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Analysis of historical forest fire regime in Madrid region (1984-2010) and its relation with land-use/land-cover changes

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Understanding the interaction between natural and socio-economic factors that determine fire regime is essential to make accurate projections and impact assessments. However, this requires having accurate historical, systematic, homogeneous and spatially explicit information on fire occurrence. Fire databases usually have serious limitations in this regard; therefore other sources of information, such as remote sensing, have emerged as alternatives to generate optimal fire maps on various spatial and temporal scales. Several national and international projects work in order to generate information to study the factors that determine the current fire regime and its future evolution. This work is included in the framework of the project "Forest fires under climate, social and economic Changes in Europe, the Mediterranean and other fire-affected areas of the World" (FUME http://www.fumeproject.eu), which aims to study the changes and factors related to fire regimes through time to determine the potential impacts on vegetation in Mediterranean regions and concrete steps to address future risk scenarios.
We analyzed the changes in the fire regime in Madrid region (Spain) in the past three decades (1984-2010) and its relation to land use changes. We identified and mapped fires that have occurred in the region during those years using Landsat satellite images by combining digital techniques and visual analysis. The results show a clear cyclical behaviour of the fire, with years of high incidence (as 1985, 2000 and 2003, highlighted by the number of fires and the area concerned, over 2000 ha) followed by another with a clear occurrence decrease. At the same time, we analyzed the land use changes that have occurred in Madrid region between the early 80s and mid-2000s using as reference the CORINE Land-cover maps (1990, 2000 and 2006) and the Vegetation and Land Use map of the Community of Madrid, 1982.
We studied the relationship between fire regimes and observed land-use and land-cover changes in the periods analyzed, it was determined that between years 1984 and 2006 most of the burned area remained pre-fire cover type (above 80% of the area). However, in areas that experienced change, the most important transitions were recorded in wooded areas, especially conifers, which became shrubs or sparsely vegetated areas, followed by non-irrigated crops, which were replaced by grasslands or industrial areas, and sparse vegetation which changed to shrubs. Finally, the analysis of land-use changes over burned areas situated shrubland as the most favored type of cover, either as a result of a vegetative degradation process after intense burning of wooded areas, especially conifers, or as stage of natural increase in areas previously covered by sparsely vegetation.