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Interrelations of MCD64 burned area and land use patterns in the Cerrado

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Fire is an essential climate-related element in atmosphere-biosphere interactions. Global change will modify the frequency, intensity and occurrence of fire seasons, which are essential in the structure of fire-prone ecosystems. Therefore, knowledge of the fire dynamics is necessary to understand the impact of man-caused fires in the Brazilian Savannas ("Cerrado"). The burned area can be evaluated by satellite remote sensing observations to estimate fire impacts on a large scale spatially and temporally. New or reprocessed products incorporate algorithm refinements in order to improve the accuracy of fire mapping. However, there still is a lack of studies to quantify the uncertainties from available satellite products at biome level. Accordingly, the aim of this work was to evaluate the improvement of detection accuracy from MODerate resolution Imaging Spectroradiometer (MODIS) collection 6 BA product (MCD64 /C6) compared to previous collection 5.1 (C5.1) over 2 million km^2 in the Cerrado for the fire season of 2015, considering fire incidence and land use patterns. We used reference data derived from Landsat-8 OLI generated by National Institute of Space Research (INPE) to validate MCD64 collections and performed an intercomparison of C6 with independent active fires from the Visible Infrared Imaging Radiometer Suite (VIIRS) and recent land use patterns from IGBP-MCD12Q1 product. The overall accuracy assessment showed more satisfactory results for the regions with the highest total burned area, or with larger fire scar sizes. The southern Cerrado, with the highest intensity of land use, presented higher omission and commission errors (over 50%) due to the scar characteristics (small and fragmented), which are a challenge detection by MODIS ∼500 m resolution. Our analysis showed that errors of both collections are associated more with underestimates (overestimates) of scar size than with complete omission (false detection), except for low fire severity. C6 performs better than C5.1, with a moderate increase in hits and a considerable reduction of omissions. Despite the improvements in the detection there are still challenges to be overcome regarding the MCD64 product for the Cerrado, such as small burnings in croplands.

Keywords: MODIS, fire scars, active fires, commission error, omission error, land use, Cerrado.

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