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Evaluation of GSMaP rainfall for flood inundation Simulation in Jakarta, Indonesia

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1. Introduction

Jakarta, as a capital city of Indonesia, is located in the western part of Java. The city is considered as one of the most vulnerable cities to climate-related disasters including flooding, sea-level rise and storm surge[1]. Jakarta has experienced many floods in the past[2]. It is important for Jakarta to develop a real time flood forecasting system in order to prepare the flood event with some lead times. Satellite-based rainfall products such as the Global Satellite Mapping of Precipitation (GSMaP) has been studied by Hur J et al[3]. They evaluated the uncertainties of two high-resolution satellite precipitation products. The main objective of this study is to evaluate a satellite-based rainfall products GSMaP NRT for flood inundation simulation on 1-10 February 2015 flood event.

2. Study Area

Jakarta is located in West Java, Indonesia. Ciliwung River basin, Jakarta city and outside of Jakarta are selected as the study area in this study, totally covering 1,346.6 km^2. Thirteen major rivers flow northwards through Jakarta into the Java Sea, and Ciliwung River is the main and the longest river in Jakarta which passes through Jakarta and some areas in West Java Province.

3. Methodology

1) GSMaP rainfall data

The GSMaP project has been developed since 2002 for rainfall rate retrieval algorithms and production of high resolution global precipitation maps from satellite data[3), 4)]. Global Satellite Mapping of Precipitation in Near Real Time (GSMaP NRT) distributed from JAXA Global Rainfall Watch[4)]. The rainfall data of GSMaP NRT has been used to input of rainfall-runoff module.

2) Flood Inundation Model

This study investigated flood inundation situations in Jakarta based on rainfall-runoff [5)] and flood inundation model [6)]. The model consists of rainfall-runoff module at each sub basin, hydrodynamic module in the river and canal networks, and flood inundation module for the floodplains. The hydrodynamic module in the river and canal networks consist of continuous equation, and a momentum equation of steady flow (Saint-Venant equation).

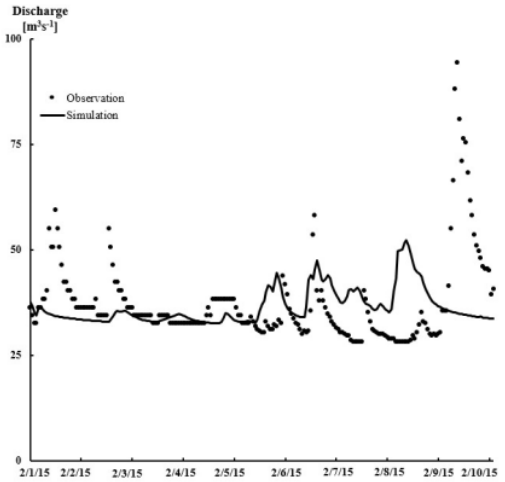

Fig. 1 Simulated and observed river discharge at Depok Station during the 2015 event

4. Results and Conclusions

Rainfall-runoff and flood inundation model were applied to the flood event of 1 – 10 February 2015

using the GSMaP input rainfall data. Simulated hydrographs at Depok station is shown in **Figure 1.** **Figure 2** shows the simulated and observed flood inundations for flood event 2015. It can be seen from **Figure 1** and **Figure 2** that there are differences between simulated and observed river discharge and flood inundation, so that we concluded that satellite precipitation used in this study needs a correction for bias in order to use GSMaP rainfall data as the real time input data for the flood inundation simulation.

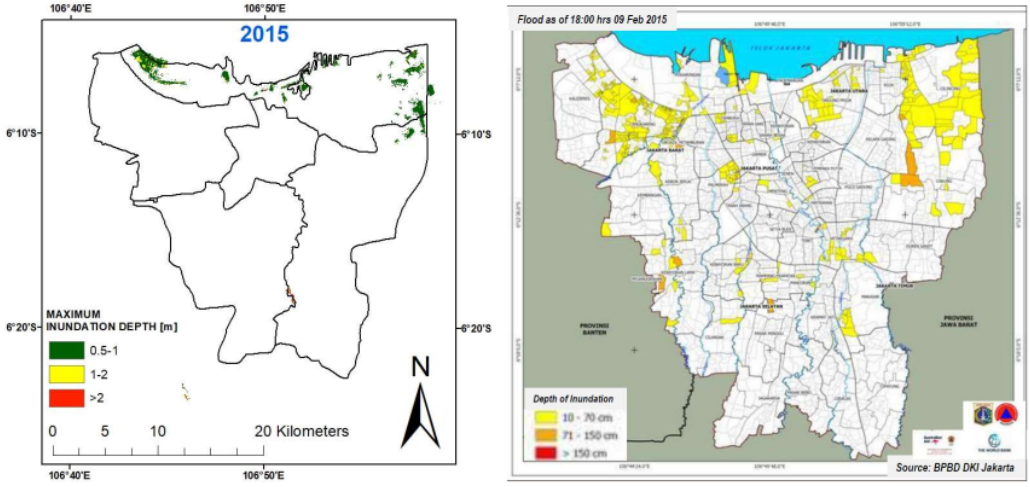

Fig. 2 Simulated (left) and observed (right) Flood inundation of the 2015 flood event.

Acknowledgments

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Key Words: Jakarta, Indonesia, Flood inundation, GSMaP

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