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Burnt Scar Mapping from High Resolution Optical Remote Sensing

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Existing remote sensing-based Burnt scar mapping methodologies are mainly based on medium spatial resolution sensors. These methodologies cannot accurately detect burnt areas smaller than 200 ha. However, smaller burnt areas can represent a significant number of the total burnt areas. They play an important ecological roll, and also have relevant socio-economic consequences.
Within this framework, a new methodology for burnt scar mapping from high resolution optical remote sensing data is being developed by the Institute for Environment and sustainability of the Joint Research Center of the European Commission. This methodology aims to map burnt patches larger than 10 ha, which represent more than 90% o fires over Europe
A two stage approach is implemented. The first stage applies a classifier for the identification of burnt scar seeds. The second stage applies a region growing routine using the previously identified seeds as initial points. Together with standard burnt area detection approaches (i.e. thresholding of original bands, spectral indices and combination of both, Gaussian classifiers), several more algorithms such as neural networks, classification trees and bagging techniques are tested for the identification of burnt scar seeds. This combined approach allows conservative estimate of the initial seeds which reduces the overestimation of burnt areas, while the region growing stage produces a precise delineation of the burnt polygons.
The methodology is tested for images from the Advanced Wide Field Sensor (AWIFS) over fires in Portugal. Training data was obtained from MODIS-based polygons generated by the Rapid Damage Assessment (RDA) module of the European Forest Fire Information System (EFFIS). The method has been validated using burnt area polygons were derived from visual interpretation of ETM scenes at the end of the fire season. These polygons were provided by the Department of Forestry of the University of Lisbon. In a later stage, a digital elevation model-based post processing is implemented in order to minimize the potential overestimation of burnt scars.
In general the validation exercise shows a very high accuracy and precision in the identification of burnt scars and delineation of burnt scar borders. The two-stage methodology also proves to be robust over number different environments. The importance of proper training data during the seed identification stage is highlighted. The tests also show that non-parametric algorithms (neural networks and classification trees) outperform classic approaches in the identification of burnt scar seeds.
Given the promising performance of the proposed methodology, the next goal will be the production of the first high resolution burnt scar map at pan-European level.