Application of Level Set Methods for burnt area mapping and comparison with DLR's TET-1 hotspot data – a case in Portugal

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Abstract

We present a Level Set segmentation based method for mapping of burnt area using data from the Moderate Resolution Imaging Spectrometer (MODIS). Level Set methods reflect changes in topology, through the utilization of variable, local thresholds. Compared with fixed threshold or post-classification techniques, burnt areas can be extracted from satellite data more efficiently and exactly.

We use MODIS satellite data from August, 2016, to determine burnt areas of the wildfires in Portugal. The results are compared against common burnt area extraction approaches, such as the differential Normalized Differential Vegetation Index (NDVI) and the modified Burned Area Index (BAIm). The reference data is derived from high resolution optical Landsat-8 imagery.

To assess the different levels of burn severity, the results are correlated to Fire Radiative Power (FRP) measurements of the TET-1 satellite from the German Aerospace Center (DLR). TET-1 is a micro satellite system targeted at wildfire observation. It is designed to facilitate the detections of low intensity and small fires, and is therefore able to detect temperature anomalies which are missed by the MODIS AQUA/TERRA and VIIRS sensors.

The comparison shows the superiority of Level Set Methods in terms of detection reliability and geometric accuracy.