APPLICATION OF GPM IMERG SATELLITE-BASED PRECIPITATION PRODUCTS FOR FLOOD RUNOFF SIMULATION IN A DAM WATERSHED

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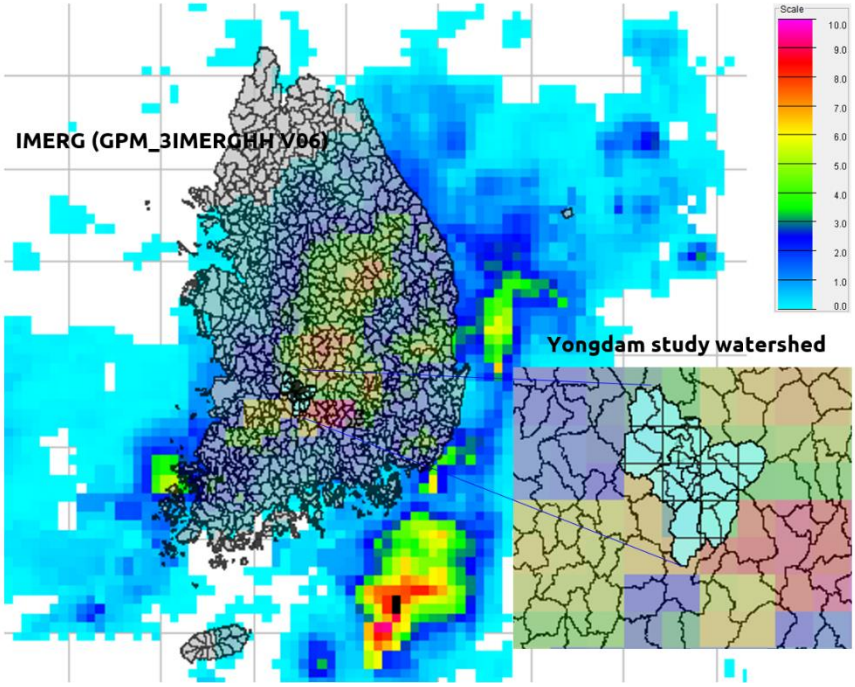
ABSTRACT: Since most of South Korea is consisted of mountainous areas (about 65%), the spatial distribution of precipitation during rainfall storm event is highly variable. Especially, in the dam watershed, which is a typical mountainous terrain, the shape and pattern of rainfall and the resulting changes in the outflow show complicated characteristics. Therefore, it is often unlikely to use the areal rainfall, which is estimated by averaged method (e.g. Thiessen polygon) with gauge observations, for flood runoff analysis and the introduction of the radar- and satellite-based spatially distributed rainfall is required for hydrological simulation. Currently, the NASA's Global Precipitation Measurement (GPM) Integrated Multi-satelliteE Retrievals for GPM (IMERG) satellite-based precipitation products are available to public, greatly enriching alternative precipitation data source with 0.1° by 0.1° spatial and half-hourly temporal resolution within the 60° N-S latitude band.

In this study, we applied the IMERG Final Run products (GPM_3IMERGHH V06, 2.5 months latency) to the Yongdam study watershed, which is a representative dam area of the mountainous terrain in South Korea and has a relatively large number of monitoring stations (water level/flow) and data compared to other dam watershed, in order to perform the flood runoff simulation and calculate the inflow of the dam during flood events using hydrologic model. Also, the feasibility of hydrological modeling using the relatively coarse spatially distributed (about 10 km by 10 km) satellite-precipitation products from the GPM was evaluated. HEC-HMS, which is a relatively simple model for adopting spatially distributed rainfall, was applied to the hydrological simulations with a total of eight independent flood events that occurred during the last five years (2014 to 2018). Although HEC-HMS is typically classified as a lumped hydrologic model and does not mainly use inputs of spatially distributed data such as radar rainfall, it is possible to construct a model that can associate the grid-based spatially distributed rainfall using HEC-GeoHMS and ModClark method. The simulation results were evaluated by comparing with those of outputs using spatially averaged rainfall and radar-based spatially distributed precipitation (KMA's Radar-AWS Rainrates) data.

In addition, the ModClark-based flood runoff simulations are limited to the interpretation of flood routing considering the catchment-to-grid ratios of travel times in each sub-basins, so the recently developed hybrid hydrologic model (Distributed-Clark) is also planned to be introduced and applied to the same watershed using IMERG.


IMERG (GPM_3IMERGHH V06)
Scale
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Yongdam study watershed