Interpretations of 20th Century Patterns in Tree-Ring Reconstruction of European Hydroclimate

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The Old World Drought Atlas (OWDA) is the most recent product of an ongoing effort to capture global hydroclimate variability on multi-decadal time scales from tree-ring chronologies. Centered over the European continent, OWDA reconstructs Palmer Drought Severity Indices (PDSI) from 0 CE to the present. In this study, leading patterns of OWDA's PDSI reconstruction are compared with instrumentally recorded average seasonal precipitation and temperature data over the 20th century. Instrumental PDSI (scPDSI) measurements are also included to quantify OWDA's ability to capture PDSI. Empirical Orthogonal Function (EOF) analysis is used to determine leading patterns in OWDA and summer (JJA) scPDSI, and correlations are used to compare the spatial and temporal likenesses amongst EOFs of OWDA and JJA scPDSI and EOFs of seasonal precipitation and temperature. Results confirm that leading patterns of OWDA and scPDSI correlate to leading patterns in seasonal precipitation and temperature both in JJA and the preceding winter (DJF) and spring (MAM). Hence, JJA soil moisture as recorded in OWDA can be influenced by multiple modes of DJF, MAM, and JJA climate variability, similarly for JJA scPDSI. Better agreement between OWDA and JJA scPDSI may be thwarted by strong, small scale JJA precipitation variability. Once OWDA's relationships to seasonal precipitation and temperature are understood more fully, perhaps OWDA may be able to be linked to significant atmospheric modes like the North Atlantic Oscillation (NAO), a known contributor to the European hydroclimate.