

# Analysis of Drainage Efficiency under Extreme Precipitation Events Based on Numerical Simulation

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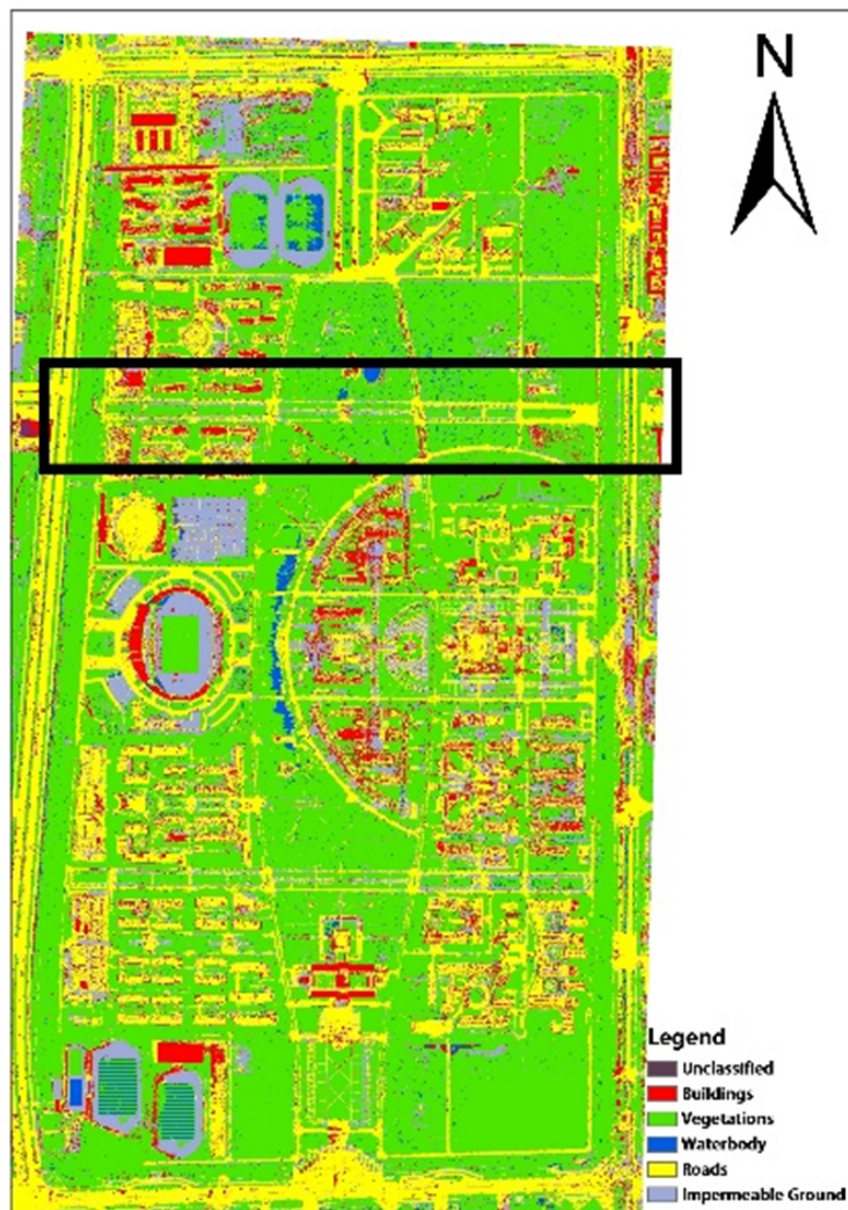
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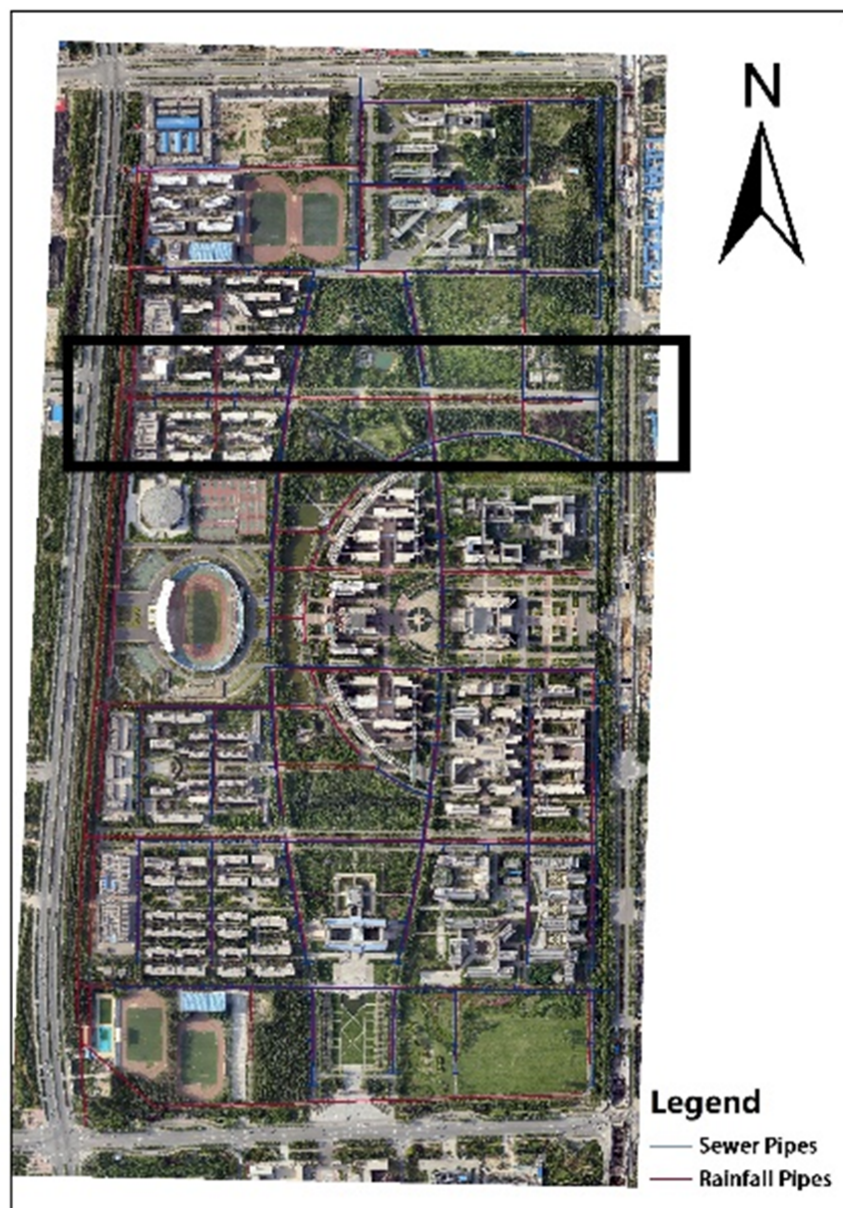
## Abstract

The recent increase in extreme climatic phenomena has gradually attracted the attention of researchers regarding urban flooding. This paper used a hydrological model combined with the Computational Fluid Dynamics software to assess the drainage efficiency, predict the hydrological processes under different precipitation intensities and establish the relationship between rainfall intensity and inundation depth under extreme rainstorm events. The study proposed several thresholds such as specific rainfall intensities (that is,  $RI_{95\%}$  and  $RI_{50\%}$ ), drainage efficiency, and the limited flow rate of pipes. Based on 2021 July 20, 0:00 to 24:00 precipitation monitoring data from the “7.20 Zhengzhou Rainstorm Extreme Event”, the relationship between rainfall intensity and road-pipe overflow patterns was determined by analyzing these thresholds for different drainpipe diameters and spacings of catchment wells. The results demonstrated the evaluation parameters varied with rainfall intensities and pipe characteristics and revealed the main limitation of drainage efficiency and flow rate of drainpipes. The simulation helped the drainage systems design for different precipitations and proposed several relative suggestions for drainage-system improvements, wherein the diameter of the branch pipes plays a dominant role in coping with extreme rainstorm events.

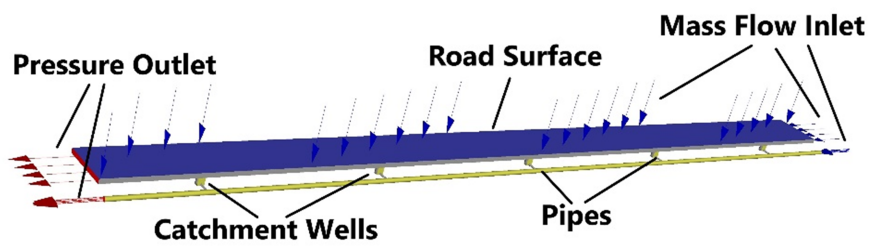
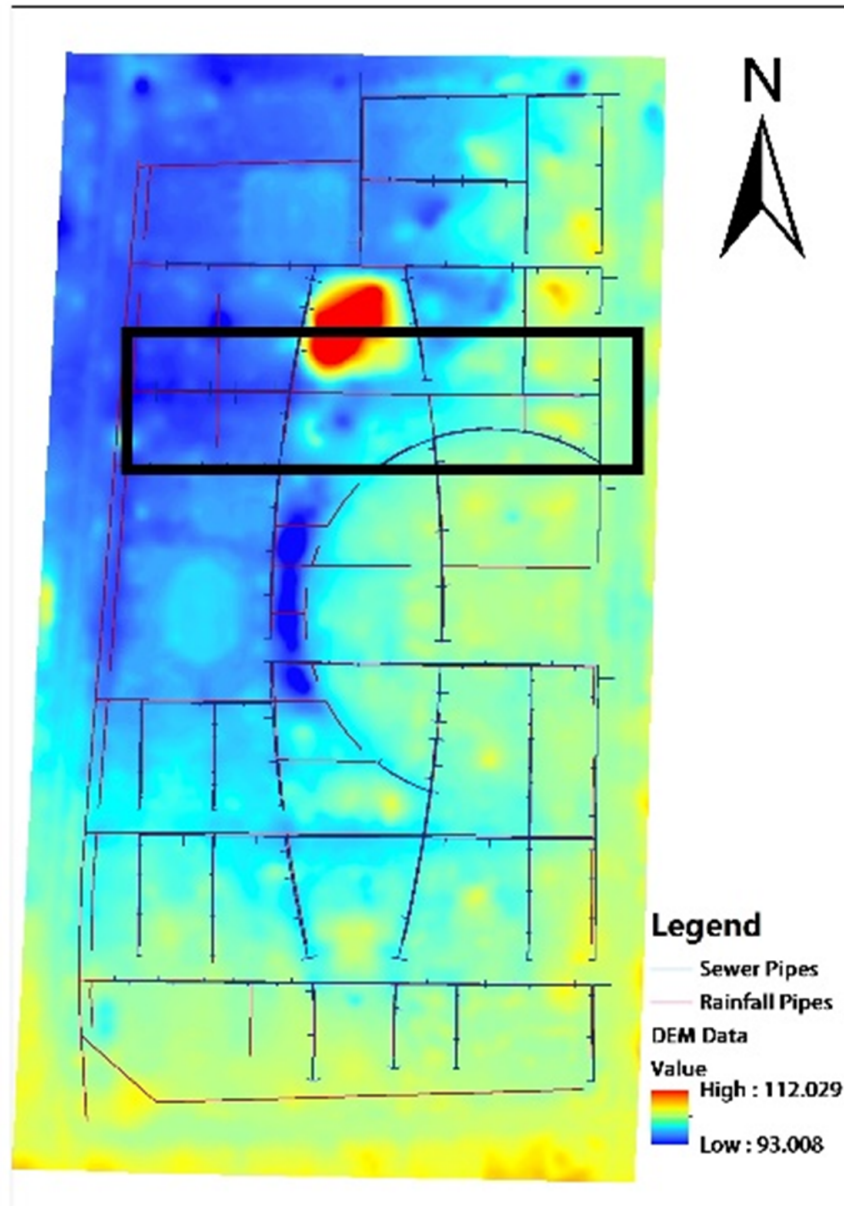
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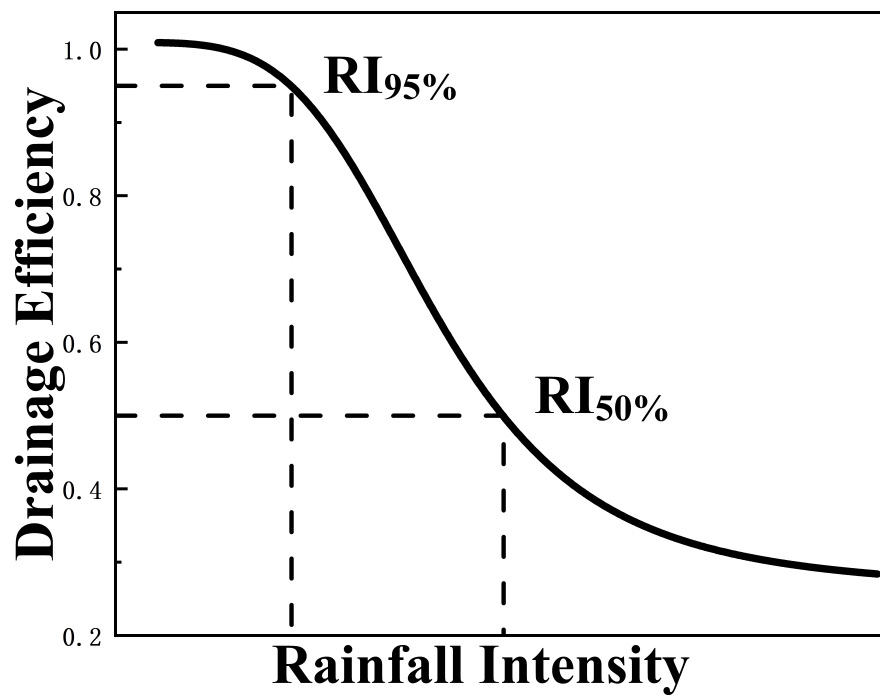
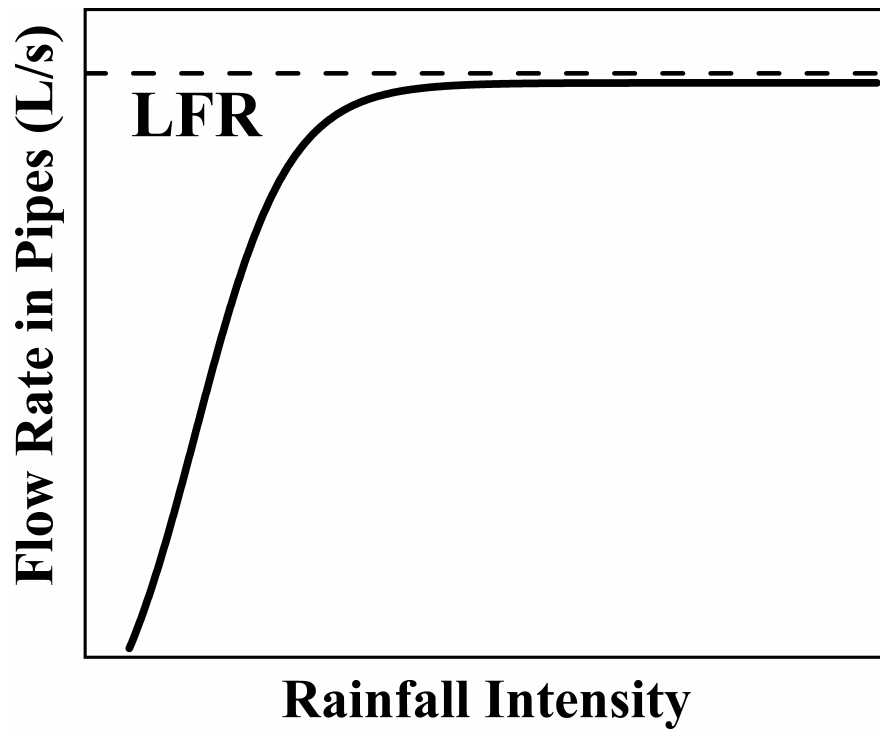


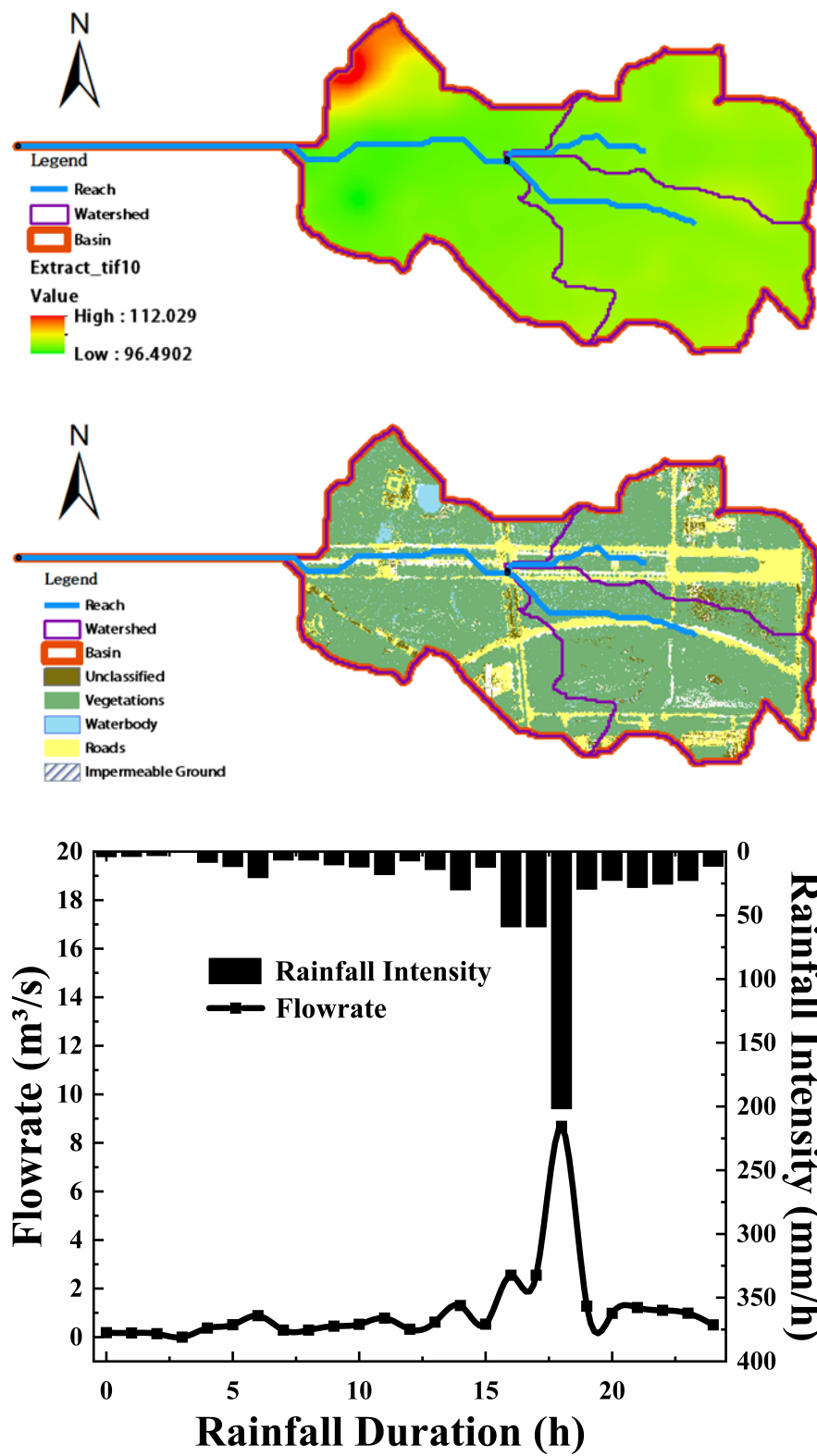


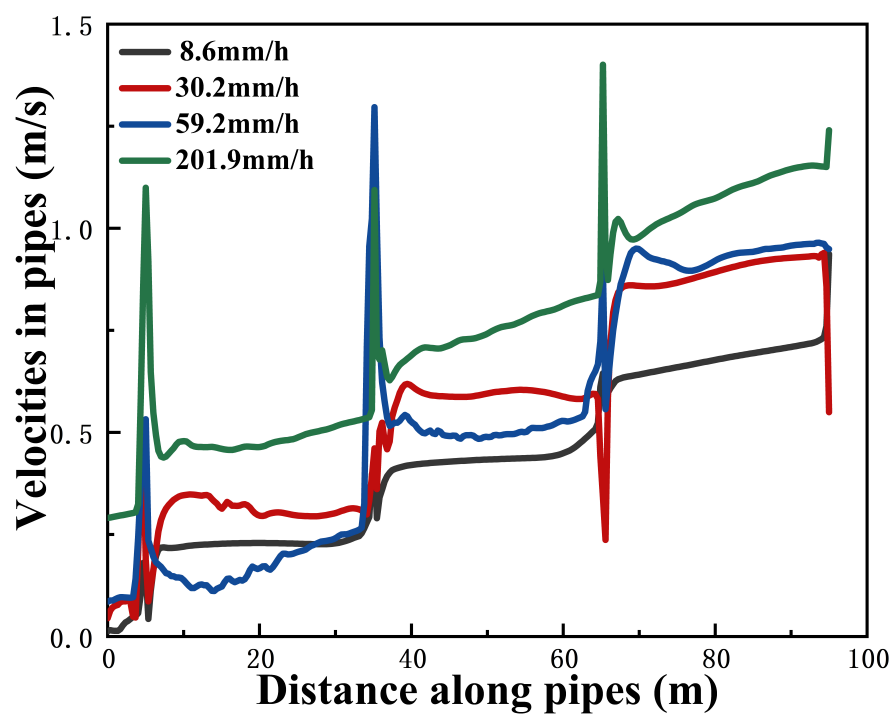
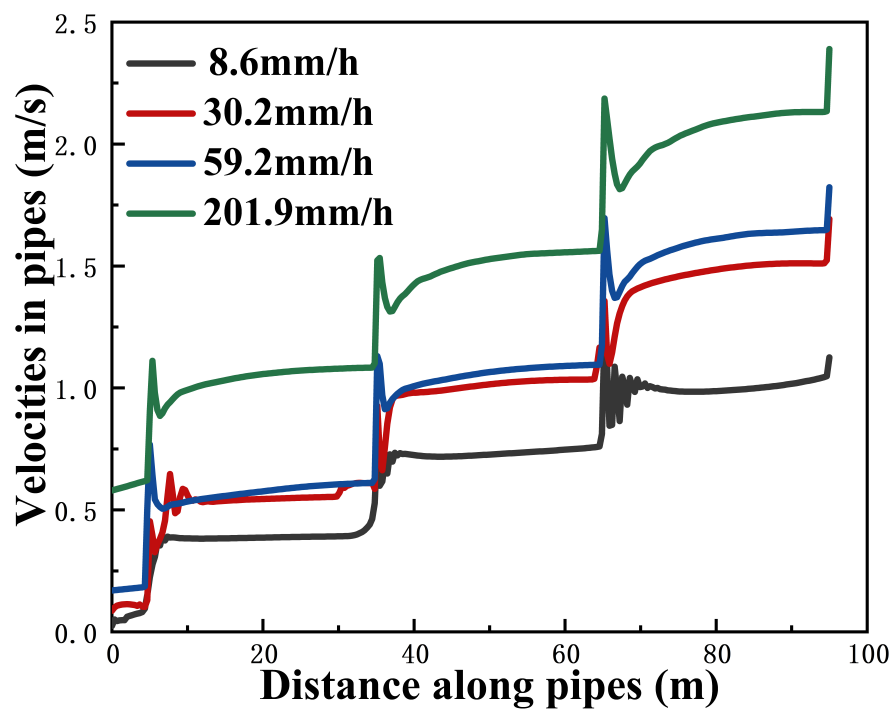




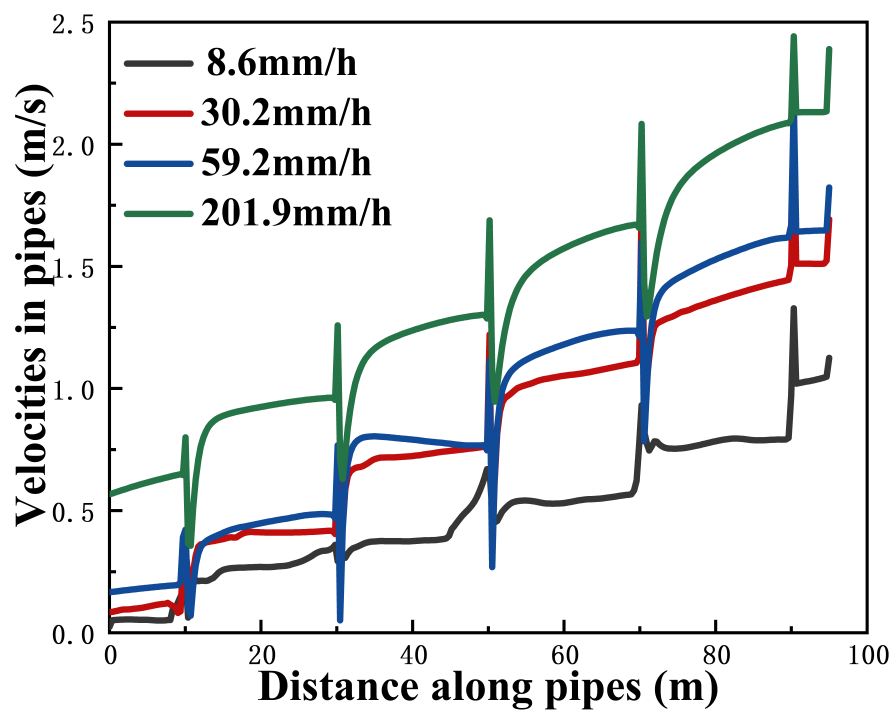
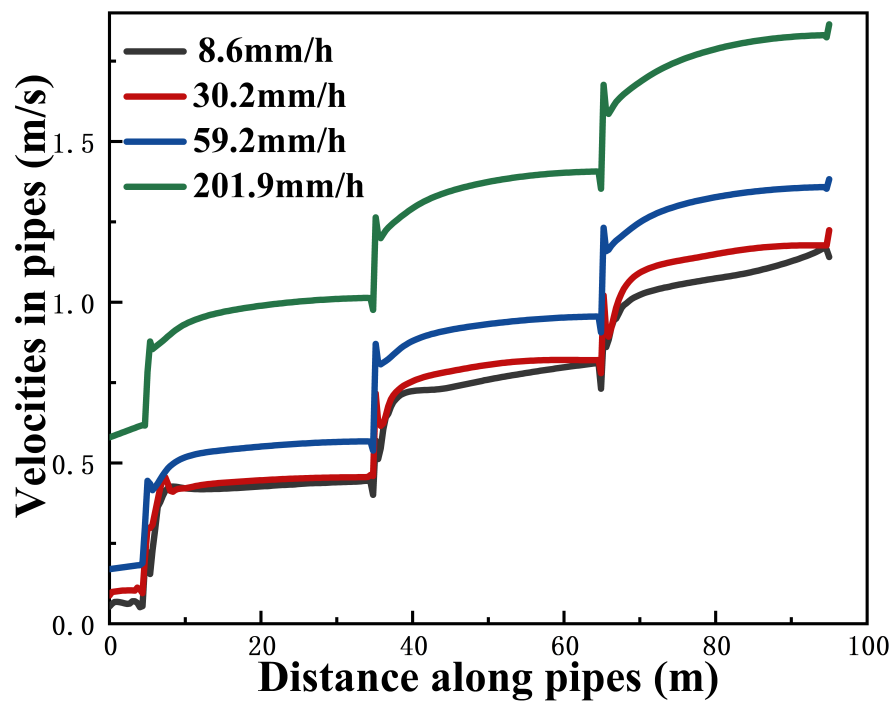


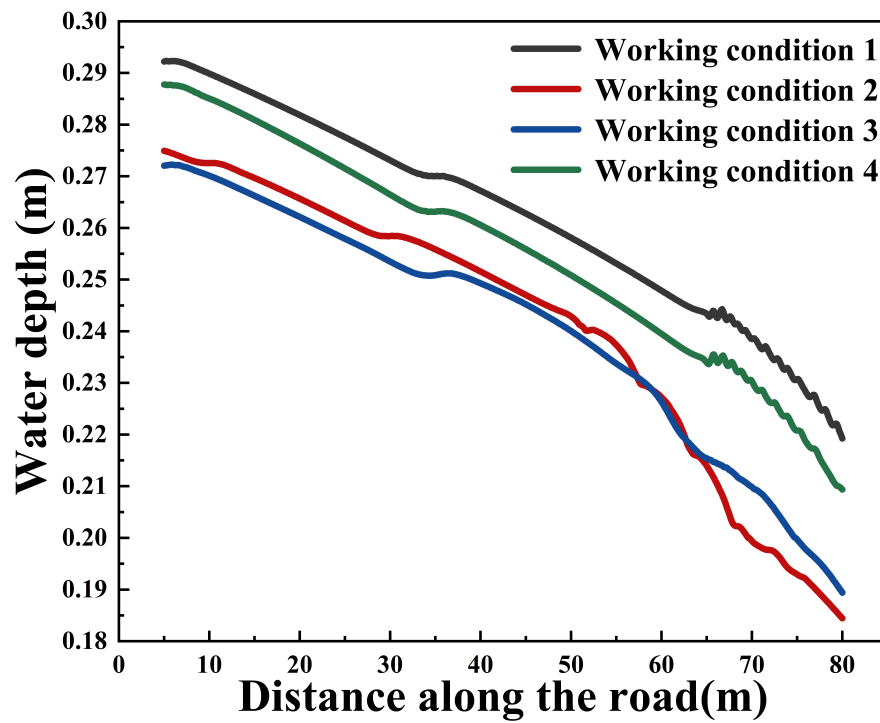
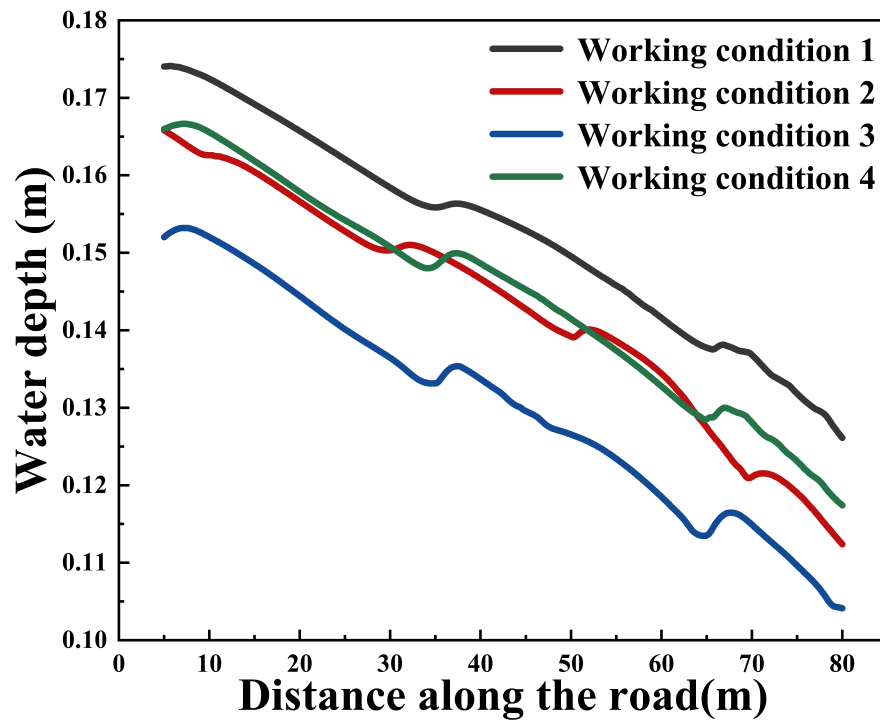


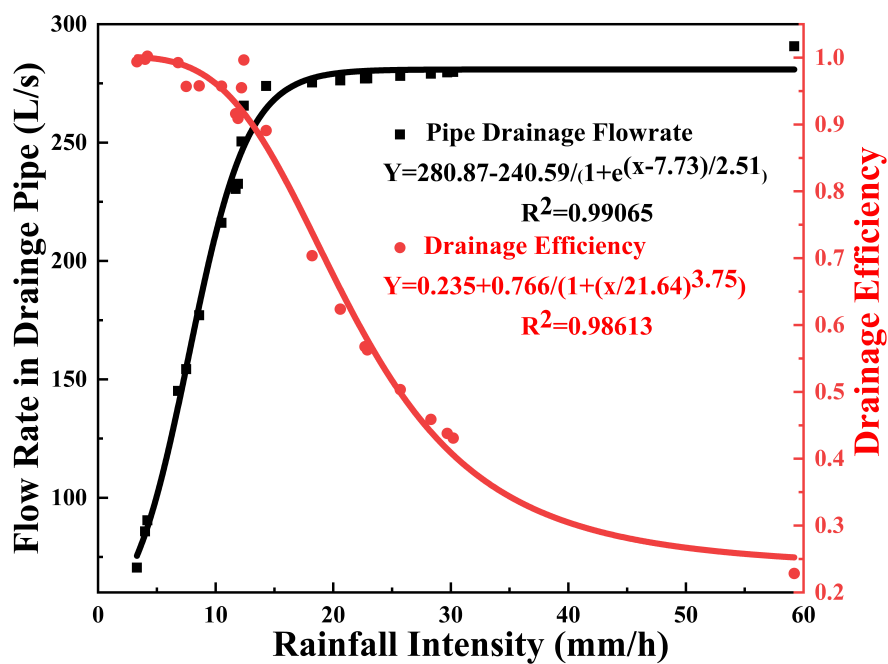
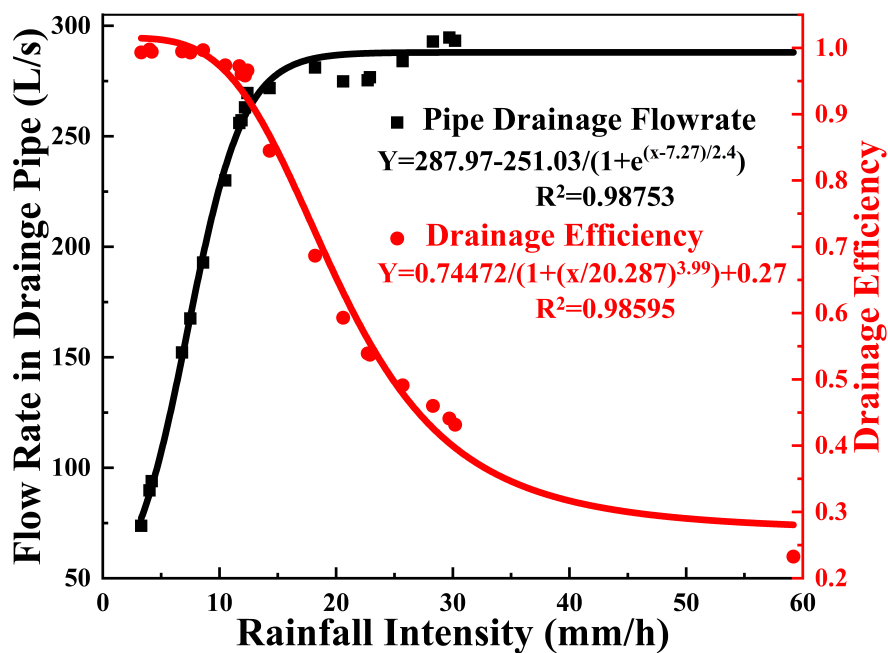




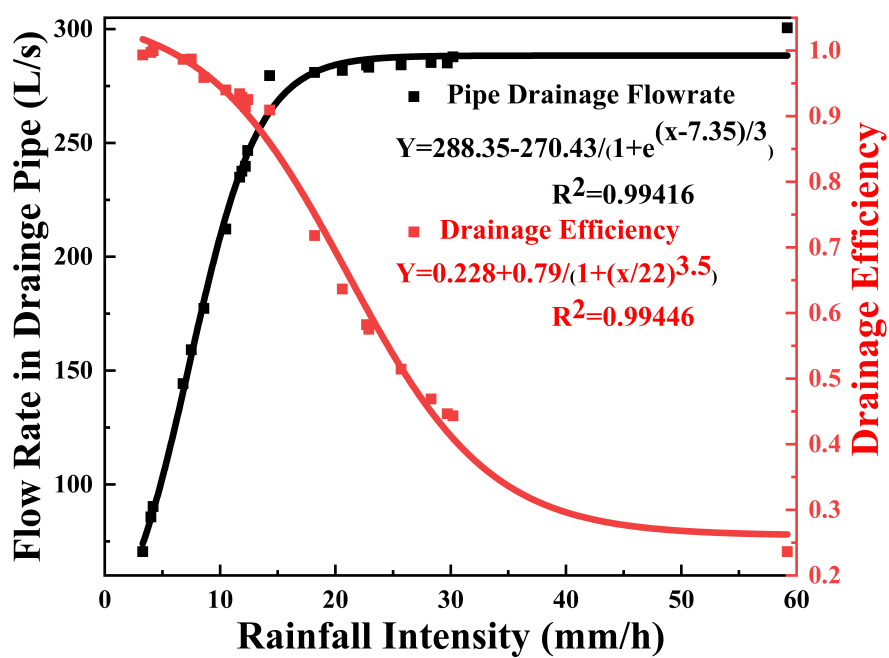
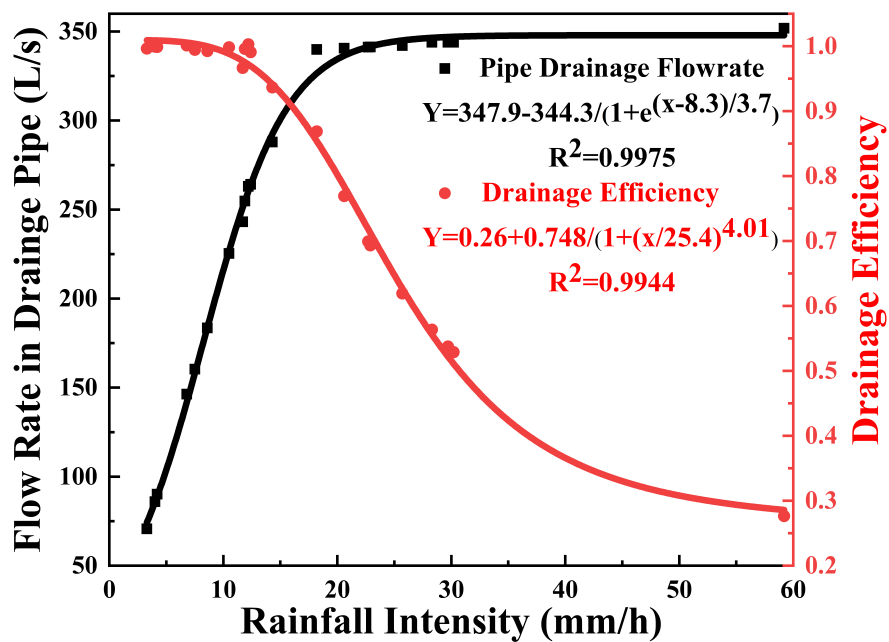


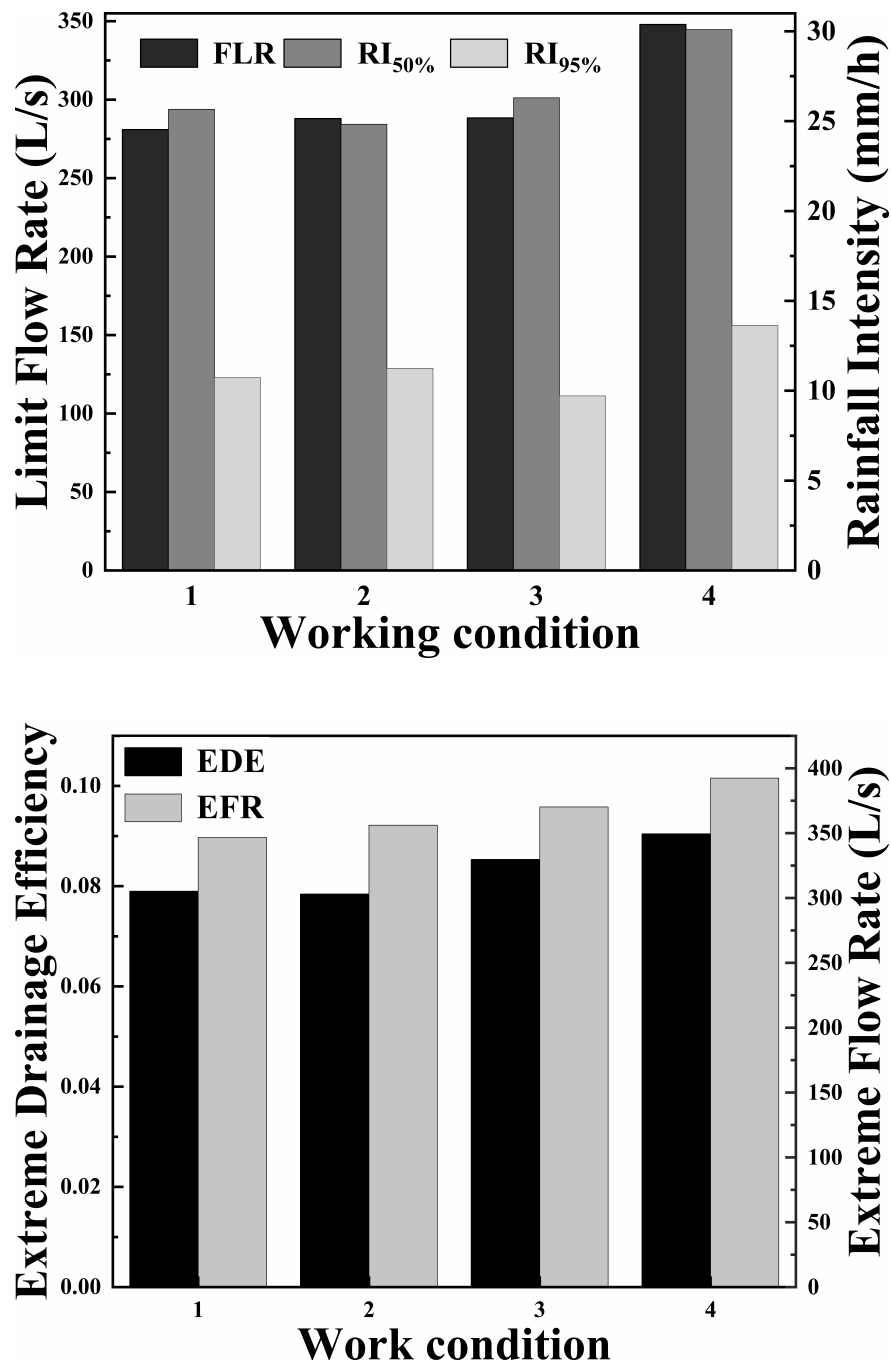












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