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# Landscape-structure metrics influence on fire size distribution in Portugal

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The spatial patterns of fire frequency are a proxy for the landscape-level mosaic of vegetation composition, structure and loading that is expected to affect wildfire spread and growth. This work aims to assess the role of landscape heterogeneity on fire size distribution in Portugal. The dataset used includes 2,200 fire records with size greater than or equal to 100 ha registered from 1998 to 2008. We used the Portuguese Forest Service digital fire atlas and ArcGis to calculate previous fire recurrence (number of times burned since 1975) for the patches within the fire perimeter, whereby each patch is unique in its fire history in relation to the adjacent patches. Patch Analyst was used to compute the landscape metrics for each fire, which express landscape structure in terms of the composition, complexity and diversity of fire recurrence. Several distribution functions were tested to fit the positively skewed fire size samples with burnt area values above an increasing lower threshold. Estimates of the distribution parameters were obtained based on maximum likelihood method while the ability of each function to fit the empirical distribution was assessed with standard goodness of fit statistical tests (e.g., Kolmogorov-Smirnov, Crámer von-Mises and Anderson-Darling) as well as with probability- or quantile-plots. Results indicate that the Weibull and its truncated version allow an adjustment for all records in the database, and that the truncated Weibull provides the best fit (with the highest p-value). For higher values of the lower threshold (>150 ha), other functions (e.g., gamma) provide a good fit to the data but only for fires larger than 350 ha (n=726) the truncated Weibull is not the best statistical model.
Then, several landscape metrics of fire recurrence (e.g., mean, dominant, relative patch richness, area weighted mean shape Index, mean perimeter-area ratio, mean patch fractal dimension, edge density, median patch size, patch density) with expected influence on fire size were studied by using these variables as covariates in the truncated Weibull distribution shape parameter. The methodology was applied to the entire dataset or considering fires recorded in specific periods and/or locations. Results point to the usefulness of these parametric models to characterize the observed fire size distribution and to assess the role of landscape characteristics on fire size distribution.