Geophysical Research Abstracts
Vol. 20, EGU2018-7066, 2018
EGU General Assembly 2018

Post-fire vegetation recovery mapping using multi-temporal Sentinel-2A imagery in Chios island, Greece

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Remote sensing techniques offer the opportunity to study fire effects and vegetation recovery dynamics across large areas, providing essential information for effective management strategies development over fire-prone landscapes. Chios, the fifth largest of the Greek islands, has experienced recurring forest fires during the recent years, resulting to significant risk of environmental degradation.
The aim of this study was to estimate and analyze the state of post-fire vegetation recovery in the island of Chios following major fire events occurred during the summer of 2016.
A post-fire 8-band WorldView-2 image was used for burned area mapping by employing a geographic object-based classification approach, followed by field campaign for assessing post fire vegetation recovery, which was conducted during summer 2017 by establishing reference plots in the main pre-fire vegetation types (maquis, shrublands and pine forest areas) within the fire-affected area.
A series of single and multi-temporal spectral indices including Normalized Burn Ratio, Normalized Difference Vegetation Index, Enhanced Vegetation Index and Soil Adjusted Vegetation Index, were derived from multi-temporal Sentinel-2 images. A random forest modelling procedure was performed for estimating post fire vegetation recovery within the burned area, as well as the areas of high risk erosion.
We identified dNDVI, EVI and the second red edge band of Sentinel-2 as the most important spectral variables for predicting vegetation recovery within pre-fire areas. In the case of pre-fire areas with maquis, post-fire NBR, EVI and NDVI were selected as best predictors. Finally, the results revealed that vegetation recovery is more pronounced within the pre-fire pine forest areas, while topographic and geological sub-strata factors were also found significant in defining post-fire vegetation recovery.