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Assessment of global burned area satellite products in the African savannah

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Africa is the continent with the highest annual burned area, with the African savanna being the most affected ecosystem. This paper presents an assessment of the spatio-temporal accuracy of three of the main global-scale burned area products derived from images from polar-orbiting satellite-borne sensors: 1) Fire_CCI 5.1, of 250 m spatial resolution, developed by the European Space Agency (ESA) and led by the University of Alcalá de Henares; 2) MCD64A1 C6, of 500 m spatial resolution, developed by the University of Maryland; and 3) GABAM (Global Annual Burned Area Map), of 30 m spatial resolution, developed through the Google Earth Engine (GEE) platform by researchers from the Aerospace Information Research Institute of China. The first two products are based on daily images from the MODIS (Moderate-Resolution Imaging Spectroradiometer) sensor onboard NASA's Terra and Aqua satellites, and the third is based on Landsat images available on GEE. The almost total absence of reference burned area data from official sources has made it difficult to assess the spatio-temporal accuracy of these burned area products in Africa. However, the recent creation of the Burned Area Reference Database (BARD), which includes reference datasets from different international projects, opens the possibility for a more detailed assessment. The study focused on a region covering an area of approximately 29.5 million ha located in the southern hemisphere between 10°S and 15°S and bounded longitudinally by the 35°E and 40°E meridians. The results show that the Fire_CCI 5.1, MCD64A1 C6 and GABAM products present an annual distribution of burned area with an irregular pattern in the interval between 7 and 10 million ha per year (around 30% of the whole study area), but there is hardly any correlation between their time series, with correlation coefficients lower than 0.3 for the period 2000-2019. The spatio-temporal accuracy analysis was performed for 2005, 2010 and 2016, the only years for which BARD has reference perimeters. The results are highly variable, with values between 1 and 20 million ha per year depending on the product, the year and the reference set used, which does not allow definitive conclusions to be drawn on the accuracy of the burned area estimates. These results indicate that uncertainties persist both in the burned area estimates derived from remote sensing products in these regions and in the reference sets used for their evaluation, which require further research effort.