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Analysis of canopy structural and functional properties of tropical forests in a fertilisation experiment by Sentinel-2 images

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Tropical forests such as Amazon is repository of ecological services. Understanding how tropical forest responds to the climate helps to improve ecosystem modeling and declining the uncertainty in calculation of carbon balance. Nowadays, the availability of very high resolution satellite imagery such as Sentinel-2 are powerful tools for analyzing the canopy structural and functional shifts over time, especially for tropical forest.

In this study, we examined the effect of the nutrient availability (nitrogen (N) and phosphorus (P)) on canopy and structural properties in tropical forest of French Guiana. In situ observations of canopy structure and functioning (i.e. photosynthesis, leaf N, chlorophyll content) were collected at two experimental sites (Paracou and Nouragues). Three topographical positions in each site were considered (top of the hills, middle and bottom end of the slope) and four plots were manipulated with different level of fertilization (Control, N, P, NP) in September 2016. Statistical analysis were conducted to analyze how the fertilization affect the forest canopy seasonality and if differences between sites and across positions existed. Furthermore, we tested whether Sentinel-2 data could help or not to describe the canopy changes observed in the field. Therefore, all Sentinel-2 images available before the start of the experiment, which date represent the natural situation, and two years after the intensive and repeated fertilization were collected. Greenness, chlorophyll and N, P related indicators were calculated from Sentinel-2 images.

Key words: Sentinel-2, Tropical forest, soil fertilization, topographical position.