Modeling the Land Surface Energy Balance Model of Heihe River Basin with STELLA and Applications in Spatial Modeling Environment

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The land surface energy balance model is a bridge which links the land surface models (LSMs) and the atmospheric global circulation models (GCMs) together. It plays a crucial role in any models which characterize the land surface processes. Moreover, to describe the land surface models accurately and visually is significant to understand the dynamic balance of land surface energy budget. With a visualized and use-friendly modeling tool, STELLA software, this article took the middle reaches of the Heihe River Basin as experiment region and constructed an explicit iconic model of land surface budget, which could help researchers to visually understand and comprehend the land surface energy budget process and its effect in hydrological, ecological and biogeochemical researches in the Heihe River Basin. In the STELLA model of land surface energy balance designed in this article, the evapotranspiration (ET) submodel adopted two widely used approaches for contrast, which were the FAO (Food and Agriculture Organization of the United Nations) Penman–Monteith method and the modified Priestley–Taylor method. The land surface energy fluxes simulations of the STELLA model were verified by local flux observations of eddy covariance system. Researchers can construct model easily and describe the real world process clearly via STELLA, however, the model can not be spatial distributed, which is a basic requirement of Geography. Consequently, the constructed visual land surface energy model was introduced into the Spatial Modeling Environment (SME). Finally, the SME model simulated land surface energy budget in the middle reaches of the Heihe River Basin and obtained spatial distributed and time series fluxes data of land surface energy budget.

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