Assessing Land-Cover Changes in the Brazilian Cerrado Biome based on the Time-Series Analysis of MODIS and Landsat Datasets

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INTRODUCTION

In 2018 the Brazilian government launched the deforestation monitoring system in the Cerrado - PRODES-Cerrado (INPE, 2018), under the project **Development of systems to prevent forest fires and monitor vegetation cover in the Brazilian Cerrado** (CLIMATE INVESTMENT FUNDS, 2018), mapping the conversion of native vegetation from 2000 and revealing that, currently, Cerrado has only ~50 % of original vegetation cover (figure 1). Other product of the project is the **Deforestation Polygon Assessment Tool**, which will assign a quality score for all deforestation (figure 2).

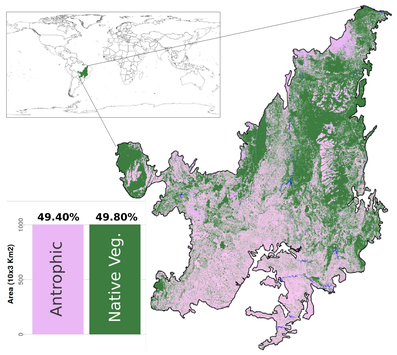

Figure 1. Anthropic area and native vegetation of the Cerrado biome, in 2017, according to PRODES-Cerrado mapping.

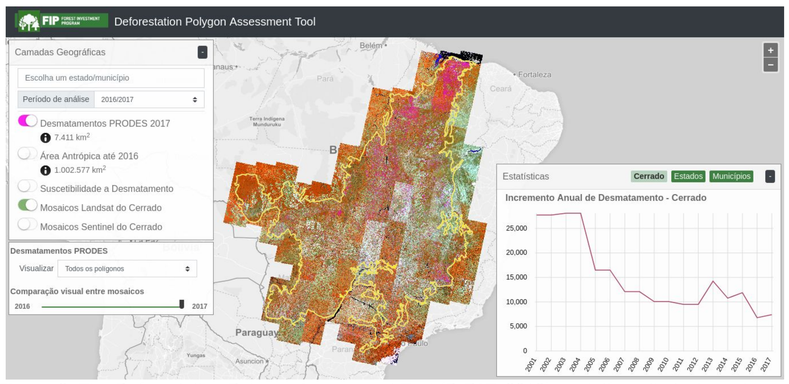

Figure 2. The Deforestation Polygon Assessment Tool (D-PAT, 2018), a platform that will assign a quality score for all PRODES-Cerrado deforestation polygons, considering the socioeconomic, soil, climatic and infrastructure data; the trends of deforestation expansion and the analysis of satellite time series (**http://dpat.lapig.iesa.ufg.br**).

DATA AND METHODS

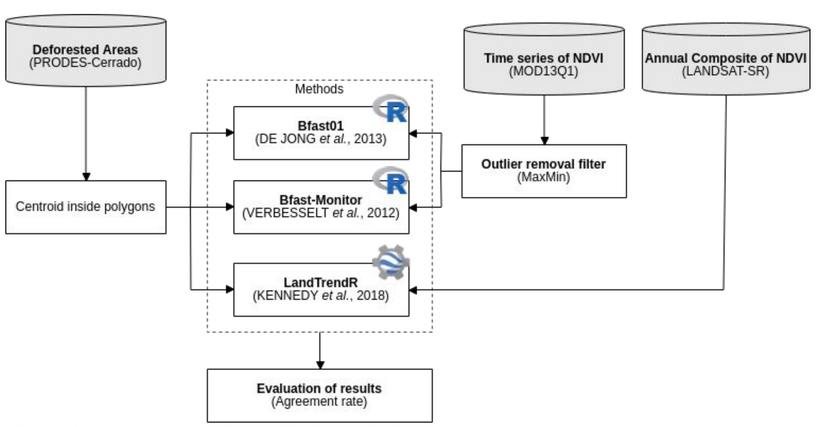

Figure 2. Data and methods used in the evaluation of breakpoint detection algorithms, applied over vegetation index time series, MODIS (2000 - 2017) and Landsat (1985 - 2017), and PRODES-Cerrado deforested areas, for periods 2008/2010 and 2016/2017.

RESULTS

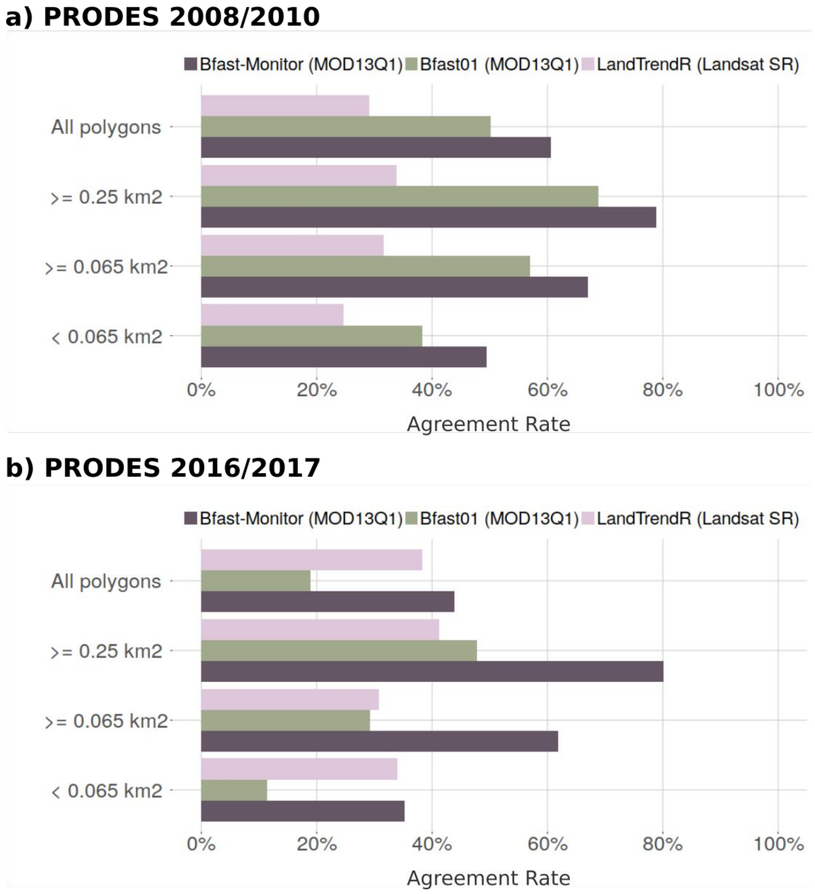

Figure 3. The agreement rate between PRODES-Cerrado deforestation, **a)** 2008/2010 and **b)** 2016/2017, with automatic breakpoints detection, considering polygons with different sizes. The Bfast-monitor presented the highest agreement rate in all cases, reaching rates of **~80%** in deforestation larger than **0.25 Km²**.

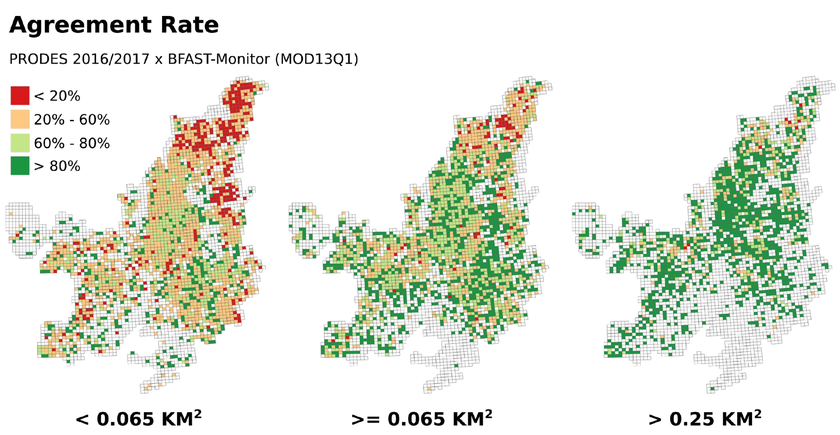

Figure 4. Spatial distribution of the agreement rates between PRODES-Cerrado deforestation and breakpoints detected by Bfast-Monitor, considering a regular grid of 25 x 25 Km². Considering only the polygons larger than a one MODIS pixel (*e.i.* **0.065 Km²**), the vast majority of cells have rates greater than **60%**.

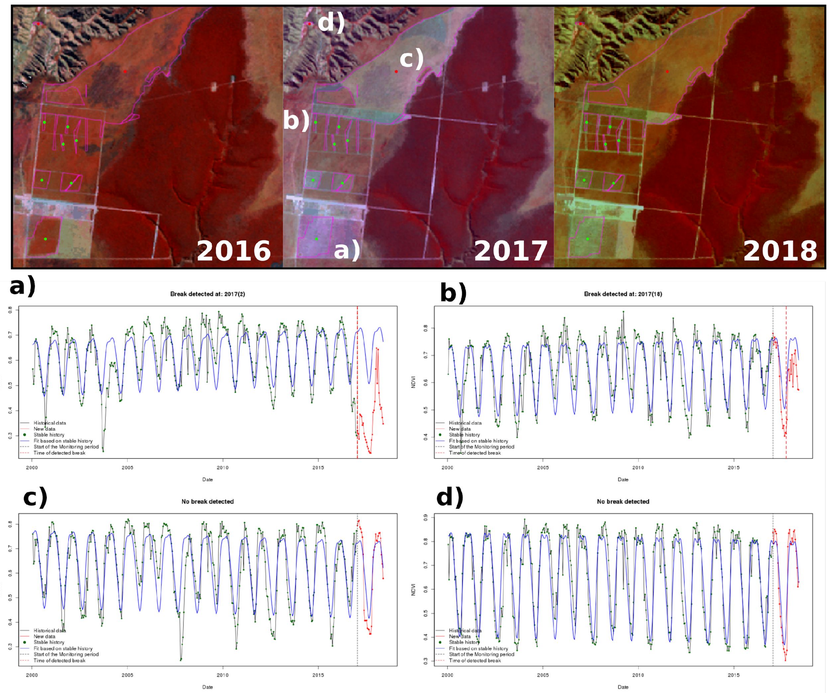

Figure 5. Area located in MATOPIBA, on the border of Santa Rita de Cássia-BA and Parnaguá-PI districts, showing **a)** breakpoint detected in large deforestation (*i.e.* **>= 0.25 km²**), **b)** breakpoint detected in small deforestation (*i.e.* **< 0.065 km²**), **c)** large deforestation with no break detected, and **d)** small deforestation with no break detected, according to Bfast-monitor. The Landsat images, presented in false color (NIR/SWIR/RED), are the same that were visually inspected by PRODES-Cerrado.

FINAL REMARKS

- The Bfast-monitor presented the best results considering large deforestation polygons (*i.e.* greater than **0.25 km²**).
- Applications in polygons with up to 4 MODIS pixels (*i.e.* between **0.065 km² and 0.25 km²**), may not detect some conversion of vegetation cover, mainly in fragmented and/or sloping landscapes.
- Future investigations will need for breakpoint detections in small deforestation polygons (*i.e.* less than **0.065 km²**).

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