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Comparison of natural and urban drainage network characteristics based on Gibbs' Model

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Natural catchments have formed efficient river networks for a long time. Similarly, urban drainage networks have been developed with the purpose of efficiently draining rainfall from catchments to flood mitigation. In this study, we analyze and compare the characteristics between the naturally formed river networks for a long time and the artificially formed drainage networks using Gibbs' Model. Gibbs' Model is a stochastic stream network model, which can generate multiple realizations of stochastic networks based on a single parameter value of λ . Gibbs' Model was applied to a total number of 239 urban catchments in Seoul, South Korea and 70 natural catchments in the Midwestern areas of US. Topographic characteristics of catchments are analyzed along with the efficiency of drainage networks, which are presented by λ for both natural and urban catchments. The result of this study demonstrates the difference between natural and artificial drainage network characteristics and suggests a new alternative measure to mitigate flood risks in urban catchments facing extreme hydrologic events with climate change.