

Using the multiple linear regression based on the relative importance metric and data visualization models for assessing the ability of drought indices

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ABSTRACT

In this study, the power of 12 of the most widely used meteorological drought indices was compared. For this purpose, the datasets of 12 stations (from 1967 to 2021) with different climatic conditions in Iran were used. For statistical analysis, multiple linear regression based on the relative importance metric introduced by the Lindeman, Merenda, Gold (MLR-LMG) and data visualization (DV) models were used. In the temporal assessment, the relative importance metrics (RIM) between the drought severity based on the different drought indices and the annual yield of rain-fed winter wheat (AYW) based on the fitted MLR-LMG model was investigated at the annual timescale in the chosen stations. In the spatial evaluation, the RIM between the drought severity based on the different drought indices and the AYW were investigated each year (1967, ..., 2021). The results showed that in temporal assessment, the modified standardized precipitation evapotranspiration index (MSPEI) was the most suitable (58.33% of selected stations). Also, in spatial evaluation, the MSPEI and Z-score were the most efficient drought indices (65.45% and 27.27% of the years, respectively). The validation results of the fitted MLR-LMG models showed that the models were trustworthy in all stations and all years.

Key words: annual yield, data visualization, drought indices, MLR-LMG, winter wheat

HIGHLIGHTS

- In this study, 12 drought indicators were evaluated and compared.
- New statistical models (multiple linear regression based on the relative importance metric introduced by the Lindeman, Merenda, Gold and DV models) were used for comparing drought indices.
- The relationship between drought and annual yield of rain-fed winter wheat was assessed in temporal and spatial forms.
- The research findings are applicable in any region with any climatic conditions.
- Results help to select the best drought index for assessing drought conditions.