

INTISARI

Hidrograf satuan adalah salah satu cara untuk memperkirakan besarnya banjir di sungai akibat hujan pada suatu DAS. Hidrograf satuan sangat populer dan dipakai secara luas di dunia. Metode ini mempunyai fleksibilitas yang rendah terhadap hujan yang berbeda, sehingga hidrograf yang dihasilkan berbeda-beda pada setiap hujan. Hal ini diduga disebabkan antara lain karena teori hidrograf satuan mengabaikan pengaruh kondisi awal kelengasan tanah (*antecedent soil moisture condition, AMC*) pada proses penurunan hidrograf satuan. Tulisan ini menyajikan hasil penelitian tentang pengaruh *AMC* terhadap debit puncak hidrograf satuan observasi (q_{p-obs}).

Dalam penelitian ini variabel *AMC* didekati dengan besaran defisit kelengasan tanah (*soil moisture deficit, SMD*) yang mempunyai makna berlawanan dengan *AMC*. *SMD* direpresentasikan dengan variabel *Sc* (*storage capacity*) yakni volume udara di dalam pori tanah yang ditinggalkan air karena ter evaporotranspirasi keluar. Penelitian dilaksanakan dengan menggunakan data hidrologi (hujan, debit aliran, dan evaporasi) yang dikumpulkan dari 3 DAS hulu (*upper catchment*) di kawasan Gunung Merapi. Percobaan penelitian dilakukan dengan cara menurunkan hidrograf satuan dengan dua cara, yakni cara konvensional memakai cara Collins menghasilkan hidrograf satuan observasi (HS_{obs}), dan cara simulasi menggunakan model tangki menghasilkan hidrograf satuan simulasi ($HS_{sim(U0+U1)}$). Analisis pengaruh *Sc* dilakukan dengan membuat hubungan *Sc* dengan debit puncak HS_{obs} dan debit puncak $HS_{sim(U0+U1)}$. Analisis regresi variabel bebas *Sc* dengan variabel tak bebas $(q_{p-obs})/(q_{p-sim(U0+U1)})$ menghasilkan formula koreksi pengaruh *Sc* terhadap debit puncak hidrograf satuan observasi.

Penelitian menghasilkan temuan yang dapat disimpulkan sebagai berikut: (1) Hubungan *Sc* dan debit puncak hidrograf satuan, menunjukkan semakin besar *Sc* (semakin kecil *AMC*) debit puncak HS_{obs} semakin kecil, (2) Formula koreksi yang didapat berbentuk fungsi eksponensial $(q_{p-obs})/(q_{p-sim(U0+U1)}) = 1,104 e^{-0,012Sc}$, dengan $q_{p-sim(U0+U1)}$ adalah debit puncak hidrograf satuan simulasi yang merupakan debit puncak hidrograf satuan observasi terkoreksi, (3) Perbandingan debit puncak hidrograf satuan observasi terkoreksi rerata dengan debit puncak hidrograf satuan sintetik (*HSS*) Nakayasu dan dengan debit puncak *HSS* Gama 1 menunjukkan bahwa debit puncak $HS_{obs-kor}$ mempunyai besaran yang tertinggi.

Kata kunci: *AMC*, hidrograf satuan observasi, model tangki, debit puncak hidrograf satuan observasi terkoreksi

ABSTRACT

Unit hydrograph is a popular method for predicting flood caused by rainfall at a point on a River in a catchment. This method has little flexibility to different storm, consequently the unit hydrographs produced differ considerably from storm to storm. This is partially due to the unit hydrograph method ignores the influence of antecedent soil moisture condition (*AMC*) on the derivation of unit hydrograph. This paper presents the research result on the influence of *AMC* to peak discharge of observed unit hydrograph (q_{p-obs}).

In this research the *AMC* is approached by parameter of soil moisture deficit (*SMD*) which has opposite meaning with the *AMC*. The *SMD* was represented by a variable of S_c (*storage capacity*) that is the space volume remaining the soil moisture evaporated. The research was conducted using hydrologic data (rainfall, discharge, and evaporation) assembled from 3 upper basin surrounding Mount Merapi. The research experiments were performed by deriving unit hydrographs using two methods, namely conventional method using method of Collins producing observed unit hydrograph (HS_{obs}) and simulation method using tank model of Yue and Hashino producing simulated unit hydrograph ($HS_{sim(U0+U1)}$). The impact of S_c to the q_{p-obs} was analyzed using the relation between S_c and peak discharge of HS_{obs} and peak discharge of $HS_{sim(U0+U1)}$. Regression analysis of independent variable S_c to dependent variable of $(q_{p-obs})/(q_{p-sim(U0+U1)})$ produced correction formula of the impact of S_c to peak discharge of observed of unit hydrograph.

The research shows some findings that are concluded that: (1) the relationship between S_c and peak discharge of unit hydrograph showed that if the S_c increases (*AMC* decreases) then the peak discharge of HS_{obs} decreases, (2) The formula of correction has exponential form of eksponensial $(q_{p-obs})/(q_{p-sim(U0+U1)})=1,104 e^{-0,012S_c}$, with $q_{p-sim(U0+U1)}$ is peak discharge of simulated unit hydrograph that is the corrected observed unit hydrograph, (3) Comparison among the peak discharge of average corrected observed unit hydrograph to peak discharge of synthetic unit hydrograph of Nakayasu and peak discharge of synthetic unit hydrograph of Gama 1 shows that the peak discharge of average corrected observed unit hydrograph is the biggest one.

Keywords: *AMC*, observed unit hydrograph, tank model, corrected observed unit hydrograph