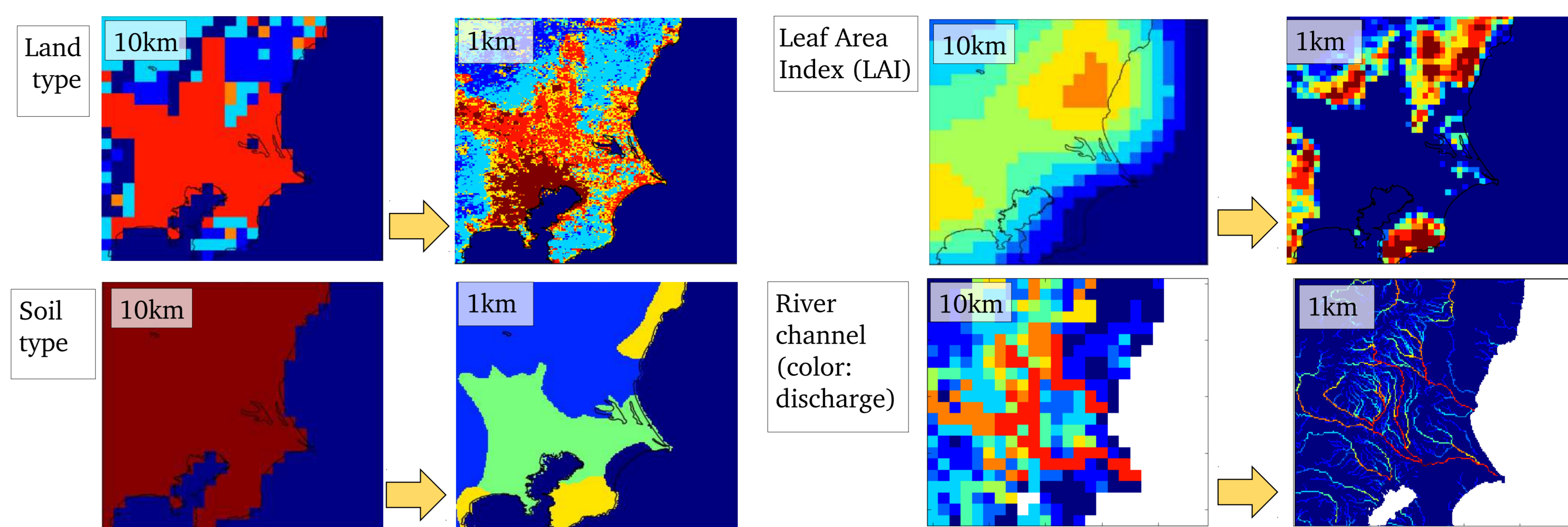
1. Introduction

- Based on the **YEE global** system (Yamamoto, GEWEX 2018, D-37), which is an EORC's simulation system of land surface and river conditions using physical models, we are developing the regional version of YEE in Japan (hereafter **YEE Japan**).
- The objectives of the YEE system is to build reliable historical dataset of hydrological condition (land and river), which helps calculate the several risk indices (e.g., flood, drought). To enhance the reliability of the dataset, some satellite-derived observation data will be used as the forcing data of the land surface model (not implemented for YEE Japan).
- System configuration of **YEE Japan** is shown below, in which most of the components are the same as those of **YEE global** except the spatial resolution and output time interval.



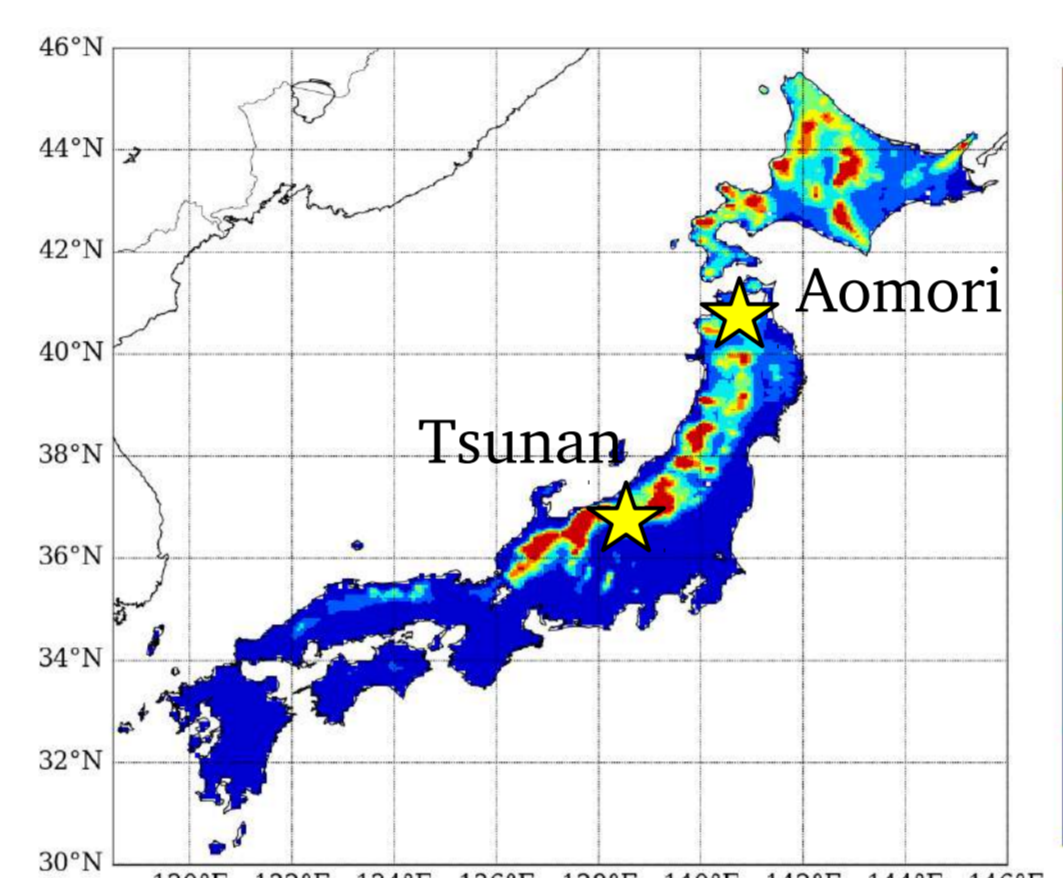
MATSIRO Minimal Advanced Treatments of Surface Interaction and Runoff (Takata et al. 2003)
CaMaFlood river model (Yamazaki et al., 2011)

3. Improvement of horizontal resolution of model boundary conditions

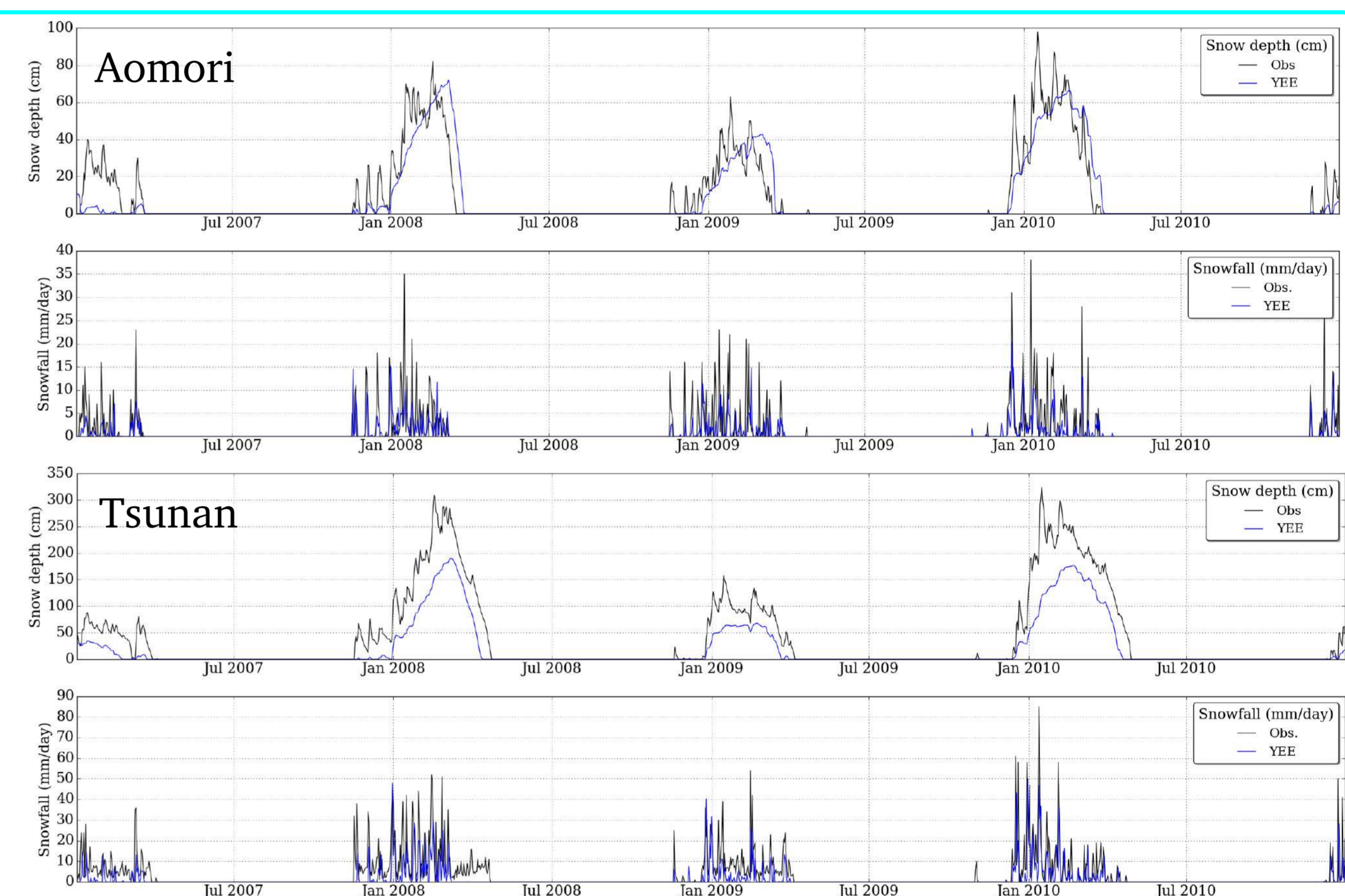


4. Various products of YEE Japan Land surface conditions (MATSIRO)

Snow depth (validation)
Annual maximum snow depth (cm)

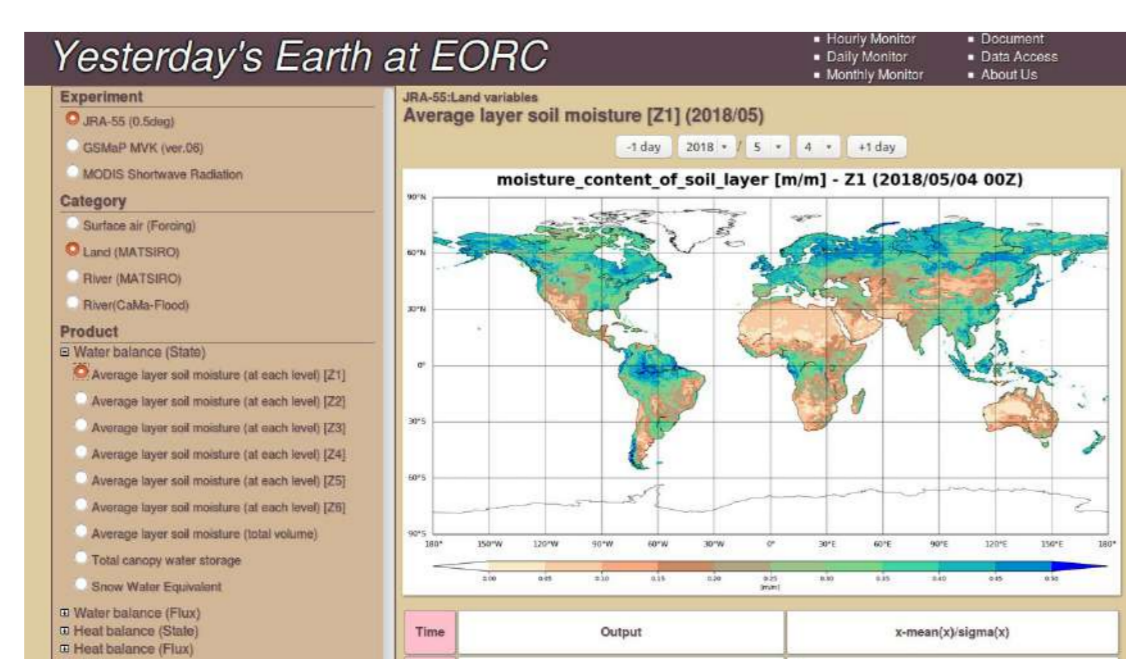
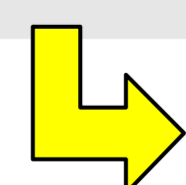


The amount and seasonal cycle of snow depth are well reproduced



2. Basic information of YEE global and Japan

	YEE global (In operation)	YEE Japan (under dev.)
Period	1958-present	2007-2009 (in progress)
Resolution	Land (MATSIRO) 0.5° River (CaMa-Flood) 0.25°	Both Land and River 0.01° ~1km
Forcing Data	JRA55, MODIS, GSMaP-NRT	MSM/GPV, GSMaP, Himawari-8
Models	MATSIRO+CaMa-Flood	MATSIRO+CaMa-Flood
Ensemble	3 (JRA55, MODIS, GSMaP) + 50 (NICAM/LETKF)	2 (MSM+SAT) SATellite: GSMaP + Himawari-8
Validation	GRDC river discharge, AMSR2 soil moisture/snow	Snow depth (AMeDAS) River surface level, discharge (suimon-suitsu database in Japan)
Output time interval	3 hours	1 hour
UI	Interactive GUI	Interactive GUI (under dev.)

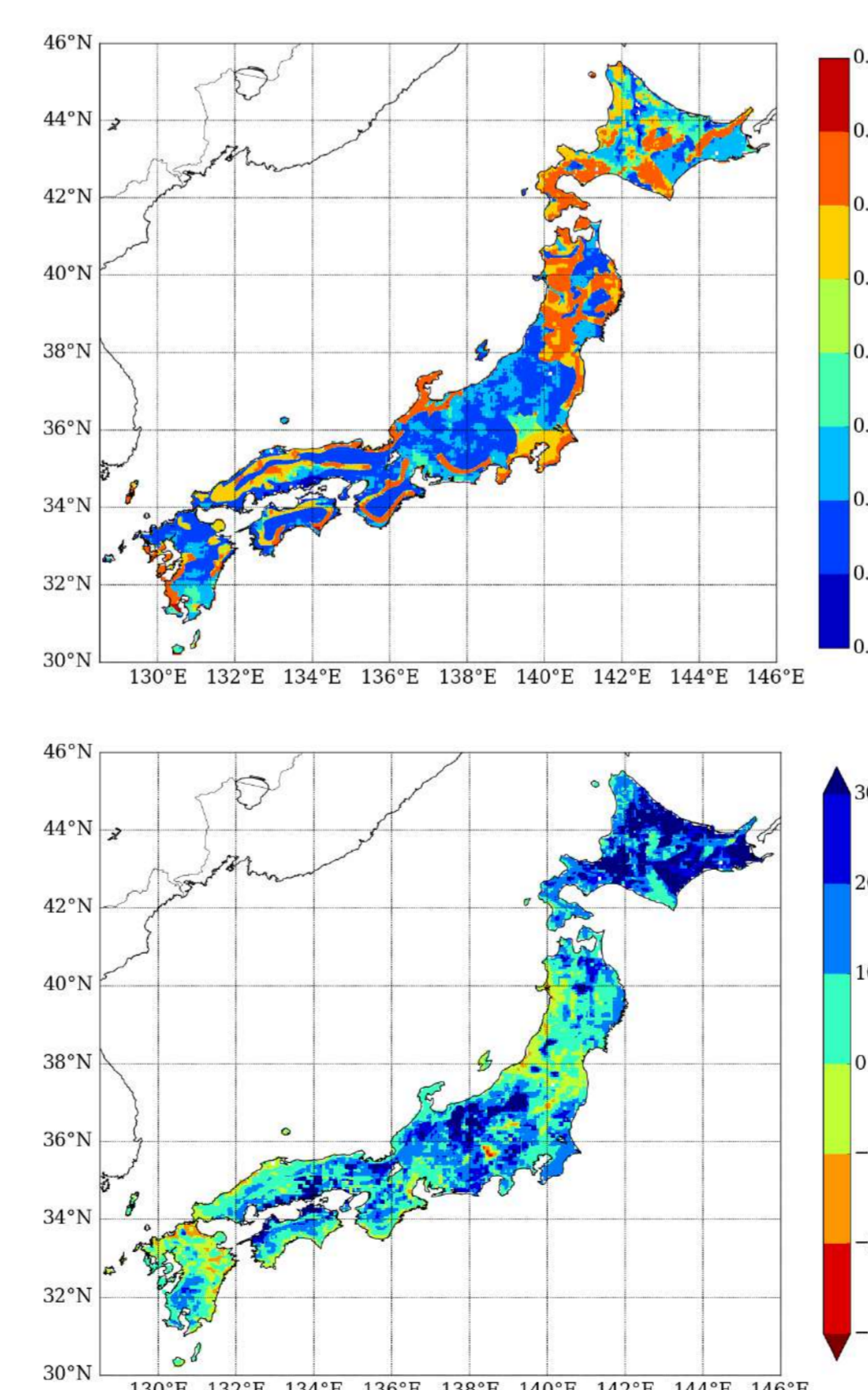


Official website of YEE global
<http://www.eorc.jaxa.jp/theme/water/>
URL:



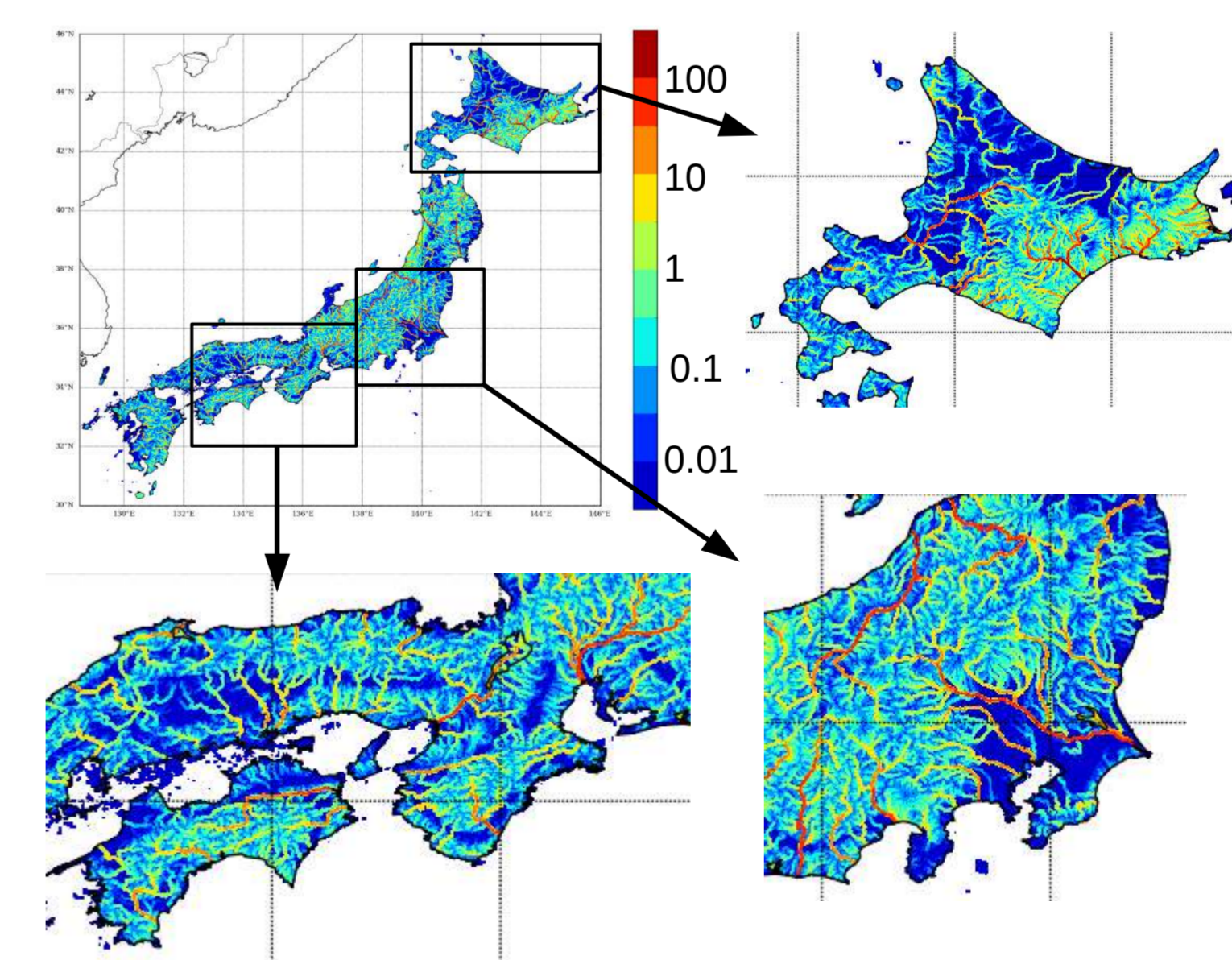
Variables and products can be selected interactively.

Surface **soil moisture** - 5 cm depth (m/m)
Top: monthly average (May, including rainy season) soil moisture
Bottom: relative difference (%) ((May)-(August))/(August)*100



River discharge (m³/s) - 2009/9/15

River channel in the YEE Japan is introduced based on the newly developed high-accuracy digital elevation data (Yamazaki et al., 2017)



Not only the main river channel, but also their tributaries can be represented accurately in the model.

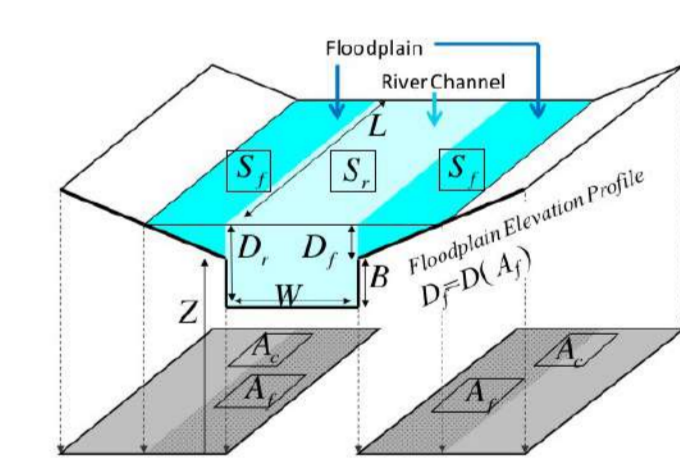
Other variables of YEE Japan output

Meteorological data (forcing data of MATSIRO): precipitation surface air temperature and moisture, radiation

Land conditions: runoff, sensible and latent heat flux, transpiration, ground heat flux, albedo, canopy temperature, etc.

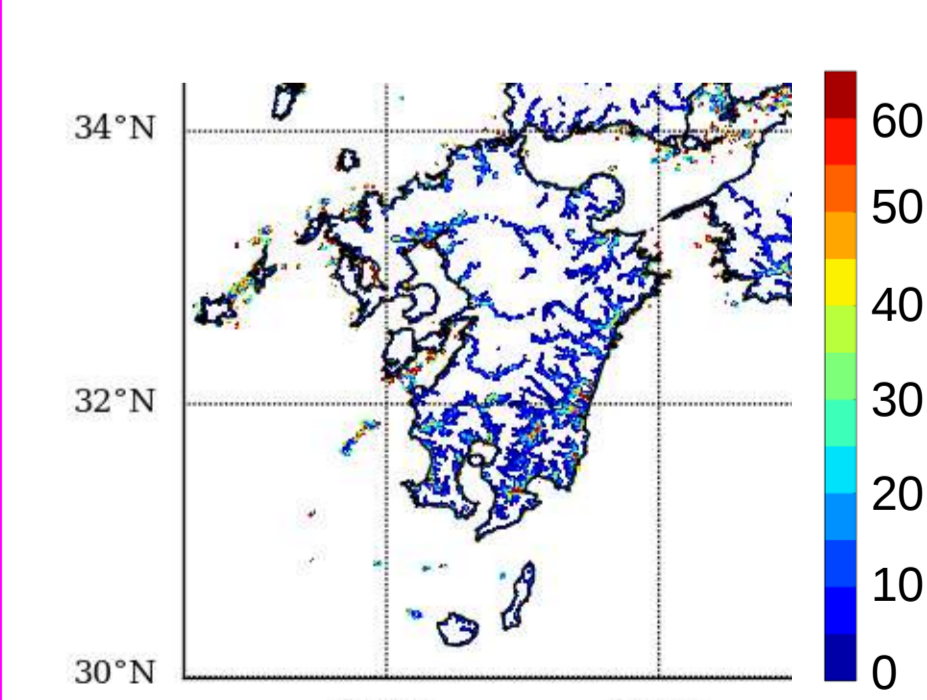
River conditions: water surface elevation, river water storage, river flow velocity, etc.

Floodplain area (fraction)



(from CaMa-Flood manual)

The fraction of flooded area (%) (2007/7/13 02Z: heavy rainfall due to Typhoon 4th in 2007)



5. Summary

- The system of YEE Japan reproduces the past disaster regarding the hydrological conditions, e.g., heavy rainfall and snowfall, drought, flood, which helps predict the present and future disasters accurately.
- We hope to collaborate with the researchers who are utilizing our hydrological dataset, YEE global and Japan.