

Modification of the standardized precipitation evapotranspiration index for drought evaluation

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Abstract Deficiencies of the standardized precipitation evapotranspiration index (SPEI) were identified. Using monthly precipitation, temperature and soil available water capacity datasets, we generated a new standardized water balance-derived index (SWBI) through a moisture departure probabilistic approach. The moisture deficit/surplus was calculated at different temporal scales and several techniques were used to adjust the time series to a generalized extreme value distribution. Comparisons of historical records of multiple indices show that the SWBI is highly consistent and correlated with the corresponding SPEI and self-calibrated Palmer drought severity index. The SWBI is most robust and preferable to the SPEI in spatial consistency and comparability, and it combines the simplicity of calculation with sufficient accounting for the physical nature of water supply and demand relating to droughts, all making it promising to serve as a competent alternative and reference to drought monitoring and assessment.

Key words drought analyses; multiple indices; water balance; probability distribution; standardized index