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Editorial

Water Resources Management Using High-Resolution Monitoring and Modelling

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Water resources' management at a high spatial and temporal resolution calls for data support at the relevant scales, which has long been hindered by the availability of high-resolution data. Thanks to the development of data acquisition, storage and processing techniques, the data acquisition and implementation have been enhanced to an unprecedented level. Data from new platforms, such as the GaoFen series from China, the Sentinel series from the EU and the Landsat series from the US, have become available, new approaches, such as AI, machine learning and Web of Things have been developed, and new platforms, such as the Google Earth Engine, have been utilized for water resources' management at a much higher resolution than that of traditional research. This Special Issue addresses the use of new sensors and approaches for water resource management and ecohydrological modelling at a high resolution, and covers the following topics:

(1) New sensor data for water resources' management;
(2) Novel approaches to extracting key ecohydrological variables;
(3) High-resolution ecohydrological modelling;
(4) AI models and approaches to monitor water disasters.

Field water use efficiency is an important parameter for evaluating the quality of field irrigation in irrigated areas, which directly affects the country's food security and water resource allocation. The cosmic-ray neutron sensor (CRNS), time-domain reflectometers (TDR) and automatic weather stations (AWS) were used to monitor meteorological and hydrological data such as SM, atmospheric pressure, and precipitation in the experimental area of Jinghuiqu Irrigation District for three consecutive years [1].

River discharge is crucial to water resources' development and ecological protection. Cai et al. [2], unmanned aerial vehicle (UAV) imagery was used to estimate river discharge at two river sections in the upper reaches of the Shiyang River in the eastern part of the Qilian Mountains based on the Manning formula. The estimated discharges at those two sections are 1.16 m^3/s and 3.11 m^3/s, respectively. Taking the discharges measured by an acoustic Doppler current profiler (ADCP) as the reference, the relative error of the estimates is below 5%, which is accurate for water resources' management in mountain basin regions [2].

Flooding in urban streams can occur suddenly and cause major environmental and infrastructure destruction. With increasing urbanization, it is critical to understand how urban stream channels will respond to precipitation events to prevent catastrophic flooding. This study uses the Prophet time series machine learning algorithm to forecast hourly changes in water level in an urban stream, Hunnicutt Creek, Clemson, South Carolina (SC), USA. Bolick et al. [3] collected terrestrial Light Detection and Ranging (LiDAR) data for Hunnicutt Creek to model these areas in 3D to illustrate how the predicted changes in water levels correspond to changes in water levels in the stream channel [3].

Ground validation of remote-sensing soil moisture requires ground measurements corresponding to the pixel scale. Song et al. [4] applied a measurement method of soil

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moisture using ground-penetrating radar (GPR) was proposed for the pixel scale. The authors used a PulseEKKOTM PRO GPR system with 250 MHz antennas to measure soil moisture by Fixed Offset (FO) method in four 30 × 30 m^2 plots chosen from the desert steppe [4].

Ki et al. [5] mapped the recharge potential of the existing aquifers, making use of remote sensing and GIS techniques to make a validation based on chloride and tritium contents in the borehole water [5]. Ji et al. [6] proposed a method combining a pixel-level water index and image object detection. The method was tested using 2018/2019 multispectral 4 m resolution images obtained from the Chinese satellite Gaofen-2 across Beijing, China [6]. We propose a method to map spring irrigation areas using historical meteorological data, the main crop phenological characteristics, irrigation regimes, and MODIS land-surface temperature (LST) products [7]. Gui et al. [8] generated a new method for river channel extraction, which is based on the combination of Jenks natural breaks classification method and a digital elevation model (DEM); then, the river channel range is complemented by the water range monitored by GF-1(Gaofen-1 satellite) in flood season [8].

Combining geostatistical methods and GIS technology, the spatial variability and distribution pattern of soil moisture and the influencing factors of spatial variation and surface soil moisture (0–7 cm) on a typical karst shrub–grass hillslope were analyzed in this research [9]. Luo et al. [10] selected the Huajiang dry-hot valley region in southwest China as the research object, aiming to comprehend the soil calcium distribution characteristics of different altitudes and vegetation types in this karst dry-hot valley region [10].

Ro et al. [11] evaluated the effect of considering data intermittency and log-normality in simple Kriging applications [11].

These new research studies present the application of new sensor, UAV remote sensing and satellite remote sensing techniques in soil moisture monitoring, river discharge calculating, aquifer recharge assessment, urban stream flooding evaluations, etc. They will enlighten and provide help to hydrological scientists and water resources' governors worldwide.

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