Evaluating the advection-aridity model of evaporation using data from field-sized surfaces of HEIFE

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Abstract The advection-aridity model for estimating daily evaporation is evaluated using the data of the HEIFE experiment. In the dimensionless form of the model, the evaporation ratio (the ratio of the actual evaporation ($E$) to Penman potential evaporation ($E_0$)) is expressed as a linear function of the proportion of the radiation term ($E_{rad}$) in $E_0$. Because the value of the evaporation ratio is between 0 and 1, the advection-aridity model is only applicable under a certain range of $E_{rad}/E_0$, and the applicability of the model is influenced by the water availability of the surfaces implied by $E_{rad}/E_0$ from atmospheric conditions. The calculated evaporation ratio is negative for small values of $E_{rad}/E_0$, and is larger than 1 for large values of $E_{rad}/E_0$. Significant systemic bias would be presented if the advection-aridity model underestimated the actual evaporation under dry conditions and overestimated under wet conditions. A comparison between the reference values of the mean daily evaporation of the Gobi desert and oasis surfaces obtained by the eddy correlation method and evaporation estimates from the advection-aridity model validated the analysis.

Key words complementary relationship; advection-aridity model; HEIFE