

Evapotranspiration Estimation Study Based on Coupled Water-energy Balance Theory in River Basin

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Abstract

Basin evapotranspiration is the result of water balance and energy balance, which is affected by climate and underlying surface characteristics, the process is complex, and spatial and temporal variability is large, the evapotranspiration estimation of river basin is an important but difficult problem in the field of hydrology, over the years, many scholars devoted to the basin actual evapotranspiration estimation and achieved excellent results.

We discuss Budyko coupled water-energy balance theory and evaporation paradox, then use the Fu's equation to estimate actual evapotranspiration yearly in different areas with different dryness. The result shows that Fu's equation has high precision for estimating evapotranspiration yearly in our selected study area, and the estimation result has higher precision in the area with high dryness. Then, we propose an improved formula which can be used to estimate actual evapotranspiration monthly. Furthermore, we found that the parameter in the formula reflects general conditions of underlying surface and it is affected by several factors, at last, we tried to propose the calculation formula.

The study indicates that Fu's equation provides a reliable method for evapotranspiration estimation in dry regions as well as semi-humid and semi-arid regions, which has great significance for forecasting river basin water resources and inquiring into ecological water requirement.

Keywords : Coupled water-energy balance, Budyko hypothesis, Fu's formula, Evapotranspiration

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