EMS Annual Meeting Abstracts,
Vol. 6, EMS2009-59, 2009
9th EMS / 9th ECAM

9th EMS Annual Meeting
9th European Conference on Applications of Meteorology
High resolution meteorology
- applications and services

A multi-scalar drought index sensitive to global warming: The Standardized Precipitation Evapotranspiration Index - SPEI

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We propose a new climatic drought index: the Standardized Precipitation Evapotranspiration Index (SPEI). The SPEI is based on precipitation and temperature data, and has the advantage of combining a multi-scalar character with the capacity to include the effects of temperature variability on drought assessment. The procedure to calculate the index is detailed, and involves a climatic water balance, the accumulation of deficit/surplus at different time scales, and adjustment to a Log-logistic probability distribution. Mathematically, the SPEI is similar to the Standardized Precipitation Index (SPI), but includes the role of temperature. As the SPEI is based on a water balance, it can be compared to the self-calibrated Palmer Drought Severity Index (sc-PDSI). We compared time series of the three indices for a set of observatories with different climate characteristics, located in different parts of the world. Under global warming conditions only the sc-PDSI and SPEI identified an increase in drought severity associated with higher water demand due to evapotranspiration. Relative to the sc-PDSI, the SPEI has the advantage of being multi-scalar, which is crucial for drought analysis and monitoring.