

Abstract

Fusing MODIS and Landsat to assess trends in fire regime in mainland Spain from 2001-2021

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Abstract: Fire is an essential component of many ecosystems and is one of the most recurrent disturbances in the Mediterranean biome. Moreover, the impact of global warming has led to an increase in the intensity of fires in many areas of the world. Here, we assess the trends of different fire regime properties (i.e., number of fires, fire size, and severity) fusing monthly burned areas derived from MODIS (MCD64A1) and Landsat data for mainland Spain from 2001 to 2021. We focused only on summer fires, the most common ones. The methodology consisted of crossing Landsat pixels at 30 m with MODIS pixels at 500 m and by means of a classification process, those pixels that were significantly different between pre- and post-fire dates were identified. Afterward, significant levels of severity based on the Relativized Burnt Ratio (RBR) were identified by a new classification process. Finally, those “true” burned pixels were crossed with vegetation types and ecoregions. Trends in fire regime properties were assessed using the Mann-Kendal test. We found that number of fires has significantly decreased over time. On the contrary, fire size was increasing. The proportion of burned shrublands grew in all ecoregions, but especially in the Mediterranean ones; whereas the proportion of burned forests was decreasing. In addition, the median RBR, as well as their percentiles, augmented, especially in conifers and shrublands burned in Mediterranean ecoregions. Moreover, the percentage of areas burned with high severity was expanding mainly due to the increase in the percentage of shrublands burning more severely. Thus, while fire activity decreased, fire severity increased. This new reality needs to be considered because the efficacy of risk management must not be based only on the number of fires or area burned, but on the damages that are likely to increase due to higher fire severity.

Keywords: fire regime; severity; MODIS; landsat; ecoregions; trends