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Drainage network configuration focusing on the flood mitigation in urban catchments

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Flood vulnerability in urban areas is increasing more and more due to climate change and intense or rapid urbanization. Various counter measures are introduced to urban catchments such as detention or retention ponds, pumping stations, levees and drainage systems to mitigate these impacts. However, conventional and structural measures can trigger serious flood damages in case of failure due to operational problems. This study aims to minimize these problems and focused on sustainable alternatives that can operate persistently to prevent floods in the event of hydrologic extremes.
We focused on the drainage networks configuration while looking at the relation between network topology and hydrologic response of an urban catchment. The analysis of drainage network in Seoul showed no close correlation between the network configuration and the topological characteristics of the catchment. This is important because the construction of the drainage network is not entirely dependent on natural factors. Therefore, it is important to take account of the network configuration more due to its impact on peak flows at the outlet. This study demonstrated this importance with a case study in Seoul. The result showed that an alternative drainage network with low efficiency and high sinuosity reduces peak flows. Moreover, the result showed the importance of spatial planning of network configuration. Different network configuration can be applied to different location in an urban catchment for the purpose of reducing peak flows at the outlet. It implies strategic planning and application of the proposed approach for the resilient strategy of flood mitigation in urban catchments.