EGU2020-12162
https://doi.org/10.5194/egusphere-egu2020-12162
EGU General Assembly 2020

Watershed water-energy balance dynamics and their association with diverse influencing factors at multiple time scales

Shengzhi Huang, Jing Zhao, and Kang Ren
Xi'an University of Technology, Xi'an, China (huangshengzhi7788@126.com)

The Budyko curve is an effective tool for estimating how precipitation (P) partition into evapotranspiration (E) and streamflow (Q). Controlling the shape of the Budyko curve, the Budyko parameter represents the superimposed impact of various periodic factors (including climatic factors, catchment characteristics, teleconnection factors and anthropogenic activities) on the watershed water-energy balance dynamics, and such superimposed impact is not conducive to identifying the driving factors of the dynamic change of Budyko parameter at different time scales, and thus affect the parameter estimation. Here we obtain the dynamic change of Budyko parameter for the Wei River Basin (WRB)-a typical Loess Plateau region in China based on a 11-years moving window, and then adopt the Empirical Mode Decomposition (EMD) method to reveal the relationships between influencing factors and Budyko parameter series at multiple time scales by considering the interplay among different influencing factors. Results indicate that (1) Budyko parameter series are decomposed into 4-, 12-, 20-, exceeding 20-year time scale oscillations and a residual component with an significantly increasing trend in the upstream of the WRB (UWR) and the middle and lower reaches of the WRB (MDWR), a non-significantly decreasing trend in the Jing River Basin (JRB) and Beiluo River Basin (BLRB); (2) by analyzing the residual trend component, evaporation ratio (E/P), soil moisture (SM) and effective irrigated area (EIA) are found to induce the significant increase of parameter in the UWR, whereas that in the MDWR is dominated by baseflow (BF) and Niño 3.4; (3) parameter dynamics at the 4-year time scale is dominated by E/P, aridity index (E_p/P), BF and SM; BF, PDO and sunspots attribute to the dynamics at 12-year time scale; all the factors except BF and SM contribute to the dynamics at 20- or exceeding 20-year time scales. The results of this study will help identify the connection between watershed water-energy balance dynamics and changing environment at multiple time scales, and also be beneficial for guiding water resources management and ecological development planning on the Loess Plateau region.