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## Spatial patterns of fire patch size and shape complexity in the Brazilian savanna

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Fire events on a landscape scale are a widespread global phenomenon that influences the interactions between atmosphere and biosphere. Global burned area (BA) products derived from satellite images are used in dynamic vegetation fire modules to estimate greenhouse gas emissions, available fuel biomass and anthropic factors driving fire spread. Fire size and shape complexity from individual fire events can provide better estimates of fuel consumption, fire intensity, post fire vegetation recovery and their effects on landscape changes to better understand regional fire dynamics. Especially in the Brazilian savannas (Cerrado), a mosaic of heterogeneous vegetation where has prevailed an official “zero-fire” policy for decades leading to an increase in large wildfires, intensified also by rapid changes of land use using fire to land clearing in agriculture and livestock purposes. In this way, we aim to assess the fire size and shape patterns in Cerrado from 2013 to 2015, identifying each fire patch event from Landsat BA product and calculating its fire features with landscape metrics. We calculated its surface area to evaluate fire size and the metrics of shape index, core area and eccentricity from an ellipse fitting from burned pixels to estimate the fire shape complexity. The study focused on 48 Landsat path/row scenes and the analysis final compared the fire features of overlapped patches between the years. The total number of coincident fire patches is higher between the years 2013 and 2015 than 2013-2014 and 2014-2015. Large fires are found in the north and east regions for all comparisons. In this region, high core area values are consistent for having large areas of burnt patches and low shape index values and more elongated patches revealed a low fire shape complexity. These results demonstrate a greater burned area in the north, where the remaining native vegetation and less fragmented landscapes allow the fire to spread, when associated with favorable meteorological conditions. However, with the implementation of a new agricultural frontier in 2015, this region is under greater anthropic pressure with positive trends to land use. In the south, the fire shapes are already more complex and smaller because they are from agricultural areas historically developed, and consequently the landscape is more fragmented. Our results demonstrate a distinct spatial pattern of fire shape and size in Cerrado related to fragmentation of landscape and fire use to land cleaning. This information can help the modelling estimates of fire spread processes driven by topography, orientation of watersheds or dominant winds at local level, contributing to understanding the feedback with land cover/use, climate and biophysical characteristics at regional level to develop strategies for fire management.

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