Análisis multiescalar de las sequías en el noroeste de África y su relación con índices de teleconexión

Multi-scale analysis of northwest African droughts and their relationship with teleconnections indices

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RESUMEN

This study analyses the temporal evolution and teleconnection drivers of drought in Northwest Africa (NA) between 1950 and 2022 by utilising the Standardised Precipitation Index (SPI) across 48 timescales, through which 102 drought events were identified at the 1-month scale. SPI at 48 time scales was correlated with several climate modes, including the Bivariate ENSO Timeseries (BEST) representing the El Niño–Southern Oscillation (ENSO), the North Atlantic Oscillation (NAO), the Tropical Northern Atlantic (TNA) index, the Mediterranean Oscillation Index (MOI), and the Western Mediterranean Oscillation (WeMO). The results indicate a statistically significant aridification trend ($p < 0.05$) across most SPI scales, while correlation analysis reveals a complex seasonal structure characterised by alternating positive and negative coefficients throughout the annual cycle. This intra-annual variability, evidenced by the shifting sign of the correlations, suggests that the influence of teleconnection patterns is highly dependent on the month of the year, where regional Mediterranean modes often exhibit stronger and more consistent associations with precipitation deficits than large-scale Atlantic signals. To quantify the drivers of the observed drying trend, a Multiple Linear Regression model was utilised for trend attribution, and the findings demonstrate that regional Mediterranean oscillations, specifically the MOI and WeMO, are the primary predictors of drought variability, as both indices were the only statistically significant drivers, whereas large-scale Atlantic signals such as the NAO and ENSO showed no significant contribution to the long-term trend in this multivariate framework, highlighting an important shift in regional climate forcing whereby Mediterranean atmospheric circulation now exerts a dominant control over Northwest African precipitation trends compared to North Atlantic influences.