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Monitoring vegetation cover in the postfire in Tavira - São Brás de Alportel (southern Portugal)

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1. INTRODUCTION

Often, restoration of areas affected by fire faces lack of knowledge of how ecosystems respond to the action of fire. Depending on environmental conditions, structure and diversity of the vegetation or the severity of the fire, burnt systems can provide responses ranging from spontaneous recovery in a relatively short time to onset of severe degradation processes. For this reason, it is necessary to monitor the evolution of post-burned in the fire, in order to plan effective strategies for restoring systems and soil erosion control.

In order to assess soil erosion risk, this research aims to is to analyse the evolution of vegetation cover in a Mediterranean burnt forest soil, using vegetation indexes derived from Landsat-7 (Thematic Mapper sensor-TM) and Landsat-8 (Operation Land Imager sensor, OLI).

2. METHODS

This study was carried out in a forest area affected by a wildfire by 18-22 July 2012. The study area is located within the coordinates 37o 9' – 37o 21' N and 7o 40' – 7o 53' W, including part of the municipalities of Tavira and São Brás de Alportel (southern Portugal). The relief in the studied area has an irregular topography. Soils are shallow and develop mainly metamorphic rocks (as slates or quartzite) and igneous rocks, which produce acidic and nutrient-poor soils, poorly developed in depth. The wildfire was one of the most important fires in Portugal during the recent years, and affected more than 24000 ha.

Vegetation is dominated by cork oak (Quercus suber) ,holm oaks (Quercus ilex), strawberry tree (Arbutus unedo) and sclerophyllous vegetation (mostly formed by Quercus coccifera and Rosmarinus officinalis). These species are adapted to acidic-poor soils and show a great capability of resprouting and germination after fire. The study area is poorly developed, with cork and timber harvesting and other forest products or tourism as main economic activities. The area shows a highly fragmented urban fabric with the sparse infrastructures. In recent years, migration processes have further aggravated the economic situation in this region.

Landsat 7 and Landsat 8 images were used for this study (April 2012, December 2012, March 2013 and November 2013). Images were corrected for the scattering effect by extraction of black objects for near infrared bands and correction by linear regression for the red bands. Several vegetation indexes were used, such as, vegetation ratio, NDVI, the perpendicular vegetation index with assessment of distance to soil, PVI, WDVI, PVI3, and vegetation indexes based on orthogonal transformation of bands (Tasselled Cap) and principal component analysis (PCA). After studying the correlations between indexes by PCA, the Tasselled Cap-green index was selected as the most accurate one. Presence/absence of vegetation and land use were monitored to select the best parameter to study the evolution of vegetation. The evolution of the vegetation was compared with the CORINE Land Cover map (2006) and validated in field visits in January 2014.

3. RESULTS

For the study area, results show a positive evolution of vegetation in the burned area during the months following to burning. Recovery of natural-native vegetation is more intense than anthropic vegetation types, with sclerophyllous vegetation showing the most intense evolution after burning.