



Drought impact on vegetation in pre and post fire events in Iberian Peninsula

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In 2004/2005, the Iberian Peninsula was stricken by an exceptional drought that affected more than one third of Portugal and part of southern Spain during more than 9 months. This severe drought had a strong negative impact on vegetation dynamics, as it coincided with the period of high photosynthetic activity (Gouveia et al., 2009). Since water availability is a crucial factor in post-fire vegetation recovery, it is desirable to assess the impact that such water-stress conditions had on fire sensitivity and post-fire vegetation recovery.

Fire events in the European Mediterranean areas have become a serious problem and a major ecosystem disturbance, increasing erosion and soil degradation. In Portugal, the years 2003 and 2005 were particularly devastating. In 2003 it was registered the maximal burnt area since 1980, with more than 425000 ha burned, representing about 5% of Portuguese mainland. The 2005 fire season registered the highest number of fire occurrences in Portugal and the second year with the greatest number of fires in Spain. The high number of fire events observed during the summer 2005 in the Iberian Peninsula is linked, in part, to the extreme drought conditions that prevailed during the preceding winter and spring seasons of 2004/2005.

Vegetation recovery after the 2003 and 2005 fire seasons was estimated using the mono-parametric model developed by Gouveia et al. (2010), which relies on monthly values of Normalized Difference Vegetation Index (NDVI), from 1999 to 2009, at 1km resolution, as obtained from the VEGETATION-SPOT5 instrument.. This model was further used to evaluate the effect of drought in pre and post vegetation activity. Besides the standard NDVI, the Normalized Difference Water Index (NDWI) and the Normalized Difference Drought Index (NDDI) were computed in order to evaluate drought intensity. In the case of the burnt scars of 2003, when data corresponding to the months of drought are removed, recovery times are considerably shorter. The extreme water stress conditions to which vegetation is subject during drought events appear, therefore, to delay the regeneration process, which is to be expected since water availability is determinant to primary productivity. On the other hand, in the case of 2005 burnt areas, vegetation is more stressed and dryer in summer than in spring and, in general, fire damage is higher for pixels with higher vegetation density and higher moisture content during the months before the fire. These relationships are also related with the distinct vegetation behavior of the different land covers: in general, shrubland holds less quantity of very dry biomass, while needle leaf presents higher amounts of fairly dry biomass.

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