

Digital Twinning Enables Smart Groundwater

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Abstract

As an important part of the water cycle in the basin, groundwater plays a very important role in stabilizing regional water resources and maintaining ecosystem functions. In order to achieve the target of "accurate forecasting, real-time warning, realistic rehearsal and on-site planning" of groundwater, the application and management of groundwater smart business are enabled, with digital twin technology as the core. The concept of intelligent groundwater system is proposed. The smart groundwater system is based on the implementation status of the national groundwater over-extraction treatment and river and lake recovery action. It aims to achieve the balance of groundwater recovery and replenishment, maintain the positive circulation and functional health of groundwater. The treatment and restoration of groundwater over-extraction areas is the core, the comprehensive treatment technology is the starting point, and the overall improvement of groundwater supervision capacity is the guarantee. Based on water awareness network, water information network, water cloud and physical environment, with spatial-temporal data as the base, groundwater model as the core and water knowledge as the drive, through digital twin, Internet of Things, big data, AI, virtual simulation and other technologies, The digital mapping, intelligent simulation and multi-scheme optimization of influencing factors of groundwater in physical basins and the whole process of over-extraction treatment and river and lake recovery management activities can realize synchronous simulation operation, virtual-real interaction and iterative optimization with physical basins. By relying on the groundwater data floor and knowledge platform, the groundwater numerical model is constructed to analyze the groundwater digital flow field in the study area and predict the groundwater dynamic characteristics in different periods. The early warning mechanism of groundwater overdrawn should be established by setting the threshold of groundwater level and water quantity control in different zones and intervals. Through rehearsing the dynamic process of groundwater under different scenarios and combining with real-time monitoring data, the plan under groundwater emergency scenario is formulated. The intelligent groundwater system with the functions of "forecast, warning, rehearsal and plan" can provide technical support for groundwater management and scientific research, enable intelligent groundwater, support precise decision-making of groundwater management, ensure national water security, promote ecological progress, sustainable economic and social development.

Keywords

Digital twinning technology; Intelligent groundwater system; "Four preplans" function; Groundwater numerical model; Data base plate; Knowledge platform.

