Analysis of influencing factors on the Budyko parameter and the application of Budyko framework in future runoff change projection

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Quantifying precipitation partition into evapotranspiration and runoff is of great importance for global and regional water availability assessment. Budyko framework serves as a powerful tool to make simple and transparent estimation for the partition with a single parameter. To extend the theory in predictability of water availability, series of works have been done. First, we employed the multivariate adaptive regression splines model to estimate the sole parameter of Budyko-type equations and their influencing factors in Budyko framework across China using a data set of long-term averages for climatic seasonality, catchment characteristics and agricultural activities. Subsequently, a bivariate probabilistic Budyko approach was developed using copula-based joint distribution model to quantify the predictability of water availability. Moreover, based on Budyko hypothesis, we projected future runoff change and its key influencing factors in 35 watersheds across China using a climate elasticity method, which is developed based on Budyko hypothesis and enhanced by selecting the most effective Budyko-type formula.