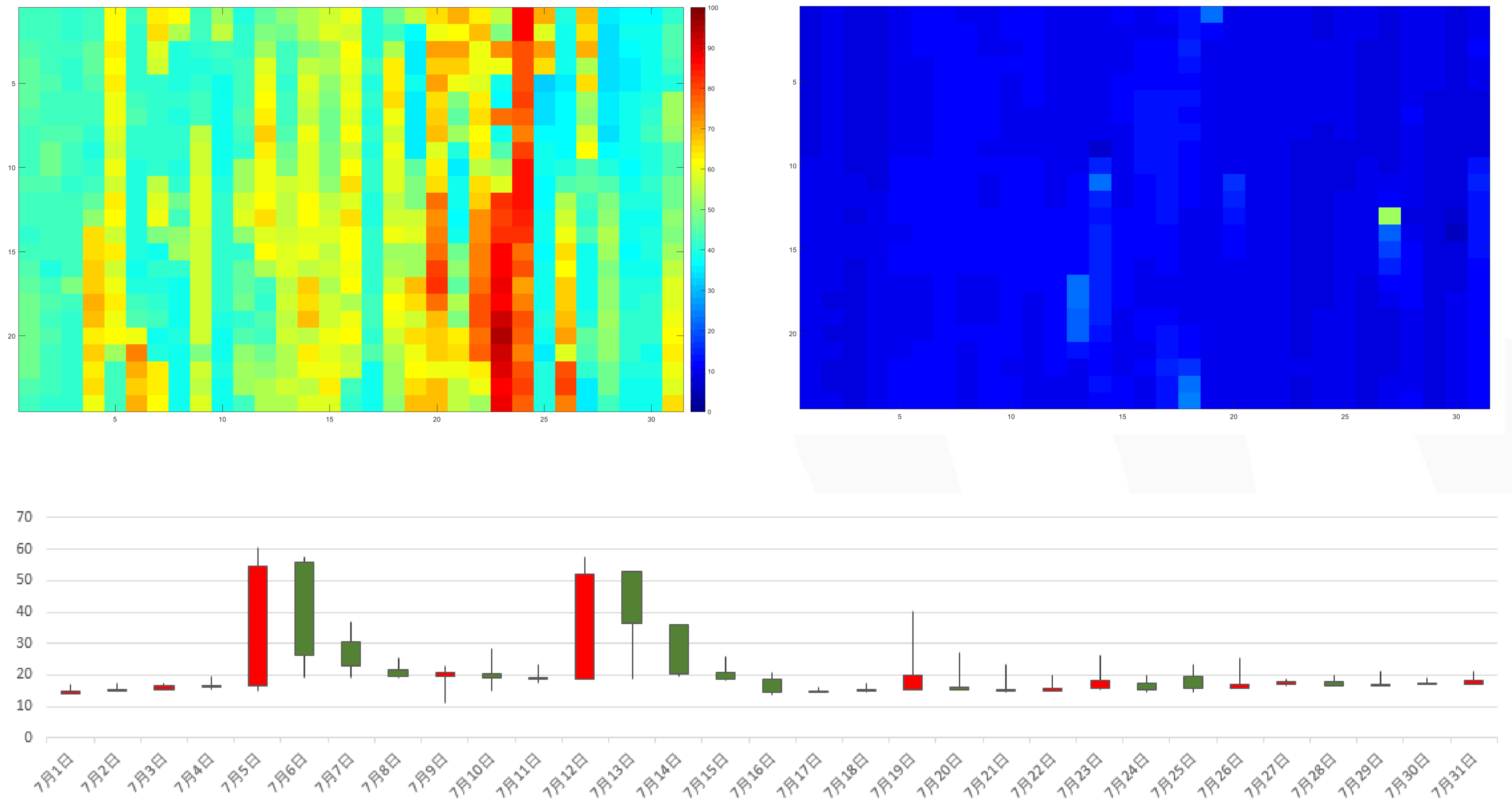


Simulation Analysis of Water Environment in Typical Watersheds of Beijing Based on System Dynamics Model

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Objectives

In recent years, the deterioration of urban water environment has become more prominent, and the sustainable development of cities has been restricted. Utilizing the self purification ability of rivers to scientifically discharge wastewater is an environmental engineering measure that can not only improve the water pollution situation of rivers, but also save on sewage treatment costs. Therefore, it is necessary to explore the characteristics of hydrodynamic changes and the laws of sewage dilution and diffusion in the watershed.



Methods

This study first draws spatiotemporal distribution maps of emissions from various monitoring stations, and explores the characteristics of pollutant emissions in both temporal and spatial dimensions, and then selects specific time and typical river basins; Next, based on the selected specific time and typical watershed, the Navier Stokes mathematical model is used to simulate the dilution diffusion field under hydrodynamic conditions; Finally, the simulation results were calibrated and validated using real-time monitored water quality data, and the flow velocity field and sewage diffusion field were studied under various conditions during the high and low water periods.

Results

Establish spatiotemporal distribution maps of various sewage outlets and typical sections, select July and January, and use the ADI method to discretize the control equations in the orthogonal curve coordinate system to simulate the hydrodynamic field of some typical watersheds in Beijing. Under different planned sewage discharge volumes, the dilution contour range near the discharge outlet is significantly different; Under different hydrological characteristics, the dilution and diffusion of sewage are also different, and the hydrodynamic conditions in some river basins are conducive to the dilution and diffusion of sewage; The current emissions have little impact on the urban water environment in Beijing; But if the sewage is not treated before discharge, the planned discharge into the river will seriously deteriorate the water quality, especially during the dry season.

Conclusions

The two-dimensional hydrodynamic mathematical model established in a typical watershed in Beijing can better reflect the hydrodynamic field of the watershed. Deeply understanding the laws of urban hydrological cycle and the characteristics of pollutant migration and transformation is of great significance for urban environmental protection, in order to provide reference for urban water environment governance and protection.

