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Assessing ET temporal & spatial pattern change along with adjustment of crop planting structure using multi-source remote sensing data

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Timely, accurate estimation of evapotranspiration (ET) spatial distribution has great importance in drought estimation, irrigation management and water resources comprehensive utilization. Remote sensing (RS) has been considered as the most promising tool for evapotranspiration (ET) estimation at regional scale. However, lack of large-scale cultivation leads to fragmentary and patch fields in most areas in northern China, while the crop planting structure tends to change frequently due to salinization and other economic drivers. Moreover, errors implied in the process of extrapolating instantaneous latent heat flux derived at satellite over-passing time to daily ET inevitably constrains the application of RS model. Thus, ET estimation with higher spatial resolution and better temporal extrapolation accuracy is considered the key issue solving the above mentioned problems. The aim of this study is to estimate and assess the ET temporal & spatial pattern, especially the inter-annual variation under the situation of crop planting structure change by applying multi-source remote sensing data. To this end, a typical irrigation district along the upper stream of Yellow river was chosen as the study area, and both Landsat 7 ETM+ data as well as MODIS land surface products on boarded Terra and Aqua satellites are used. The crop planting structure from 2000 to 2015 with major crop types were first extracted by coupling both Landsat and MODIS data using a data fusion approach. Then by establishing a single layer ET model (SEBS in this study) with an improved temporal up-scaling method from instantaneous level at satellite over-passing time to daily level, ET estimation with high spatial resolution during the same period with crop planting structure were derived with both Landsat and MODIS data. The ET estimation performance was evaluated by field measurements and regional water balance model, and an analysis of ET temporal & spatial pattern according to the change of crop planting structure and groundwater level was also made. The results give a possible solution to water demand estimation at patched fields by no means of intensive measurements, which has a high application value in agricultural water management.