



Research Brief for Resource Managers

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Global Climate Connections to Fire Occurrence

Kitzberger, T., P.M. Brown, E. K. Heyerdahl, T. W. Swetnam and T.T. Veblen. 2007. Contingent Pacific-Atlantic influence on multicentury wildfire synchrony over western North America. Proceedings of the National Academy of Sciences 104:543-548.

By using tree ring data to develop climate and fire chronologies, several climate induced fire patterns were deduced. Specifically, the researchers showed that reconstructed sea surface temperature (SST) changes in the form of three different indices (ENSO, PDO, AMO) were synchronous with the reconstructed fire frequency indices and drought frequency index (PDSI=Palmer Drought Severity Index). The ENSO is the El Nino Southern Oscillation in temperatures. The PDO is the Pacific Decadal Oscillation, and the AMO is the Atlantic Multidecadal Oscillation. The current warming AMO trend indicates that there may be an increase in wildfire for the western United States in conjunction with Global Warming (Figs. 3&4).

Separate trees were used for creating the climate and fire chronologies. For local and regional fire chronologies, about 20 fire-scarred trees were cored for each of 238 sample sites. Each site was anywhere from 10 to 100 ha, chosen through the WDC (world data center) or through the authors. Binary fire chronologies were constructed for two time periods at each site: 1550-1924 and 1700-1924, for synchronous and asynchronous comparisons. A "0" indicated a non-fire year and a "1" indicated a fire year. Fire years were those in which $\geq 10\%$ of the trees had fire scars.

Management Implications

- El Nino Southern Oscillations (ENSO) seem to be the main driver of within-region scale fires.
- Atlantic Multidecadal Oscillations (AMO) seem to drive broader wildfire synchrony patterns.
- With the AMO currently trending positive (warmer) in conjunction with global warming, there will likely be more wildfire in the western U.S. in the years to come.

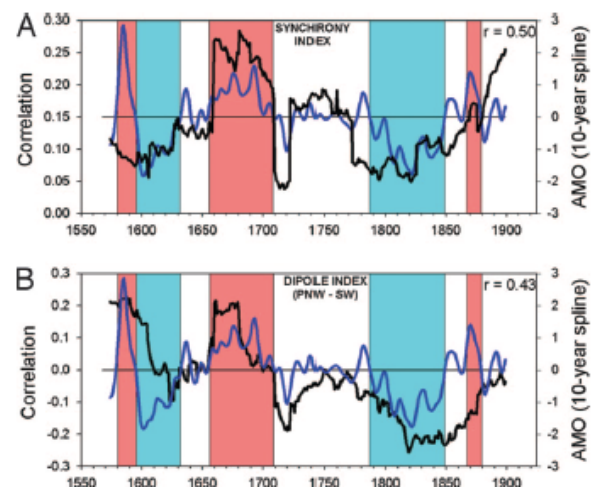


Fig. 3. Indices of fire synchrony (50-year moving correlations between selected regions, black line) compared with a 10-year spline of reconstructed AMO (blue line). Light blue and light red shaded areas indicate periods of low and high AMO, respectively, as defined by intervention analysis (19). Synchrony index was computed as the mean of all pairwise 50-year running correlations of %SF for all region pairs and reflects overall fire synchrony. Dipole Index was computed as the mean of all pairwise 50-year running correlations between the %SF of the Pacific Northwest and combined South-west regions (AZ, SNM, NNM, and SCO) and reflects the degree of synchrony or asynchrony along the north-south dipole.