

EGU2020-8601

<https://doi.org/10.5194/egusphere-egu2020-8601>

EGU General Assembly 2020

© Author(s) 2020. This work is distributed under the Creative Commons Attribution 4.0 License.



Modeling effects of plastic mulching on crop yields and water productivity in the middle Heihe River Basin

Wang Zhang¹ and Chunmiao Zheng²

¹Institute of Water Sciences, College of Engineering, Peking University, Beijing, China (zhangwang@pku.edu.cn)

²School of Environmental Science and Engineering, Southern University of Science and Technology, Shenzhen, China (zhengcm@sustc.edu.cn)

Plastic mulching is an effective field practice to improve crop water productivity (WP), especially widely used in arid and semi-arid areas. The positive effects of soil mulching on crop yield and WP have been studied through numerous field experiments and simulations at the site scale. However, few studies have focused on the mulching effects at the regional scale. Zhangye oasis, a typical arid region in the middle Heihe River Basin, was chosen as the study area. Global sensitivity analysis was applied to determine the most sensitive parameters in AquaCrop model. Based on the results of global sensitivity analysis, soil and crop parameters of AquaCrop model were calibrated and validated using field observations from three stations. The normalized root mean square error (NRMSE) values for soil water content, seed maize canopy cover, aboveground biomass, yield, spring wheat canopy cover, aboveground biomass and yield were 18.7%, 6.7%, 23.5%, 12.5%, 10.7%, 24.2% and 15.0% during the calibration period, and the corresponding values during the validation period were 25.1%, 7.0%, 22.2%, 17.7%, 9.1%, 23.6% and 11.7%, respectively. These values indicated the calibrated model performed well to simulate the soil water content and crop growth. Compared with no-mulching, the average soil water content during the growth period, seed maize yield and WP under mulching had been increased by 8.8%, 3.0% and 3.0%, respectively. The results demonstrated that plastic mulching could effectively improve the yield and WP of seed maize, which not significantly on spring wheat. This study offers a quantitatively analysis for plastic mulching applications at the regional scale.