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Burned area mapping in Brazil using NPP-VIIRS imagery and One Class Support Vector Machine

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Remote sensing observations has improved the understanding of spatial and temporal fire patterns in Brazil in the last decades based on quantitative metrics such as severity, location, extension and duration. Nevertheless, large discrepancies and uncertainties persist in the currently burned area (BA) products in determining BA extension, location, and occurrence time. Visible Infrared Imaging Radiometer Suite (VIIRS) sensor was launched in 2011 to upgrade and to maintain the Earth long-term monitoring initiated by Advanced Very High Resolution Radiometer (AVHRR) and Moderate Resolution Imaging Spectroradiometer (MODIS) sensors, but to our knowledge, none BA product has been developed using VIIRS data imagery. Accordingly, we present a BA mapping algorithm based on VIIRS imagery which includes two-steps. Firstly, monthly composites of (V, W) burned index are computed using spectral information of near infrared (NIR) and middle infrared (MIR) channels. Secondly, multispectral samples extracted by VIIRS active fires are used for training a One-Class Support Vector Machine (OC-SVM) classification that uses cumulative distribution functions criteria. The active fire data were screened to prevent extraction of unrepresentative BA samples and combined with burn index (V, W) monthly composites to produce BA scars. The procedure was applied over Brazilian savanna for 2015, a biome that has been increasingly affected by deforestation due to cropland and pasture expansion, consequently rising and changing the natural fire regime in region. Then, the developed algorithm was validated by reference scars obtained from Landsat imagery and compared with other BA product (e.g., MCD64A1). Results show that VIIRS BA product based on OC-SVM are able to map smaller areas more accurately than other products, including burned areas without active fires, due OC-SVM classification characterizes BA through active fire samples, thus eliminating a potential source of omission error.

Keywords: burned area, VIIRS, SVM, Cerrado.

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