Analysis of Post-Fire Vegetation Recovery in the Mediterranean Basin using MODIS Derived Vegetation Indices

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The Mediterranean basin region is highly susceptible to wildfire, with approximately 60,000 individual fires and half a million ha of natural vegetation burnt per year. Of particular concern in this region is the impact of repeated wildfires on the ability of natural lands to return to a pre-fire state, and of the possibility of desertification of semi-arid areas. Given these concerns, understanding the temporal patterns of vegetation recovery is important for the management of environmental resources in the region. A valuable tool for evaluating these recovery patterns are vegetation indices derived from remote sensing data.

Previous research on post-fire vegetation recovery conducted in this region has found significant variability in recovery times across different study sites. It is unclear what the primary variables are affecting the differences in the rates of recovery, and if any geographic patterns of behavior exist across the Mediterranean basin. This research has primarily been conducted using indices derived from Landsat imagery. However, no extensive analysis of vegetation regeneration for large regions has been published, and assessment of vegetation recovery on the basis of medium-spatial resolution imagery such as that of MODIS has not yet been analyzed.

This study examines the temporal pattern of vegetation recovery in a number of fire sites in the Mediterranean basin, using data derived from MODIS 16 –day composite vegetation indices. The intent is to develop a more complete picture of the temporal sequence of vegetation recovery, and to evaluate what additional factors impact variations in the recovery sequence. In addition, this study evaluates the utility of using MODIS derived vegetation indices for regeneration studies, and compares the findings to earlier studies which rely on Landsat data.

Wildfires occurring between the years 2000 and 2004 were considered as potential study sites for this research. Using the EFFIS dataset, all wildfires covering an area of at least 1,000 ha were identified. The land-cover / land-use of these large fires sites were then evaluated using the CORINE land-cover data set, and the sites dominated primarily by natural vegetation were identified. Once these candidate sites were identified, a subset was selected across a range of locations and site characteristics for post-fire recovery analysis. To evaluate the post-fire recovery sequence in these locations, time-series of NDVI, EVI, and LAI were derived using 250 meter resolution MODIS data (MOD13Q). The vegetation index values were then compared to pre-fire values to determine recovery relative to the pre-fire vegetative state. The variability in rates of recovery are then considered with respect to moisture availability, vegetation type, and local site conditions to evaluate if any patterns of recovery can be determined.