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Inter-comparison of remotely-sensed actual evapotranspiration products in the Zayandehrud river basin, Iran

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Accurate estimation of evapotranspiration (ET) helps to create a better understanding of water allocation, irrigation scheduling, and crop management especially in arid and semiarid regions where agricultural areas are far more affected by water shortage and drought events. Remote sensing (RS) facilitates estimating the ET in regions where long-term field measurements are missed. In this study, we compare the performance of free open-access remotely sensed actual ET products at eleven counties of the Zayandehrud basin. The Zayandehrud basin, one of the major watersheds of Iran, suffers from recurrent droughts and long-term impacts of aridity. The RS products used in this study are namely WaPOR (2009-2019), MOD16A2 (2003-2019), SSEBOP (2003-2019). We also merged the two products of SSEBOP and WaPOR and assessed its performance. To prepare the Merged ETa Product (MEP), WaPOR was resampled to the spatial resolution of SSEBOP. Then, the average pixel values of the resampled ETa product and SSEBOP were calculated. To compare ETa estimations over croplands in each county, maximum Normalized Difference Vegetation Index (NDVI) maps at annual scale (2003-2019) were prepared using LANDSAT 5, 7, and 8 images. Annual mean ETa estimations were then extracted over croplands by using annual maximum NDVI layers. We compared the RS-based ETa with reported long-term ETa values extracted from the local available literature. Our results showed a consistent underestimation of MOD16A2 in all counties. The MEP and WaPOR outperformed other products in the estimation of ETa in seven. Estimations of WaPOR and SSEBOP agreed in most of the counties. Our analysis displayed that, although MOD16A2 underestimated ETa values, it could together with SSEBOP capture the drought better than that of WaPOR and MEP in the lower reaches of the basin. Further study is needed to evaluate the monthly and seasonal performance of RS-based ETa products.