GIS AND REMOTE SENSING IN MAPPING THE CONSEQUENCES OF THE RECENT FIRE IN KASSANDRA, CHALKIDIKI

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INTRODUCTION

- Forest fires represent a major environmental problem in Mediterranean regions, with large areas being affected each summer.

- Remotely sensed data in combination with GIS techniques can contribute to an improved, more cost effective, and time-saving method which can be used to quantify the location of fire events and assess the fire damage.

AIM AND OBJECTIVES

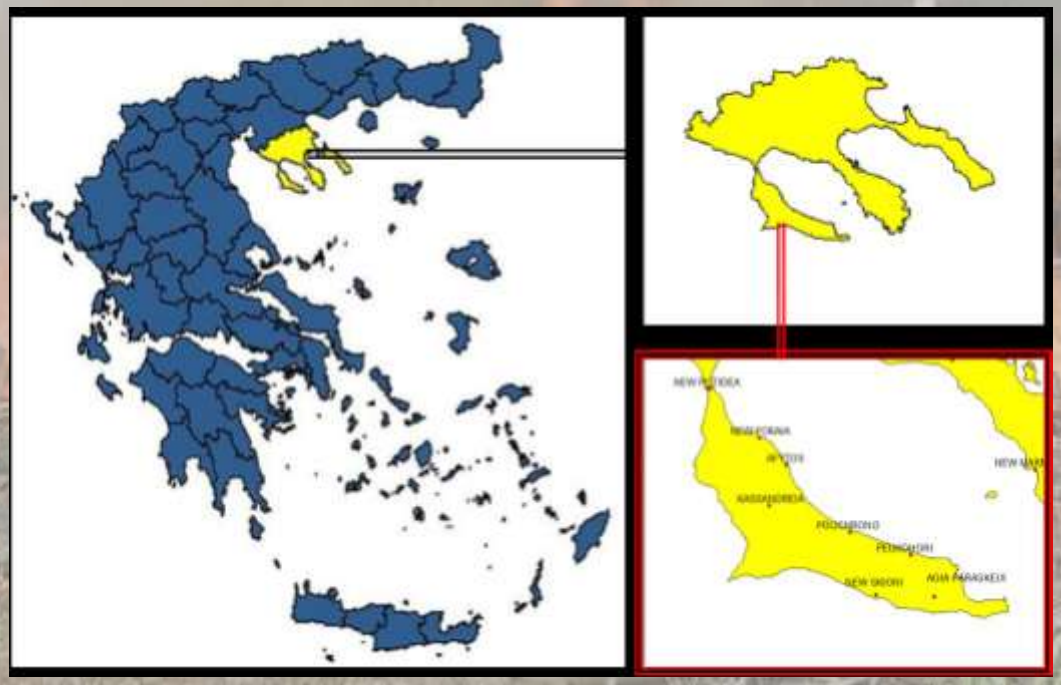
This work aimed to accurately map the spatial extent of the burned area immediately following the fire event and also to estimate the short-term fire effects in Kassandra, Chalkidiki, by employing remotely sensed data and GIS analysis.

The specific **objectives** were:

- to develop an object-based classification model for burned area mapping using MODIS/Aqua imagery
- to estimate the size of the planimetric (2D) and true surface (3D) total burned area, and also the size of the main land cover classes affected by the fire using GIS analysis

STUDY AREA

- The study area is located in North Greece in the southern part of the Kassandra peninsula and belongs to the prefecture of Chalkidiki
- The main type of forest located in the Kassandra peninsula is the pine forest with *Pinus halepensis* being the dominant species



- A major fire ignited on August 21st, 2006 and burned until the 25th of August
- The intensity and extent of the fire event caused the destruction of thousands of hectares of vegetated land, residences, and even caused casualties among civilians

DATASET

1. A MODIS/Aqua image (250m spatial resolution) taken on 28th August 2006 three days after the fire, was obtained

MODIS/Aqua Surface Reflectance daily L2G Global 250M SIN GRID V004

2. The DEM, and

3. The Corine land cover digital map of the area

METHODOLOGY

The methodology comprised mainly two steps:

1. the development of the object-based classification model for burned area mapping, and
2. the assessment of the fire damage using GIS

These steps are discussed, in turn, below.

OBJECT-BASED MODEL

The development of the object-based model involved two steps:

1. Segmentation

2. Classification

Segmentation

- Throughout the segmentation procedure , the image was segmented and image objects were generated based upon several adjustable criteria of scale, band weights and homogeneity in colour and shape.

- Two levels of image objects representing two different scales were finally created:

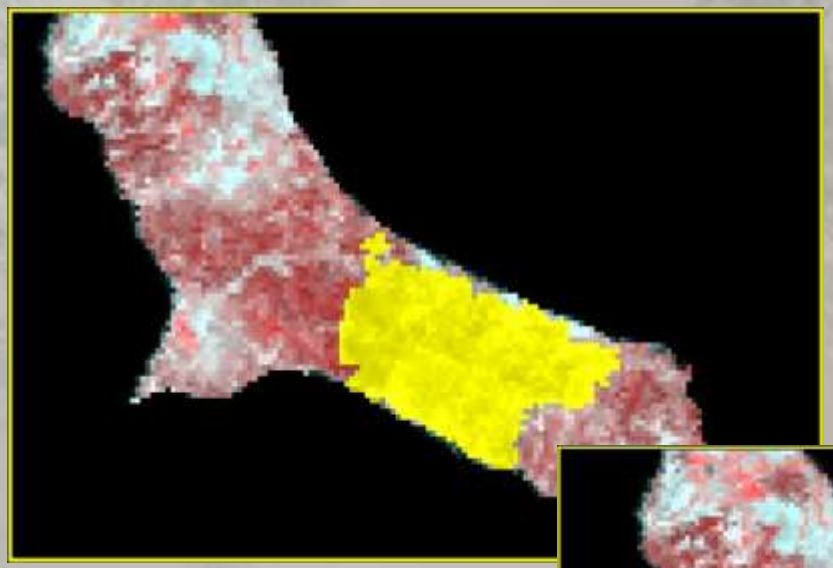
Large objects (level 2)

Small objects (level 1)

Classification

- Classification was based on fuzzy logic. Features based on object spectral information, such as band mean as well as object contextual information (relation to super-objects), were used in the classification.

- Classifications were carried out at the two segmentation levels:



Level 2:‘possible burned area’

Level 1:‘severely burned’ and ‘slightly burned area’

At level 1 the two classes were grouped semantically into one class (‘Burned Area’)

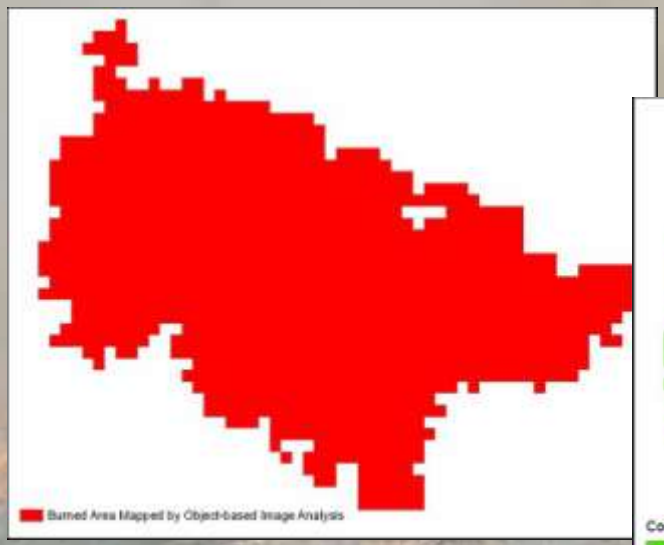
GIS ANALYSIS

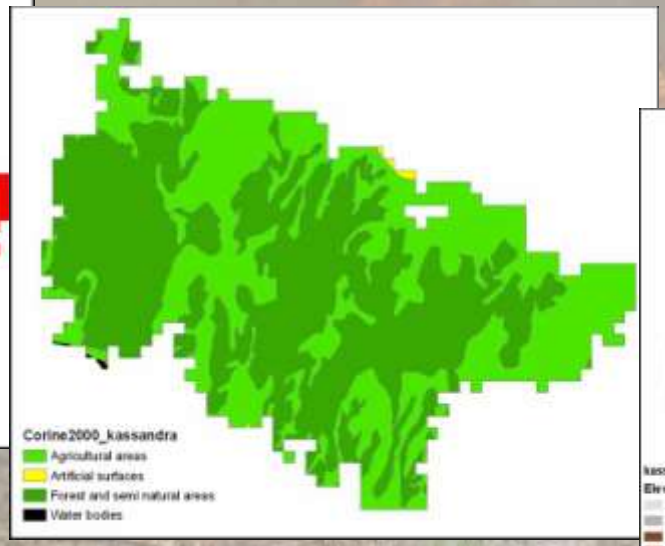
- The software Burned Area Statistics 2 (BAS2) was used to estimate the size of the total burned area and also to produce statistics in relation to the main land cover classes affected by the fire.

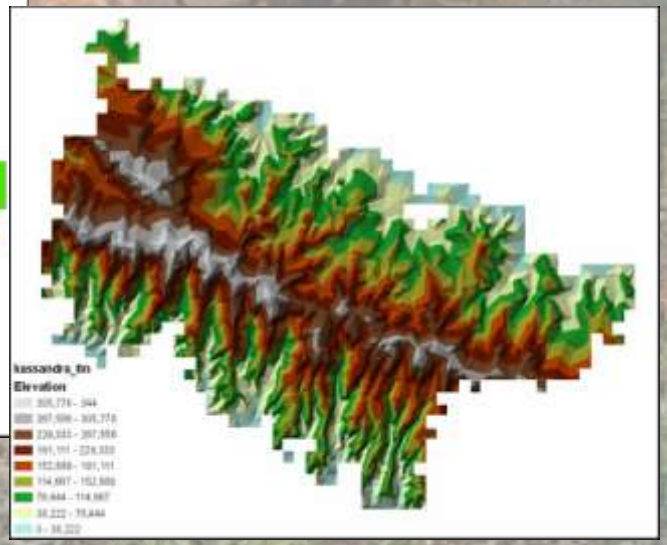
- The BAS2 module is based on a methodology that combines the fire perimeter and the surface model of the burned area with pre-fire ancillary information such as the land cover class.

INPUT LAYERS

1. The resulting fire perimeter from the object-based classification
2. The CORINE land cover map
3. The DEM of the area







RESULTS

- The developed object-oriented classification model resulted not only in mapping the burned area, but also in the separation of two fire severity classes, namely severely burned and slightly burned.

- The total burned area was found to be 6870 ha in planimetric (2D) and 7200 ha in true surface area (3D).

- In both cases (2D and 3D), approximately 44% of the burned area was found to be severely burned, while 56% percent was slightly burned.

- The size of the main land cover classes affected by the fire were 3673 ha (forest and semi natural areas), 3185 ha (agricultural areas), 12 ha (artificial surfaces) in planimetric area, and 3881 ha, 3307 ha, 12 ha in true surface area, respectively.

LAND COVER TYPES	*AREA2D (ha)*	*AREA3D (ha)*
Agricultural areas	3185	3307
Artificial surfaces	12	12
Forest and semi natural areas	3673	3881
TOTAL AREA	**6870**	**7200**

CONCLUSIONS

- This work aimed at estimating as soon as possible the consequences immediately after the fire ended.

- The results of this work showed that forest fire damage can be assessed rapidly with the successful synergy of low resolution remote sensing data and GIS techniques.


THANK YOU FOR YOUR
ATTENTION