

# Research on dam inflow analysis based on radar rainfall data

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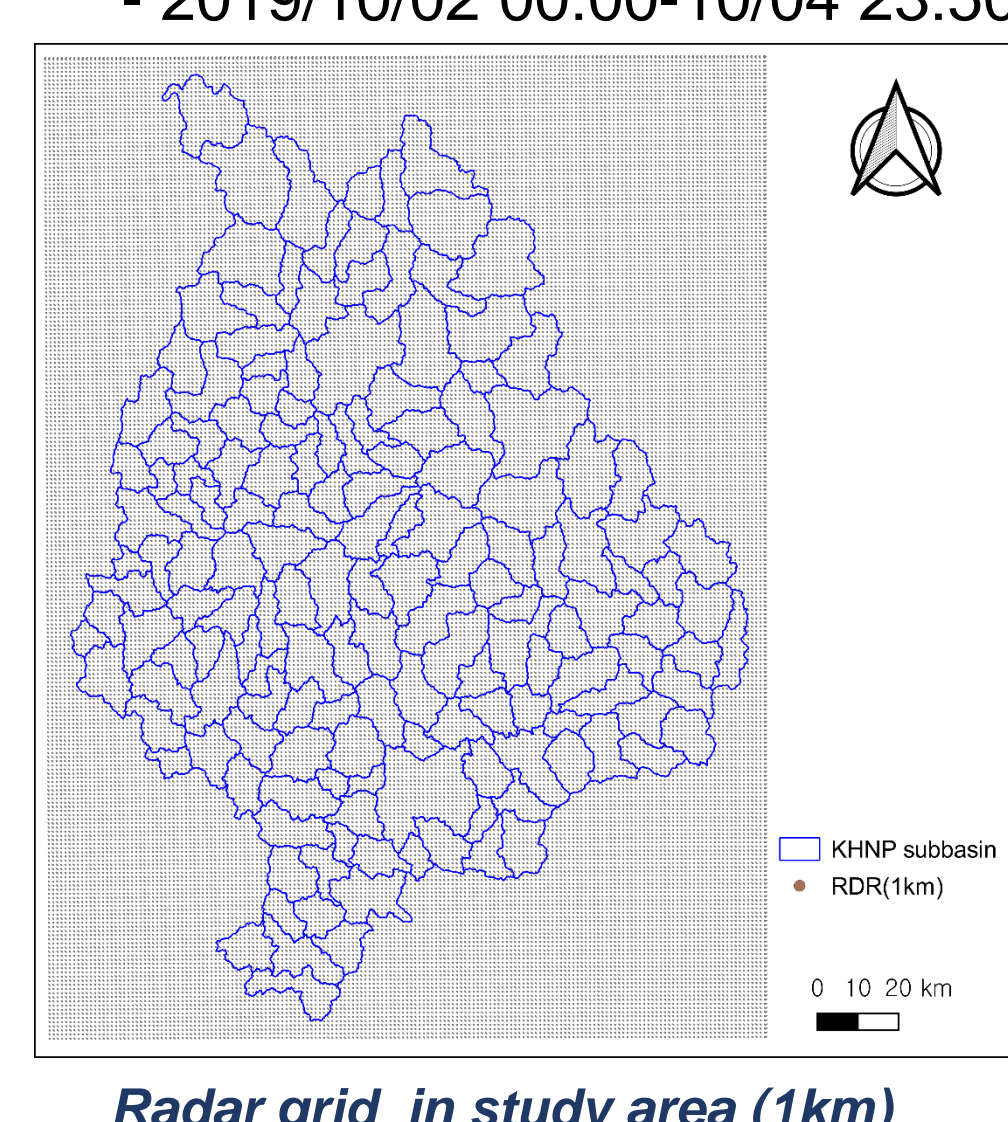
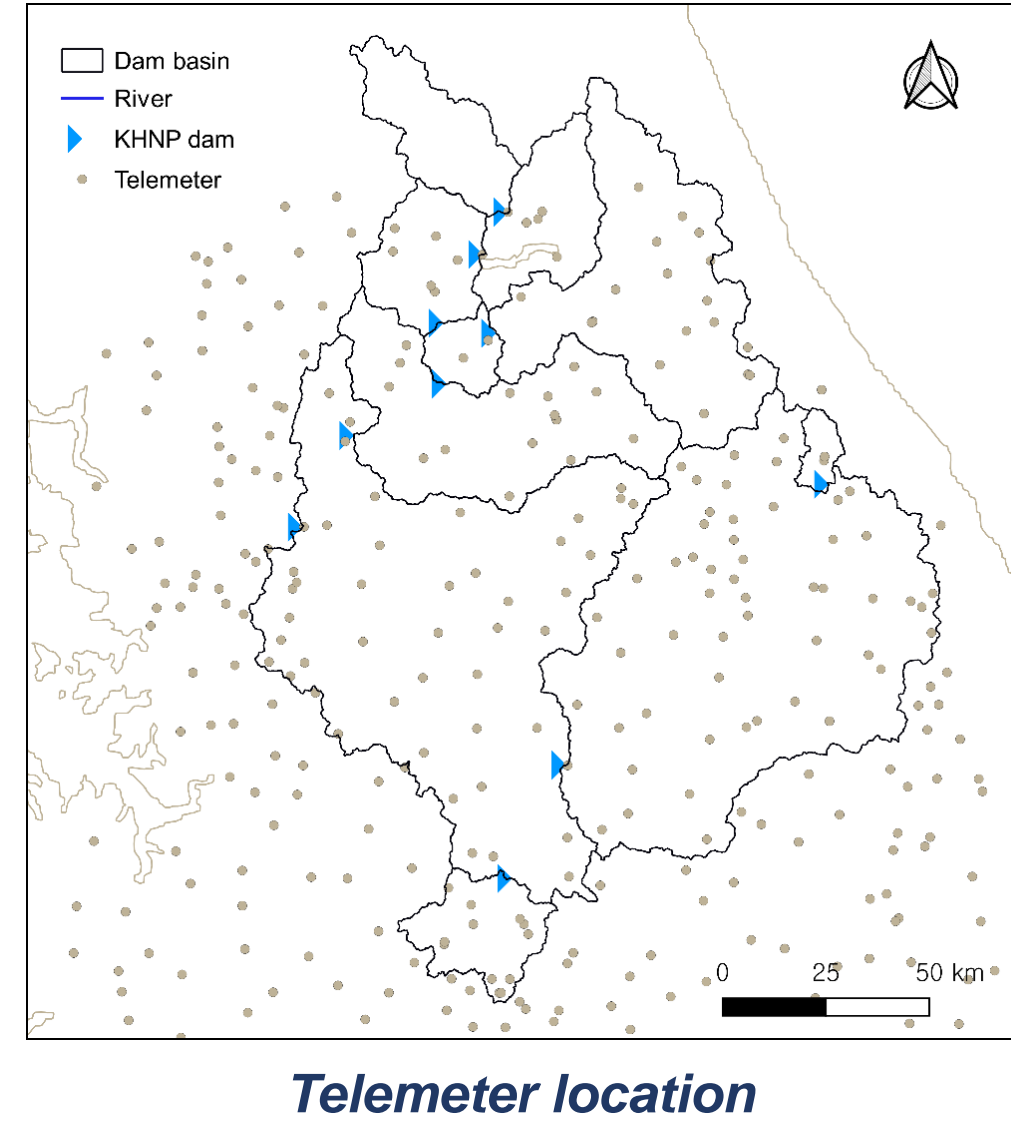
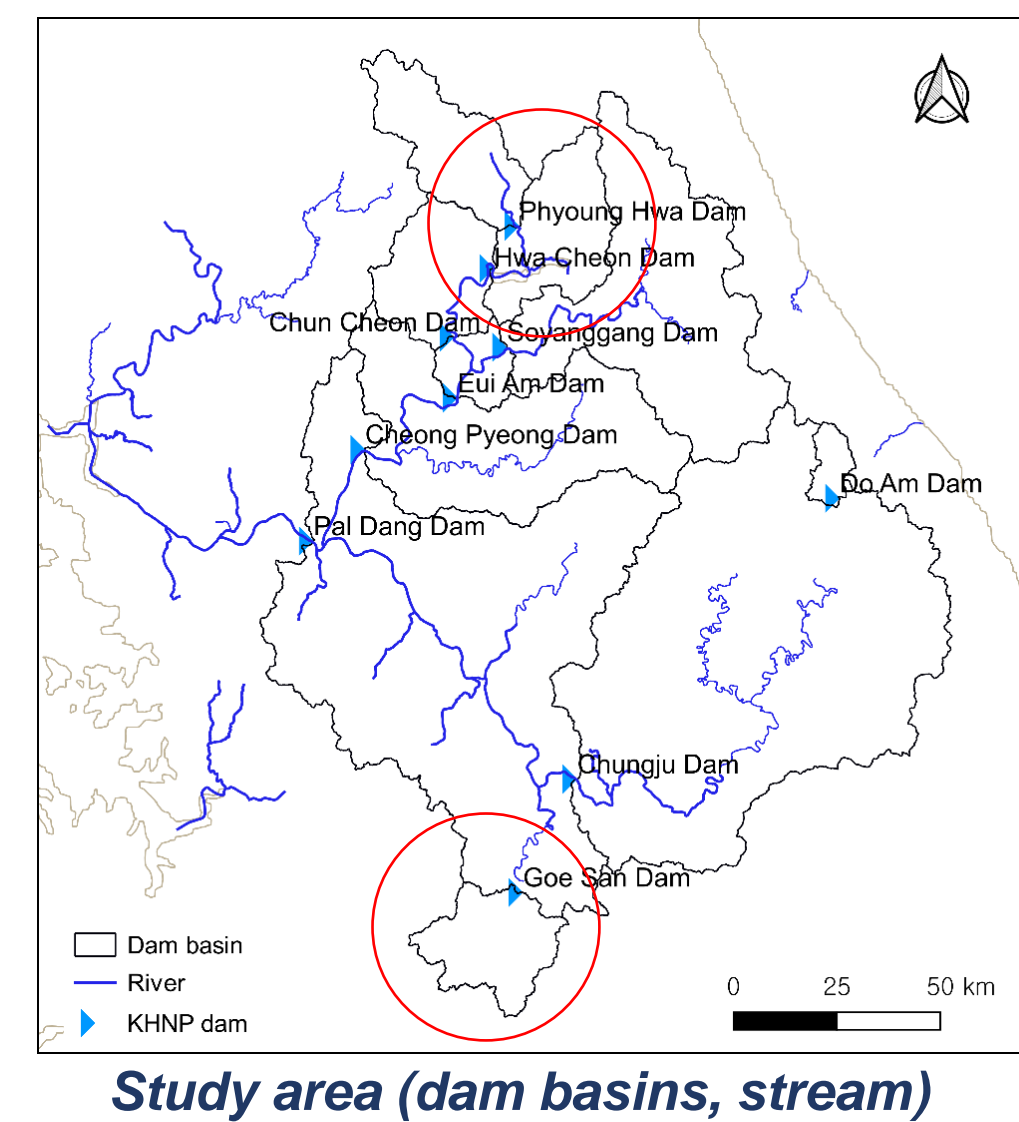
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## Abstract

Estimation of dam inflow using rainfall needs for efficient and timely operation of dam. Accuracy of rainfall data is important to estimate dam inflow. Currently, rainfall pattern has volatile temporal and spatial distribution. Dam inflow based on rainfall gauged data is inadequate for operating hydroelectric dam. Radar rainfall has been used as an alternative because radar data provides spatially distributed rainfall. In this study, we estimated inflow discharge for hydroelectric dam using both radar and rain gauged data to find a case to improve the accuracy. Hydrological modeling have been adopted to estimate inflow and based on rainfall data collected from 2018 to 2019.

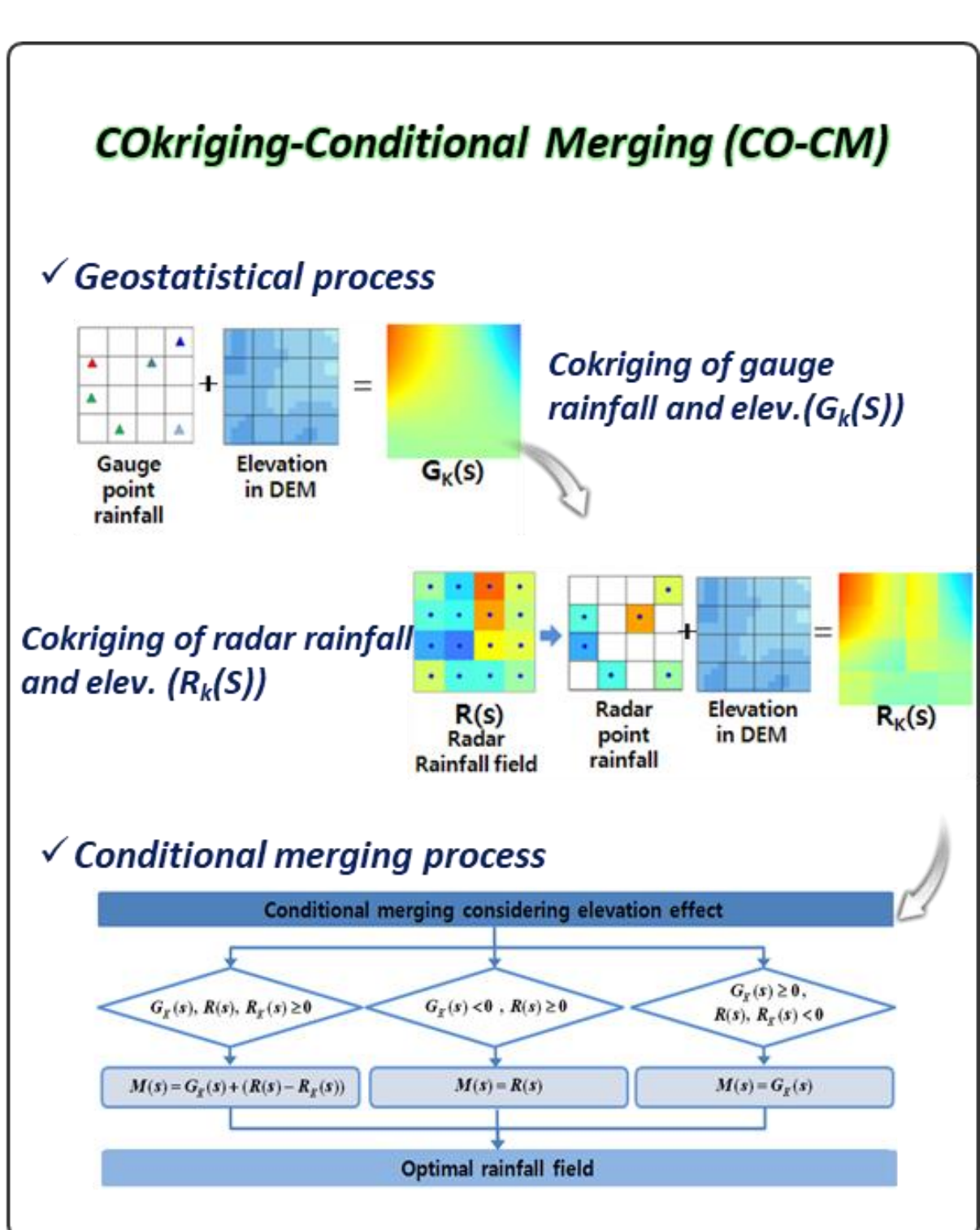
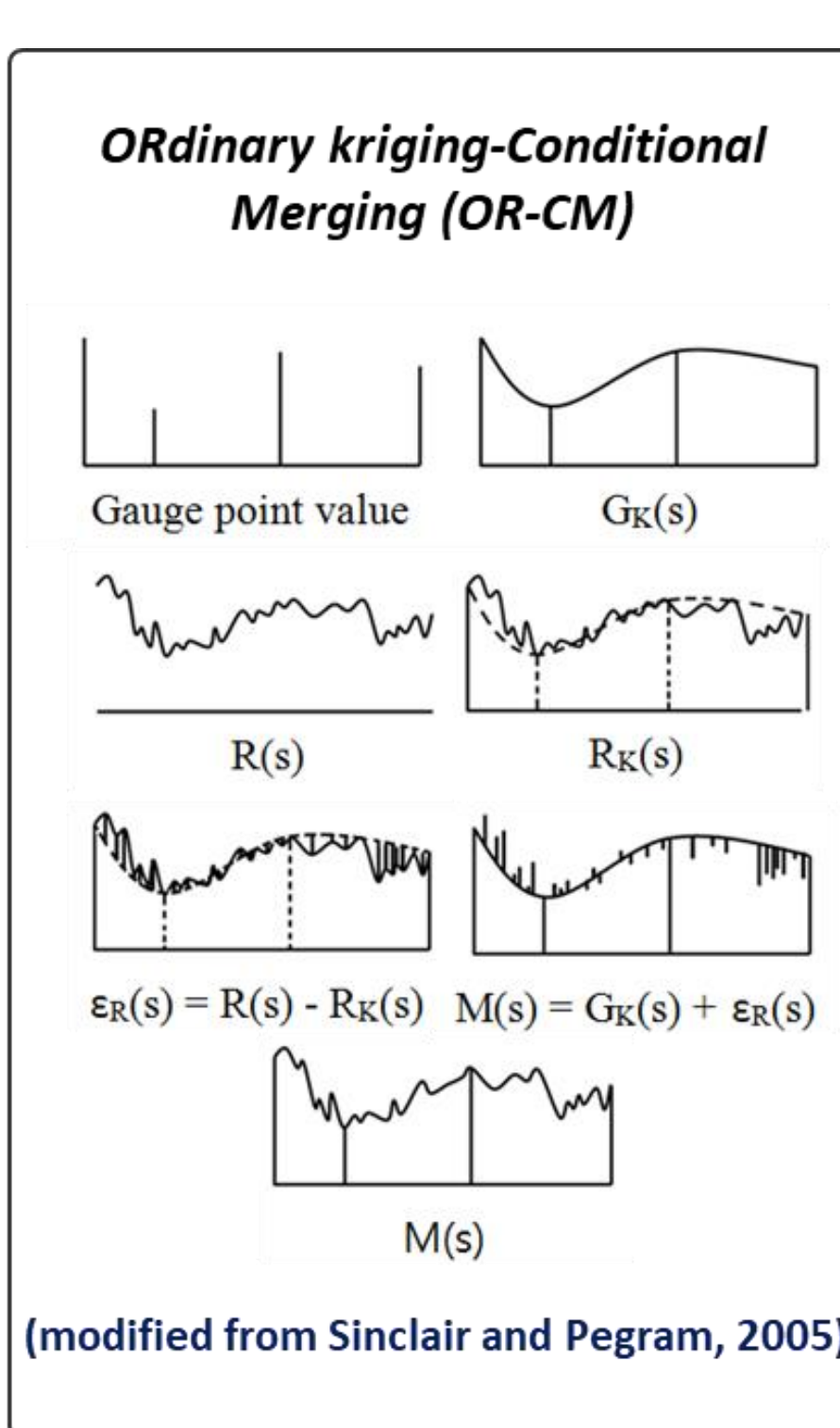
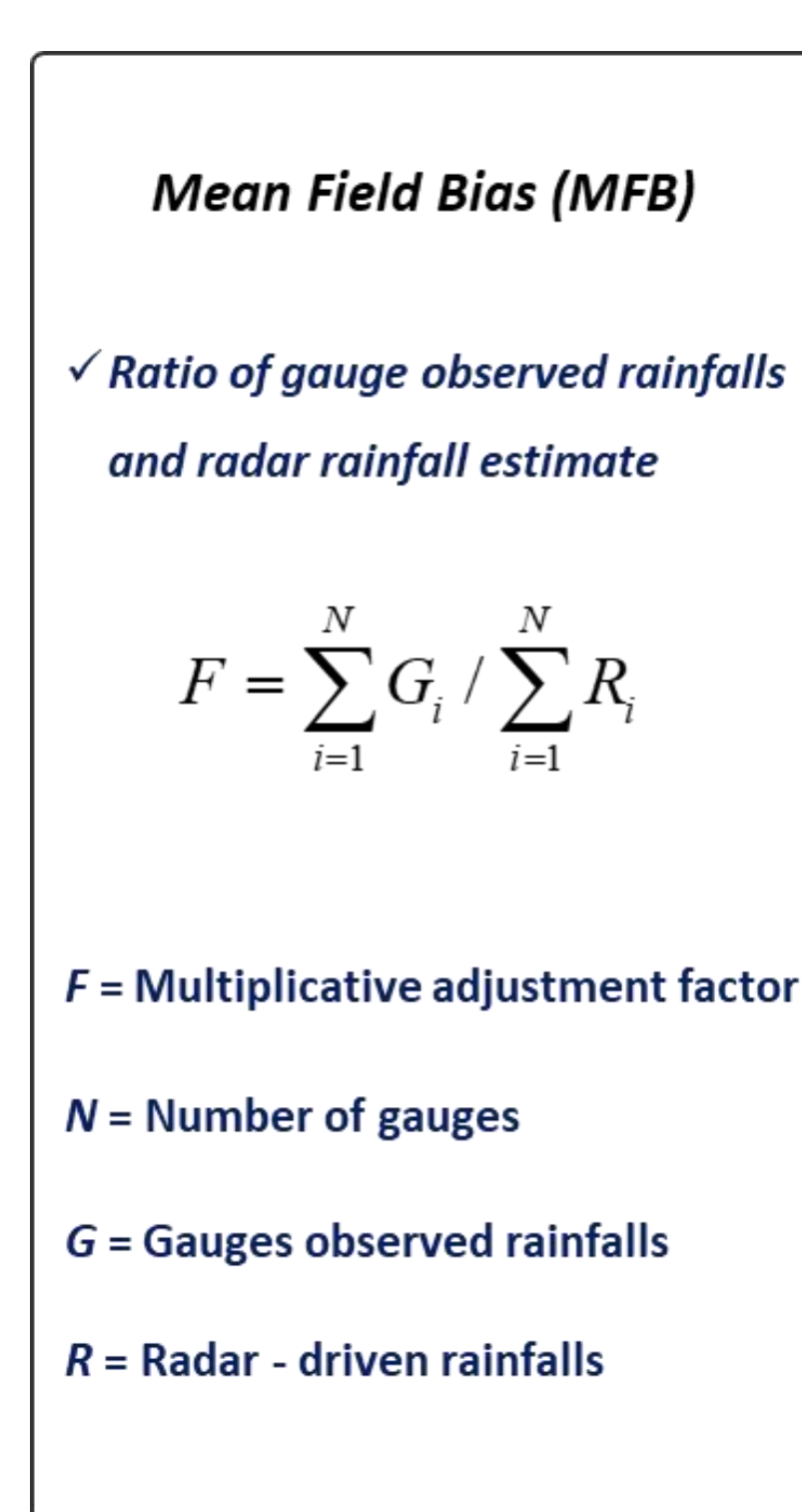
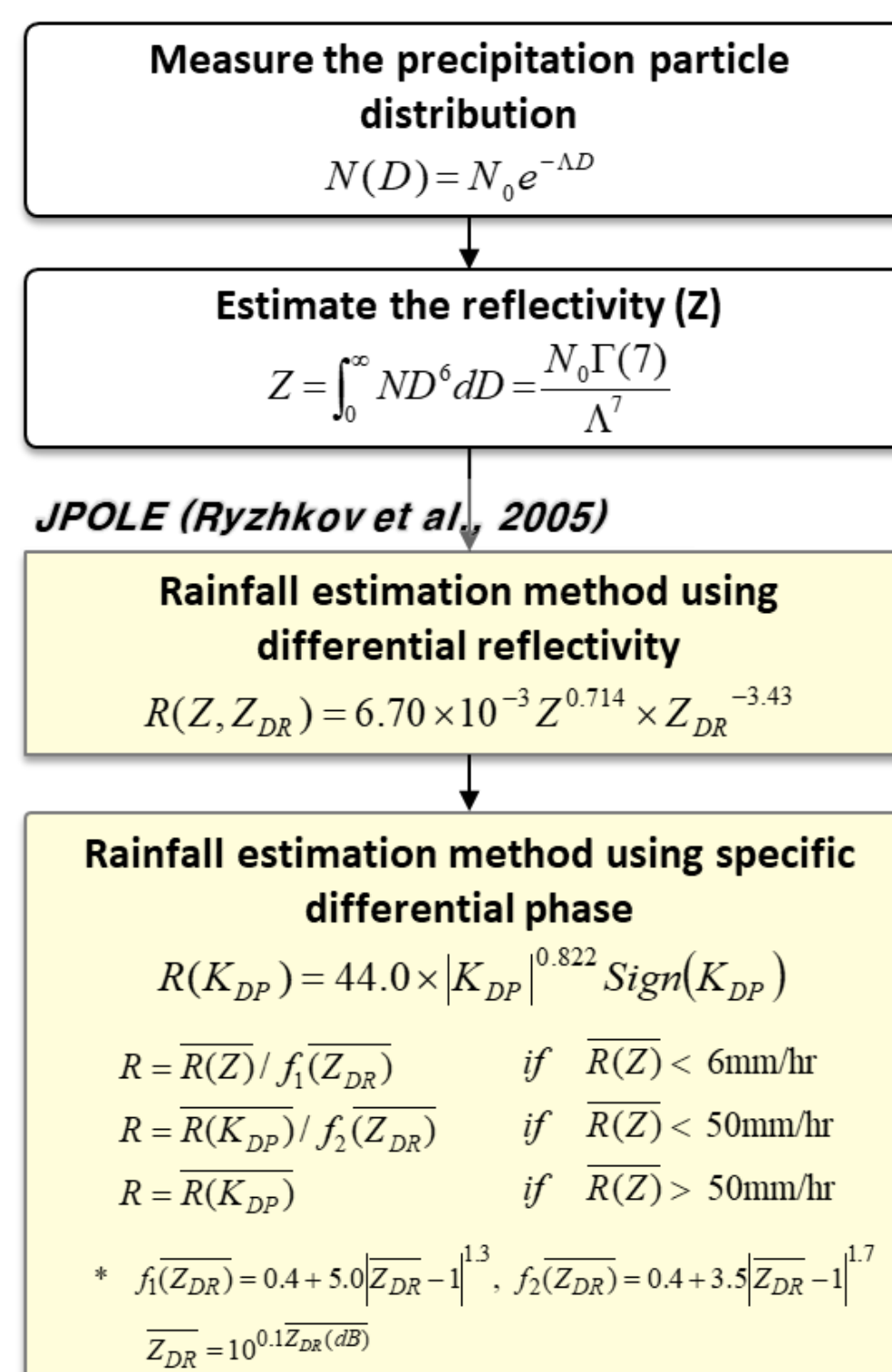
## 1. Study area and data

- Study area**
  - The hydroelectric dams in Han River basin
  - Hwa Cheon Dam and Goe San Dam
- Weather data**
  - Telemeter 604 stations (10 min. ASCII)
  - Composited radar rainfall (10 min. Netcdf)
- Rain events**
  - 2017/07/14 12:00-07/17 23:50
  - 2019/08/06 00:00-08/08 23:50
  - 2019/10/02 00:00-10/04 23:50



## 2. Radar rainfall estimation and adjustment

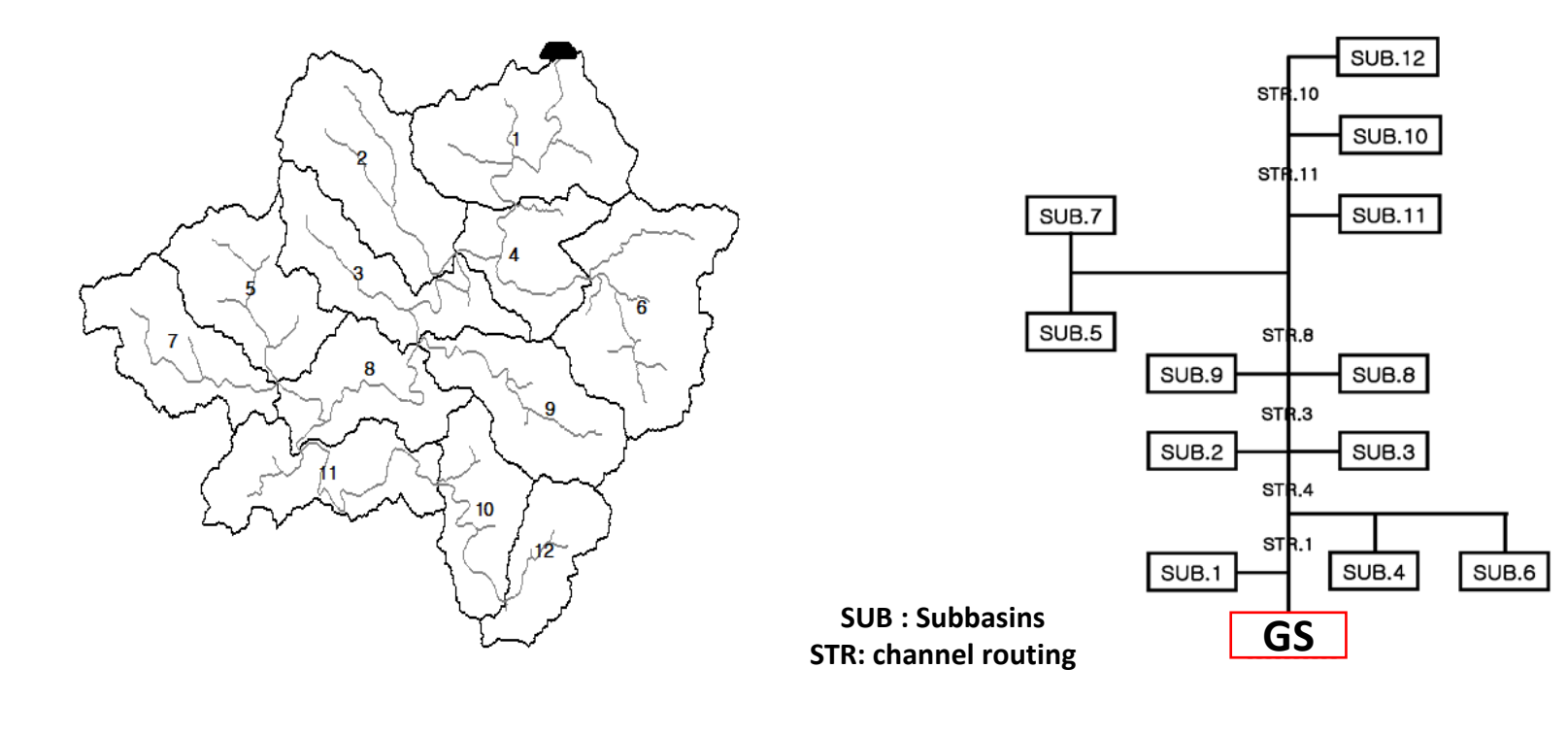
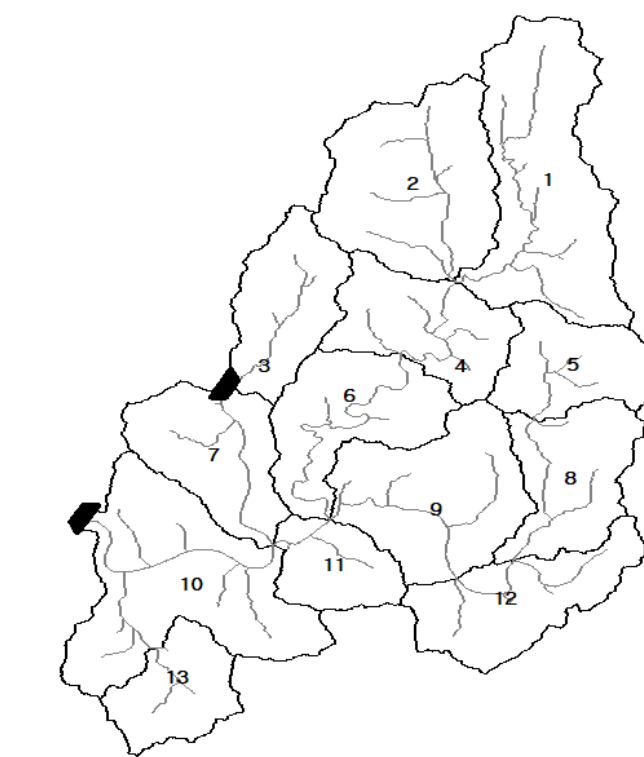
- QPE methods**
  - To estimate radar rainfall using dual-polarized radar variables ( $Z_H$ ,  $Z_{DR}$ ,  $K_{DP}$ )
  - JPOLE algorithm (Ryzhkov et al., 2005) is used.
- The used radar rainfall adjustment methods**
  - Mean field bias adjustment (MFB)
  - Original conditional merging (OR-CM)
  - Conditional merging considering the elevation (CO-CM)



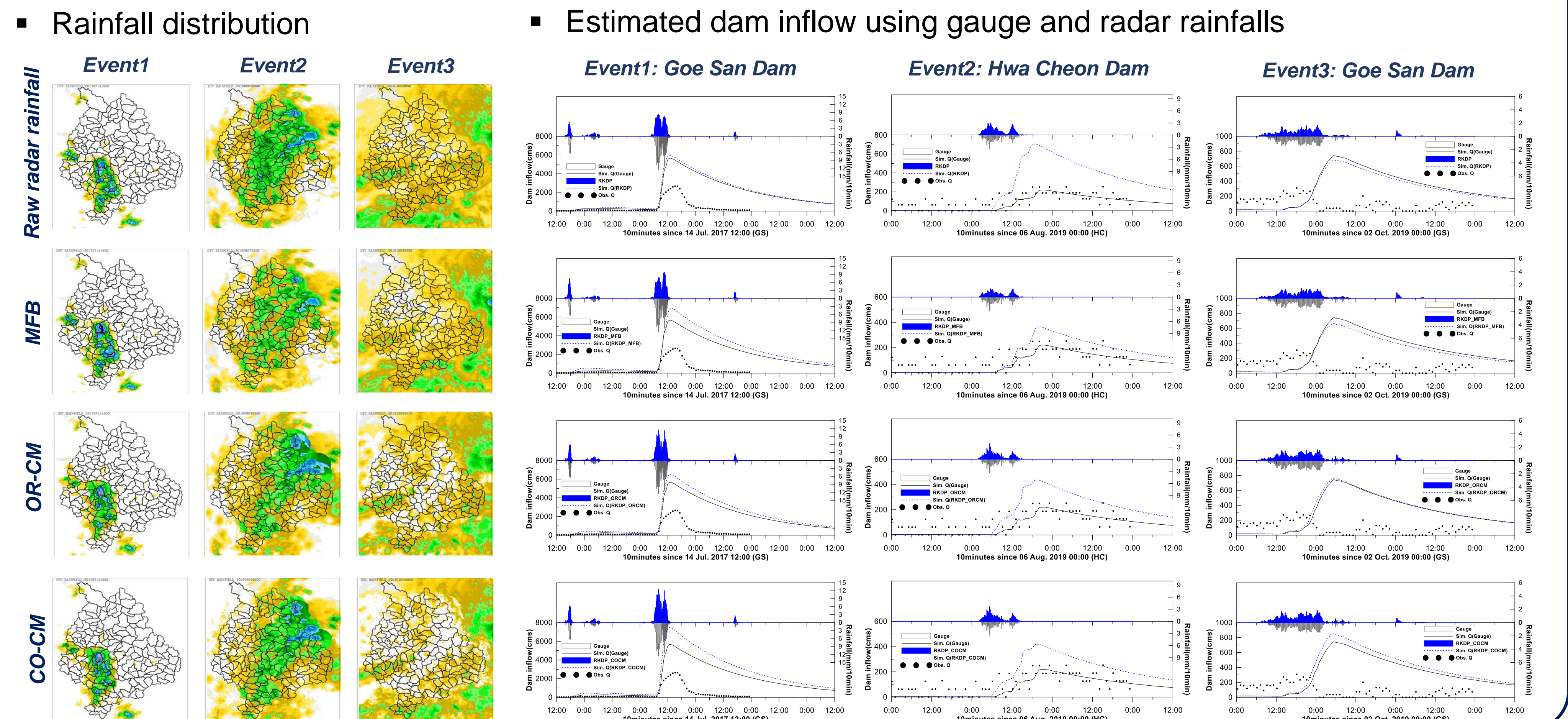
## 3. Applications

### Dam inflow estimation using HEC-HMS

- HEC-HMS (Hydrologic Engineering Center-Hydrologic Modeling System)
  - To simulate the complete hydrologic processes of dendritic watershed systems. HEC-HMS includes many traditional hydrologic analysis procedures such as event infiltration, unit hydrographs, and hydrologic routing.



### Applications



## 4. Summary

- Most of the area where the dam is located is a mountainous area, and the density of the ground rain gauge is low. Therefore, there is an unmeasured area within the dam basin where rainfall cannot be observed with a rain gauge. In this study, radar data was used to compensate for unmeasured area and mean-field bias adjustment, conventional conditional merging method, and conditional merging considering by elevation were used to improve the accuracy of radar rainfall.
- This study presents the estimated dam inflow using various rainfall data for hydroelectric dam in Han River basin, Korea. Dam inflow was simulated using HEC-HMS. The results simulated with each radar rainfall data were compared with the observed rainfall results and observed inflow data.
- The results of the simulation of the Goe San Dam in Event 1 showed that the dam inflow of adjusted radar rainfalls showed a slightly overestimated trend. For Event3, OR-CM was similar to the most simulated dam inflow using gauge. In the case of Event2 for Hwa Cheon dam, all of the adjusted radar rainfalls were similar. The simulated dam inflow using gauge is most similar to the observed dam inflow.