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Editorial

Physical and economic processes of water scarcity and water allocation for integrated river basin management

Water scarcity and stress have attracted increasing attention as water has become increasingly regarded as one of the most critical resources in the world's sustainable development. Water allocation is correlated to the land use and cover changes (LUCC), population distribution, economic development, climate changes, and environmental governance. These factors physically alter surface energy for water balance through the changes in Net Primary Productivity (NPP) of vegetation (Haiming Yan et al.), and natural resource productivity, simultaneously, financially and interactively influence on water allocation for socio-economic development (Xiangzheng Deng et al.). Therefore, it is very important to figure out a mechanism of water allocation in the course of LUCC (Xiangzheng Deng et al.; Hasan Ozdemir and Emre Elbaşı), climate and economic changes at various spatial and temporal scales.

Among the 14 accepted papers in this special issue, several advances have been achieved. Firstly, the observed data has been enhanced. Based on input–output analysis, water resource are quantitatively depicted for further understanding water allocation through diverse industries (Xiangzheng Deng et al.). Furthermore, by employing streamflow simulations, the reclassified data with Soil Water Assessment Tool (SWAT) well support modelling frameworks and its application for simulating downscaling dynamics of LUCC (Feng Wu et al.). Calibration and validation of simulated results well illustrate streamflows from upstream to downstream of Heihe River Basin and its sub-watersheds as Hydrological Response Units (HRUs) within a snowmelt process with a glacier melting module in SWAT model (Feng Wu et al.).

Secondly, a comprehensive methodology of coupled models has been improved. The combination of various techniques has been comprehensively implemented, especially some integrated models stand out. For instance, based on techniques and indices of remote sensing and Geographic Information System (GIS), Weather Research and Forecasting model (WRF) and GIS data have been synthetically applied to study the impact of land use and land cover change on surface energy and water balance (Xiangzheng Deng et al.). Based on socio-economic statistics, water is introduced into the ORANI-G model to analyze the water productivity by using the nested constant elasticity of substitution (CES) production function (Jinyan Zhan et al.). New approaches have also been developed. For research on physical water process in ecosystem, Zhixiang Lu et al. have used parameter transferability and model validation to calibrate the model (Zhixiang Lu et al.). Allocation coefficient was applied to separate water footprints of hydroelectric power from the reservoir water footprint (Dandan Zhao and Junguo Liu). Scenario simulation method has been widely used to address the practical problems, for example, a two-dimensional mathematical model has been employed to simulate the flow and heat transport in wind-driven process (Le Feng et al.). For research on socio-economic water scarcity and allocation, three-nested CES function are developed to analyze impacts of water reallocation on economic performance based on classified land use data at both provincial and multi-regional level (Xiangzheng Deng et al.; Zhan Wang et al.).

Thirdly, case studies have presented the references for water management. Water allocation induced land use changes may occur in arid area (Xiangzheng Deng et al.). Uneven distribution of population with unbalanced economic development may lead to severe regional water scarcity (Conglin Zhang et al.). Government investment on water project physically alter surface water allocation as well as finically alter business cycle for water reallocation among diverse industries (Zhan Wang et al.). Through different natural elements, water as a crucial natural resource have huge impacts on regional agriculture, and ecological security (Mansi Janmaijaya et al.). Qian Zhang et al. adopted Water Poverty Index (WPI), an interdisciplinary but straightforward measure that considers water availability from both a bio-geophysical perspective and the socio-economic perspective of people's capacity to access water, to measure spatio-temporal patterns, trajectories, and typologies of water stress and evaluate the governance of the water (Qian Zhang et al.). Hence, water resource is addressed to play a significant role on both agricultural productivity and farmers' income (Gui Jin et al.). Water management system for controlling water pollution has been put forward in a new norm (Yikang Rui et al.).

This special issue of the journal of *Physics and Chemistry of the Earth* intends to advance our understanding of soil earth, geodesy, hydrology, oceans, atmosphere, solar-terrestrial and planetary science. The published papers on this journal will provide useful references for future study.

Xiangzheng Deng
R.B. Singh
Junguo Liu
Burak Güneralp

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