Introduction of the Global Hydrological Simulation System using GSMaP

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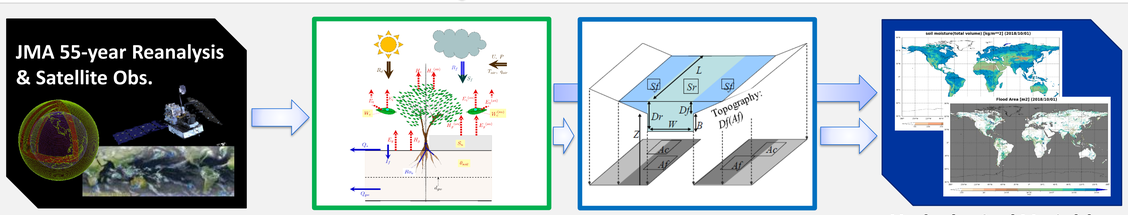
Introduction

The land water cycle is a key element of the climate system representing all water exchange processes at the surface. For better understanding, JAXA has developed the global land simulation system named **"Today's Earth (TE)"** under the joint research with the University of Tokyo. The TE system aims to :

- ✓ produce and evaluate long-term land water cycle dataset based on satellite observation and reanalysis data
- ✓ contribute the society as a part of the climate services by calculating risk indices of water hazards, particularly floods

This study introduces TE system and shows its overall validation and long-term trends.

System Overview



Experiment	Spatial Resol.	Temporal Resol.	Period	Latency	Forcing
JRA55 ver.	0.5-deg(Land) 0.25-deg(River)	3hourly, daily, monthly	1958-present	About 3.5days	Surface meteorological parameters by JRA55
MODIS ver.	〃	〃	2002-present	About 5days	Same as JRA55 ver. except solar radiation from MODIS
GSMaP ver.	〃	〃	2000-present	About 20days	Same as JRA55 ver. except rainfall from GSMaP

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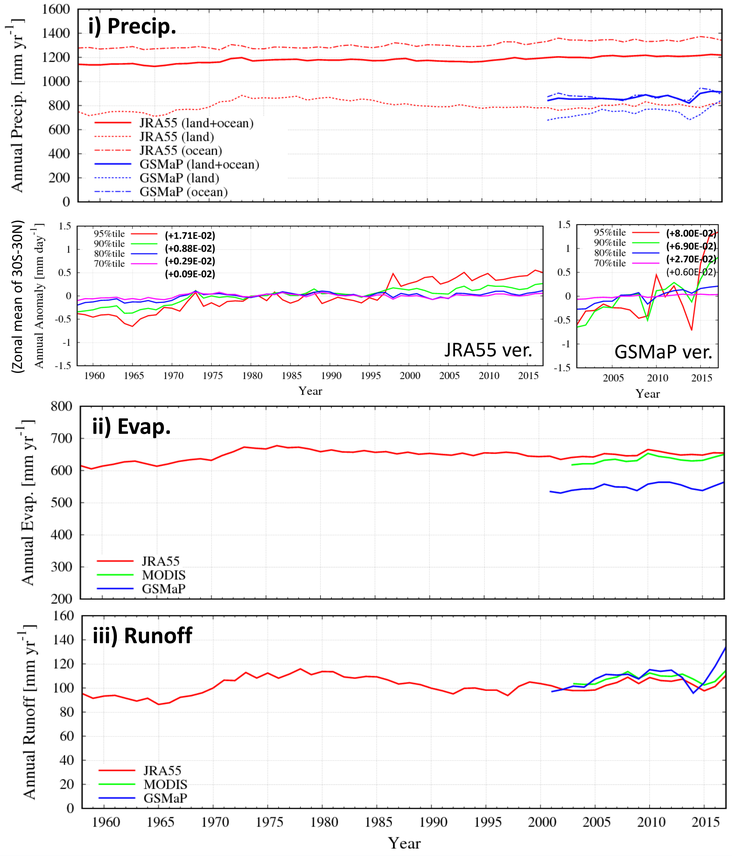
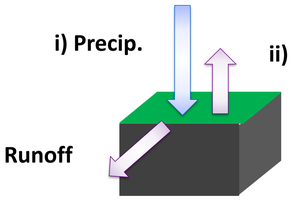
Long-term Trend



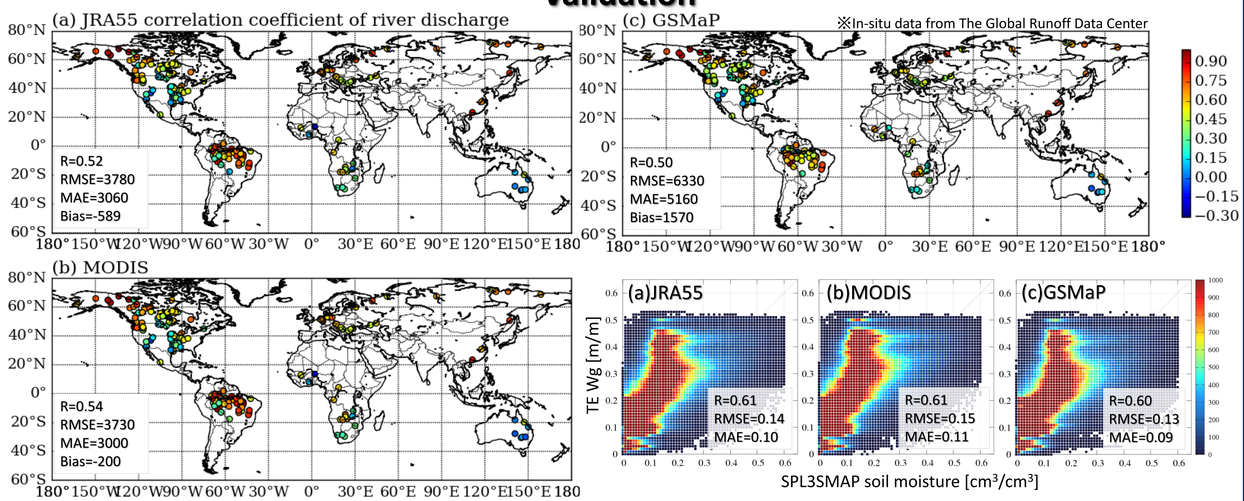


Unit : mm y^{-1}

	JRA55 ver.	MODIS ver.	GSMaP ver.
Precip.(land)	800.3	(800.3)	743.4
Evap.	647.9	633.9	548.2
Runoff	102.0	108.0	108.9

- Though GSMaP offers relatively small amount of precipitation compared to JRA55, increasing trends of high percentile precipitation in tropics are well reproduced (bold letter in the left fig. shows statistically significant regression coefficient).
- MODIS radiation works to suppress net evapotranspiration.
- Runoff rate of GSMaP ver. is higher than the rests. This may be due to the large spatial & temporal variability of satellite products compared to the reanalysis datasets.

Validation

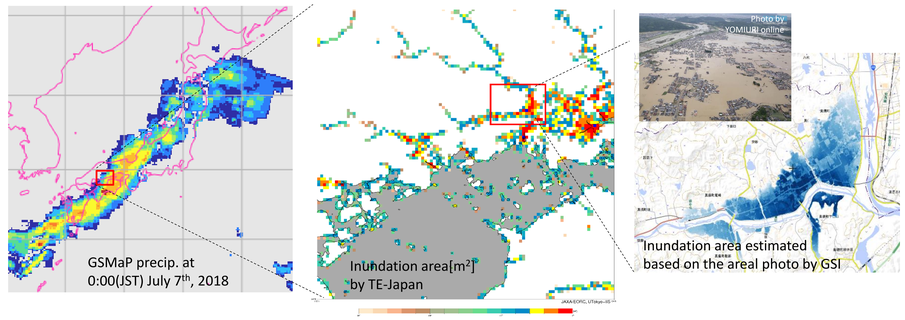


Summary & Conclusion

- Global hydrological simulation system named "**Today's Earth (TE)**" has been developed and its accuracy for several essential output variables is tested by using in-situ and satellite observation data.
- Need to confirm and improve runoff generation process in the model to make it adapt the realistic spatial & temporal variability of the precipitation suggested by GSMaP.
- Further analysis on seasonality and regionality of accuracy is required for actual use of the system.

■TE-Japan

- As regional version of TE, "TE-Japan" system (spatial resol. : 1km) is now under development.
- Hindcast of 2018 Japan floods were done and the authors confirmed that the system precisely reproduced the inundated area compared to the aerial photograph information.



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