

Standardized precipitation-evapotranspiration index (SPEI): Sensitivity to potential evapotranspiration model and parameters

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Abstract The Standardized Precipitation-Evapotranspiration Index (SPEI), a variant of the WMO-recommended Standardized Precipitation Index (SPI), has significant potential as a meteorological drought index because it uses a more comprehensive measure of water availability, climatic water balance. However, inclusion of PET, a derived term, requires rigorous testing before the index gains wide acceptance. This study addresses whether the SPEI differs significantly from the SPI and tests its sensitivity to the choice of PET method by first comparing derived PET and then SPEI/SPI across 3950 gridded land cells in Europe using five commonly used PET methods with different complexity and input requirements. The SPEI was found to differ significantly from the SPI and the resulting PET and SPEI values found to group according to the PET radiation term. The mass transfer term, which integrates wind speed and humidity/pressure, was found to have a secondary effect on PET and no detectable effect on SPEI.

Key words drought index; sensitivity; drought; meteorological drought; potential evapotranspiration; standardized precipitation index; SPI; SPEI