Abstract

Near-Real-Time Burned Area Mapping Using Sentinel-2 and Ancillary Data: Italy as a Test Case†

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An automatic near-real-time (NRT) burned area (BA) mapping approach is presented. It is based on the AUTOmatic Burned Areas Mapper (AUTOBAM) tool proposed in Pulvirenti et al. (2020) and designed to map BA using Sentinel-2 (S2) data. S2 data are complemented by ancillary data, namely MODIS-derived and VIIRS-derived active fire products, fire susceptibility mapping, and by fire notifications from operational rooms. Italy is chosen because the AUTOBAM tool was originally designed to respond to a request by the Italian Department of Civil Protection. Moreover, notifications from the firefighting fleet belonging to Joint Air Operating Centre and (for some regions such as Lazio) from the Unified Permanent Fire Protection Unit are available in NRT.

AUTOBAM uses S2 level 2A (L2A) surface reflectance products. When new L2A products are available, they are automatically downloaded and processed. The processing firstly computes the Normalized Burn Ratio, the Normalized Burned Ratio 2, and the Mid-Infrared Burned Index. Then, AUTOBAM applies a change detection approach that compares the values of the aforementioned indices acquired at the current time with the values derived from the most recent cloud-free S2 data. BA mapping is performed by using different image processing techniques (clustering, automatic thresholding, region growing). Output maps are resampled to a common grid whose pixel size is 20 m.

The evaluation of the results is carried out using different data sources. First, for 2–3 selected events (e.g., the fire that hit Sardinia in 2021), subsets of the BA maps are evaluated through comparison with aerial photos taken by Unmanned Aerial Vehicles. In addition, for the years of 2019–2020, AUTOBAM-derived BAs are compared with burned perimeters compiled by Carabinieri Command of Units for Forestry, Environmental and Agri-food protection. The results indicate that the proposed method has potential for NRT mapping of BAs.

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