ABSTRACT

Drought is a natural phenomenon that has widespread and significant effects on the global economy, environment, industries, and communities. early drought detection allows for the implementation, mitigation strategies and measures before its occurrence. Therefore, drought assessment is critical in the planning and management of water resource systems, particularly during dry climatic periods. However, assessing droughts is not always simple.

This study described and evaluated drought conditions in Campania (southern Italy) using an in-situ measurement database that spans a centennial period from 1918 to 2019. With the assistance of these tools, water managers may more accurately assess droughts and prepare in advance for water management operations during droughts. Since water resource management in our area was crucial, the Campania region in southern Italy was selected as the case study region. To achieve the objectives of this study, an analysis of the precipitation coefficient of variation, assumed as index of inter-annual climate variability, was first performed over the period 1918-2015. Based on the findings of the above analysis and with the aim of reconstructing continuous long-term monthly scale precipitation time series, the in-situ point measurements (observed at the rain gauge locations) for the two datasets were projected on a 10×10 km resolution grid covering the whole region by using a geostatistical interpolation approach.

Standardized Precipitation Index (SPI) and Standardized Precipitation Evapotranspiration Index (SPEI) time series were reconstructed for different accumulation timescales (from 3 to 48 months) to explore the full range of drought types. The modified Mann–Kendall and Sen's tests were applied to identify SPI and SPEI changes over time. In addition, the impact of the vegetation stress to better understand causes of the drought phenomenon was evaluated. Drought characteristics (Duration, severity and peak) were furthermore investigated for both moderate (SPI/SPEI ≤ -1) and extremely severe conditions (SPI/SPEI ≤ -2).

Spatial autocorrelation was used too, to evaluate whether the different events studied have similar characteristics in terms of spatial aggregation, i.e., if there are areas increasingly affected by drought and how they are affected. The same events in which drought was already assessed with the SPI and SPEI indices were taken into consideration, i.e., the events of 1962, 1989, 2003 and 2017.