Reconstructing Holocene vegetation-fire regimes in the Iberian Peninsula

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Analyses of the regional controls representing climate, vegetation and human activities on modern burnt area in the Iberian Peninsula show that the vegetation properties that determine fuel availability are major influences on the occurrence of fire. This finding opens up the possibility of using pollen data to reconstruct past changes in fire regimes. We could then make use of the much greater abundance of pollen data compared to other sources of information on past fire regimes to constrain biomass-burning feedbacks to the carbon cycle and climate. We applied Tolerance-Weighted Averaging Partial Least-Squares (TWA-PLS) to derive quantitative relationships between pollen-taxon and charcoal abundances from 15 entities from the Iberian Peninsula, using core-top charcoal data and a generalized linear model of present-day fire probability to provide conversion factors between the relative scale of charcoal abundance and the absolute scale of fire. We show that pollen taxon abundance has good predictive power for fire ($r^2 = 0.56$) and that the contribution of specific taxa to the prediction makes sense in terms of their ecological adaptations to fire. We apply the TWA-PLS quantitative relationship to predict changing fire regimes across the Iberian Peninsula through the Holocene. Results show that fire change synchronous with climate warming events.