



Evaluation of ERA5-Land reanalysis data for drought monitoring: Comparison with observation-based drought indices in Sicily

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Effective drought monitoring using standardized indices relies on long, continuous hydrometeorological records. Reanalysis datasets such as ERA5-Land are widely adopted because of their spatial completeness and temporal consistency; however, systematic biases in precipitation and temperature may affect derived drought indicators, including SPI and SPEI. This study evaluates the performance of ERA5-Land for drought monitoring in Sicily, a region characterized by complex topography, frequent drought events, and the availability of long-term observational data.

ERA5-Land precipitation and temperature were evaluated against a gridded observational dataset spanning 1951–2013 using correlation, Nash–Sutcliffe Efficiency (NSE), and RMSE metrics. Temperature was well represented by ERA5-Land, with correlations exceeding 0.9 and NSE values above 0.8. In contrast, precipitation showed lower accuracy, with correlations between 0.6 and 0.8, NSE values frequently below 0.5, and RMSE ranging from 20 to 80 mm.

These biases influenced the resulting drought indices. Multi-year SPI and SPEI (24–48 months) showed acceptable agreement with observational estimates (linear correlations of 0.75–0.9), whereas short-term indices displayed poor performance, in some cases yielding negative NSE values. Overall, the findings demonstrate that while ERA5-Land data can support drought monitoring in Mediterranean regions, their use may require careful bias correction, particularly for short-term drought assessment and for operational use in agriculture and water resources management under complex climatic and topographic conditions.