

Hydro-meteorological analysis of January 2021 flood event in South Kalimantan Indonesia using atmospheric-hydrologic model

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Abstract

In January 2021 heavy flood affected South Kalimantan with causing many casualties. The heavy rainfall is predicted to be generated due to the ENSO (El Nino-Southern Oscillation). The weak La-Nina mode appeared to generate more convective cloud above the warmed ocean and result in extreme rainfall with high anomaly compared to past historical rainfall event. Subsequently, the antecedent soil moisture distribution showed to have an important role in generating the flood response. Saturated flow and infiltration excess mainly contributed to the runoff generation due to the high moisture capacity. The hydro-meteorological processes in this event were deeply analyzed using the coupled atmospheric model of Weather Research and Forecasting (WRF) and the hydrological model extension (WRF-Hydro). The sensitivity analysis of the flood response to the SST anomaly and the soil moisture capacity also compared. Result showed that although SST and soil moisture are the main contributors, soil moisture have more significant contribution to the runoff generation despite of anomaly rainfall occurred. Model performance was validated using the Global Precipitation Measurement (GPM) and Soil Moisture Operational Products System (SMOPS) and performed reasonably well. The model was able to capture the hydro-meteorological process of atmosphere and hydrological feedbacks in the extreme weather event.

Keywords : WRF, WRF-Hydro, Atmosphere-hydrology coupled, Hydro-meteorology

Acknowledgment

This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MSIT) (No. 2019R1A2C1089109)

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