Using Temperature-Soil Moisture Dryness Index for Rapid Evapotranspiration Estimation

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Evapotranspiration (ET) estimation is crucial for the efficient water resource management and precise irrigation under the context of climate change. Remote sensing (RS) can be used to estimate the ET with high spatial and temporal resolution to combat the limited coverage of in-situ measurements. Recently-developed Temperature-Soil Moisture Dryness Index (TMDI) derived from remote sensing data has been demonstrated its suitability in evaluating ET. The TMDI is empirically calculated using the Land Surface Temperature (LST) and Normalized Difference Latent Heat Index (NDLI). This study aims to examine the TMDI's usefulness for estimating ET and water consumption over south-western Taiwan by using Landsat 8 OLI/TIRS data acquired in 2017. As the Surface Energy Balance Algorithm for Land (SEBAL) has been commonly used to derive ET, it is used to evaluate the TMDI's performance in ET prediction in this study. The results reveal that the ET extracted by the TMDI is in line with the ET derived from SEBAL model, with a high correlation (R) of 0.86 and a small Root Mean Square Error (RMSE) of 0.03 mm. The TMDI is proven to be an effective method for ET estimation. Further exploitation of TMDI in deriving ET will be crucial for irrigation management in data-scarce areas.

Keywords:Evapotranspiration, Landsat-8 data, Surface Energy Balance Algorithm for Land (SEBAL), Temperature-Soil Moisture Dryness Index (TMDI)