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The Spatiotemporal Variability of Evapotranspiration and its Response to Climate Change and Land Use/Land Cover Change in the Three Gorges Reservoir

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The construction of the Three Gorges Reservoir (TGR) has changed its land use/land cover (LUCC). Under the background of global climate change, the evapotranspiration (ET) in the TGR is also changing. As one of the most important components of the terrestrial water cycle and energy balance, ET plays a crucial role in regulating local or regional climate. The study on the spatiotemporal variability of ET is helpful to understand the variation trend and rule of various fluxes in the process of water cycle and energy balance, and also provides powerful decision support for water resource allocation in agriculture, forestry and other industries in the TGR. In this paper, CLM4.5 land surface model was used to simulate and analyze the spatiotemporal variability of ET during the period 1993-2013. And four experiments were conducted to quantify the contribution rate of climate change and LUCC. Results showed that compared with the remote sensing ET product, the CLM4.5 land surface model can better represent the spatial distribution characteristics of ET, especially in the farmland area. The mean annual ET in the TGR was 586 mm from 1993 to 2013, and it increased at a rate of 2.38 mm/year, which passed the significance test at 0.05 level. The ET in the river, grassland and forest area showed an increasing trend, while that in the farmland and urban area showed a decreasing trend. Compared with the first decade, the mean annual ET increased by 19.13 mm in the second decade. Through the four experiments, we conclude that climate change was the dominant factor causing the increasing trend from March to August, while LUCC was the dominant factor causing the decreasing trend from September to February. From the perspective of spatial distribution, LUCC is the dominant factor in the urban and canyon area on both sides of the river, while climate change is the dominant factor in the farmland, grassland and forest area.