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Exploring the Influence of Topographic Correction and SWIR Spectral Information Inclusion on Burnt Scars Detection From High Resolution EO Imagery: A Case Study Using ASTER imagery

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Information on burned area estimates is of key importance in environmental and ecological studies as well as in fire management including damage assessment and planning of post-fire recovery of affected areas. Earth Observation (EO) provides today the most efficient way in obtaining such information in a rapid, consistent and cost-effective manner.

The present study aimed at exploring the effect of topographic correction to the burnt area delineation in conditions characteristic of a Mediterranean environment using ASTER high resolution multispectral remotely sensed imagery. A further objective was to investigate the potential added-value of the inclusion of the shortwave infrared (SWIR) bands in improving the retrievals of burned area cartography from the ASTER data. In particular the capability of the Maximum Likelihood (ML), the Support Vector Machines (SVMs) and Object-based Image Analysis (OBIA) classification techniques has been examined herein for the purposes of our study. As a case study is used a typical Mediterranean site on which a fire event occurred in Greece during the summer of 2007, for which post-fire ASTER imagery has been acquired.

Our results indicated that the combination of topographic correction (ortho-rectification) with the inclusion of the SWIR bands returned the most accurate results in terms of burnt area mapping. In terms of image processing methods, OBIA showed the best results and found as the most promising approach for burned area mapping with least absolute difference from the validation polygon followed by SVM and ML.

All in all, our study provides an important contribution to the understanding of the capability of high resolution imagery such as that from ASTER sensor and corroborates the usefulness particularly of the topographic correction as an image processing step when in delineating the burnt areas from such data. It also provides further evidence that use of EO technology can offer an effective practical tool for the extent of ecosystem destruction from wildfires, providing extremely useful information in co-ordinating efforts for the recovery of fire-affected ecosystems after wildfire.

Keywords: Remote Sensing, ASTER, Burned area mapping, Maximum Likelihood, Support Vector Machines, Object-based image analysis, Greece