EVALUATION OF THE USE OF GLOBAL SATELLITE-GAUGE AND SATELLITE-ONLY PRECIPITATION PRODUCTS IN STREAM-FLOW SIMULATIONS

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1 INTRODUCTION

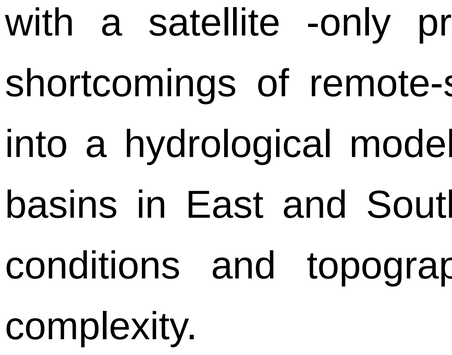
- Precipitation is one of the most important inputs for hydro-meteorological modeling. However, in many regions in the world, especially in developing countries, the rainfall information is very poor or even non-exist due to inadequate fund for installation and operation of ground-based measurement network. During the last two decades, remote-sensing rainfall estimation products with broad spatial coverage and repeated temporal coverage have provided a potential solution to the lack of data in these regions.
- Although remote sensing precipitation products provide precipitation estimations at high spatial and temporal resolution over large regions, satellite based rainfall estimates are not direct measurements of rainfall that are subject to variety of error sources and exhibit the limitation for rainfall budget accuracy.
- There have been many efforts to improve the pure satellite precipitation products by incorporating rain gauge information in satellite -based rainfall retrieval algorithms, with the emergence of global satellite-gauge rainfall estimation products.
- This raises two questions. The first is whether the satellite-gauge precipitation products always outperform the original satellite-only precipitation products. The second is whether high-resolution satellite-based precipitation estimates can provide reliable rainfall information for discharge predictions.

2 OBJECTIVES

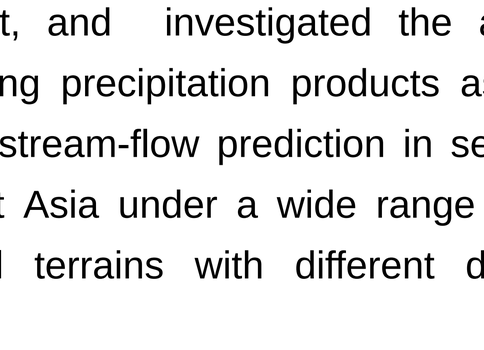
- Examining the effectiveness of combining rain gauge measurements with a satellite -only product, and investigated the ability and shortcomings of remote-sensing precipitation products as an input into a hydrological model for stream-flow prediction in several river basins in East and Southeast Asia under a wide range of climate conditions and topographical terrains with different degrees of complexity.
- Analyzing the deviations of model parameters due to the bias in remote-sensing precipitation inputs compared to standard ground measurements.

3 RESULTS AND DISCUSSION

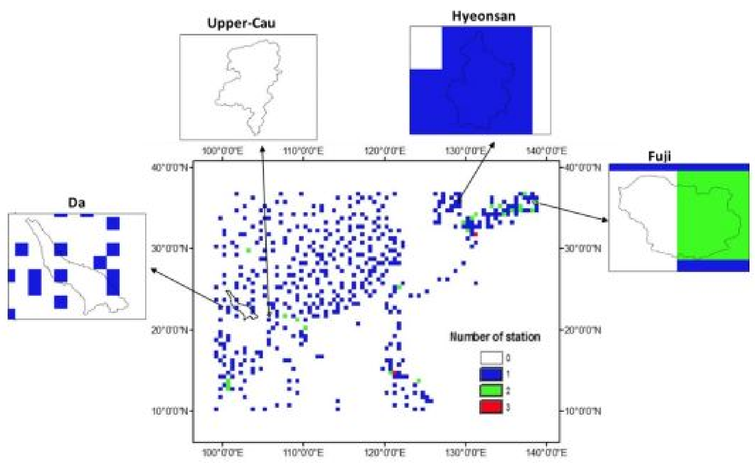
Remote sensing precipitation estimations



Accumulated precipitation of GSMaP-MVK (red line) and GSMaP-Gauge (blue line) vs ground measurements



Seasonal Variation of basin average precipitation of GSMaP -MVK (red line) and GSMaP-Gauge (blue line) vs ground measurements (green line)



Ground rain gauge distributions of the CPC global gauge data set in the study regions

Target Catchment

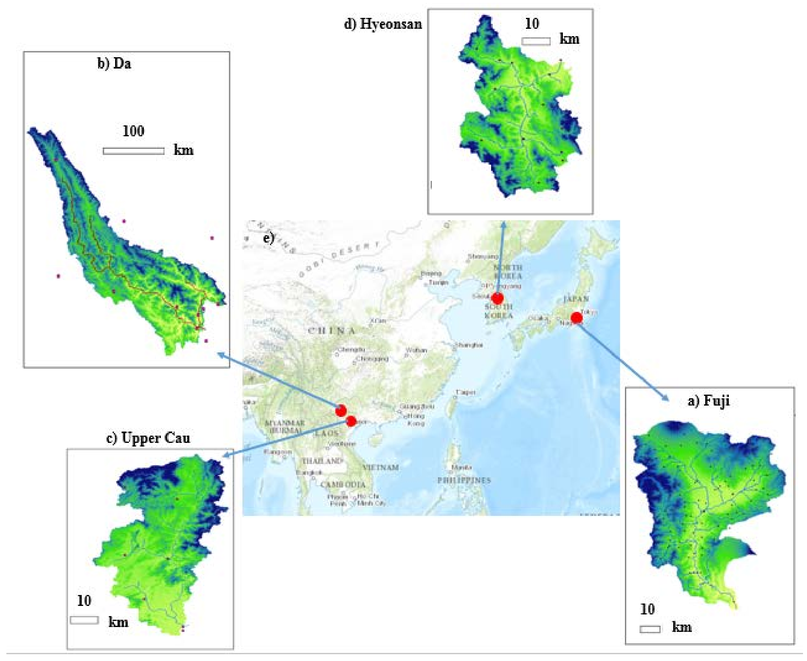
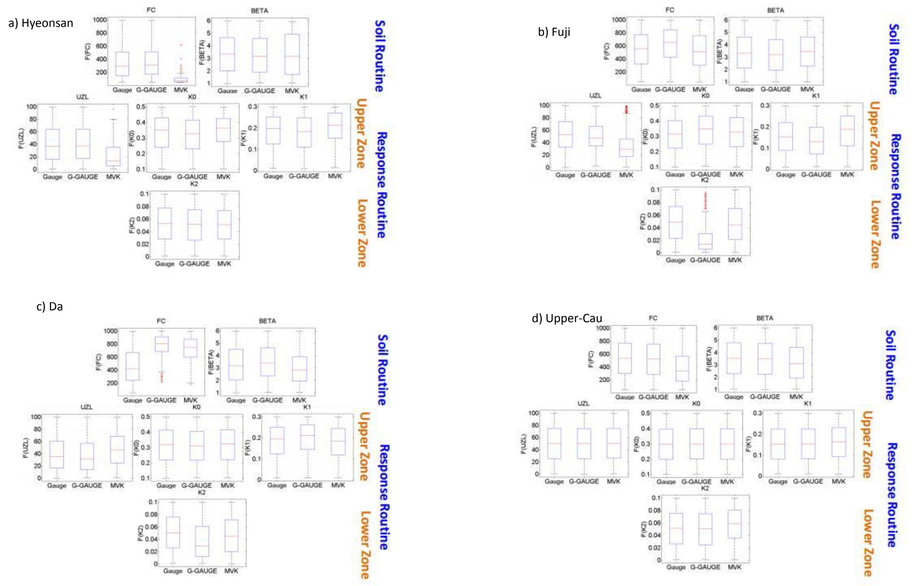


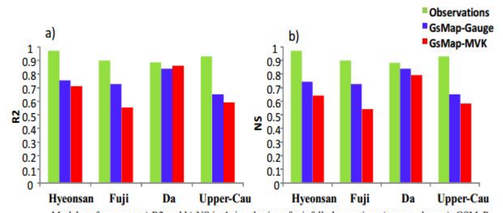
Table 1 Summary of characteristics of the study basins. JP: Japan; VN: Vietnam, SK: South Korea.

	Fuji	*Da*	*Upper-Cau*	*Hyeonsan*
Country	JP	VN	VN	SK
Area (km²)	2179	45900	2760	1167
*Size classification**	Medium	Large	Medium	Small
Gauge number	19	22	8	14
Spatial Extensions	35.5 N-36N 138E-139E	20.5N-25N 100E-106E	11N-14N 105E-106E	21.5N-22.1N 128E-130E

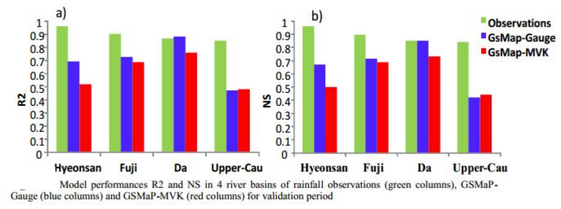
Deviations of model parameters



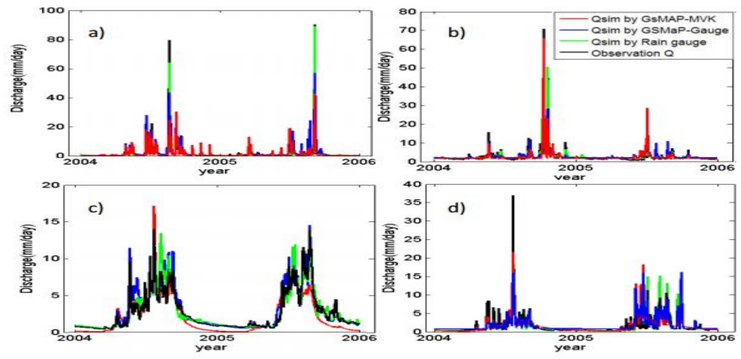
Stream flow simulations



Model performances a) R2 and b) NS in 4 river basins of rainfall observations (green columns), GSMaP-Gauge (blue columns) and GSMaP-MVK (red columns) for calibration period.



Model performances R2 and NS in 4 river basins of rainfall observations (green columns), GSMaP-Gauge (blue columns) and GSMaP-MVK (red columns) for validation period



Hydrograph of in a) Hyeonsan, b) Fuji, c) Da and d) Upper-Cau during validation period.

4 CONCLUSIONS

1. Satellite-gauge GSMAP-Gauge product produced remarkable improvements in model performance compared to satellite-only product in the area with adequate CPC global gauge data.
2. GSMap-gauge slightly worsen the performance of GSMaP-MVK in the area with low CPC global gauge density.
3. Due to the uncertainties in the rainfall estimates of remote-sensing precipitation products, the parameters were adapted in such a way that the model produced more streamflow.