Exploring the Importance of Monitoring the Fire Risk Index in the vicinity of Cultural Heritage Sites in Cyprus using Sentinel Remote Sensing data

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Abstract

In June 2016, a wildfire outbreak in the region of Solea, district of Nicosia, Cyprus, resulted in the total loss of 18.5 km^2 of vegetated area. The area accommodates a number of cultural heritage sites, amongst them sites included in the UNESCO list of World Heritage Monuments such as the Churches of "Panagia tis Asinou", in Nikitari and "Panagia tis Podithou" in Galata. The incident proved to be a turning point in the reconsideration of the significance of monitoring the risk posed by fire on Cultural Heritage sites. Earth Observation and Remote Sensing techniques provide an efficient and cost effective way of estimating the parameters behind wildfire outbreaks. With the introduction of the Copernicus Sentinel satellite constellation, the extent to which these parameters can be studied is further enabled with short revisit times and higher resolution sensors. The current study aims to explore the estimation of the likelihood of a fire outbreak in the vicinity of candidate Cultural Heritage sites in Cyprus with the use of Sentinel-2 Multispectral Instrument (MSI) imagery. A number of causative agents such as the class and density of vegetation were derived from Sentinel-2 imagery through the estimation of spectral indices coupled with ancillary topographic information such as elevation, slope and aspect derived from a Digital Terrain Model (DTM). A weighted formula for multicriteria analysis was constructed based on the significance of each factor in fire outbreak. Based on the analysis, a map for each of the candidate sites was created with assigned likelihood of fire which was then validated against an archive data pool of past fire incidences.