Mapping and spatial modeling of the passage of bush fires in a context of protected areas in northern Cameroon: contribution of time series of sentinel-2 images.

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Abstract :

In Sudanese circles, bush fires have often been considered as environmental constraints. However, recent studies on the issue tend to distinguish more and more between hazardous and catastrophic fires, and strategic and less harmful fires. More than 40% of the areas of the North Cameroon Region are subject to nature protection regulations: there are 03 national parks and 28 Areas of Hunting Interest. In this Region, the cultural power surrounding the use of bush fires and the pressure on the territory and on plant resources complicate the management of protected areas. Indeed, bush fires in ordinary areas are supported by major agro-pastoral changes with a recomposition of spaces and management methods. But, in a context of protected areas, this dynamic of fires is located at the interface of two main vocations, namely agro-pastoral incursions and hunting components. So, can fires be recommended for protected areas in northern Cameroon (Arbonnier M., 2008)? How to anticipate fires through spatial data and empirical field observation? This article aims to propose a model for spatio-temporal monitoring of fires, in order to strengthen the management of protected areas which are increasingly experiencing anthropogenic threats.

To achieve this, the time series of sentinel-2 images from the MSI instrument for the period 2015-2020 were used. They offer enormous advantages in that they are characterized by a high spectral resolution (10 m), a high spatial swath (about 290 km), a good temporal frequency (10 days) and a strong spectral richness (13 bands). Six bands were necessary for this work, namely B2 (λ=492.4 nm); B3 (λ=559.8 nm); B4 (λ=664.5 nm); B8 (λ=832.8 nm); B11 (λ=1613.7 nm) and B12 (λ=2202.4 nm). This spatial and statistical modeling uses the grid method under QGIS and the application of the Moran index (LEE, Jay & Shengwen LI (2017) at the local and regional scale. By uni-temporal and multi-temporal analysis, the burnt surfaces were determined as well as the periods of the fires. Eight landscape units were defined in order to make a comparative reading of the fires between the parks and the ordinary areas. In addition, the field observations and surveys were aimed at apprehending the determinants of the uses of fires, their periods of occurrence, their typologies as well as the respective roles of the actors.

The finding show that compared to ordinary areas, fires are more observed in national parks. This is linked to the fairly abundant herbaceous biomass in the parks, corresponding to the combustible potential. This form of extension of the fires explains the pastoral incursions into the parks. As for the modalities of their extension, fires are linked to complex environmental dynamics on the one hand, and also to occasional and recurring social issues on the other. The temporal monitoring of the fires shows that from 2015 to 2020, 70% of the burned surfaces experience regular fires which pass through the same spaces and at the same time of the year. The local interaction between the time of burning and the combustibility of the vegetation is the determining criterion of the fire regimes observed at the regional scale. The dynamics of fires then reflects the management methods of rural areas and protected areas. Prediction by cartographic modelling, although having its limits (Batty M., & Torrens P.M., 2001), makes it possible to anticipate from a planning perspective of the territory.
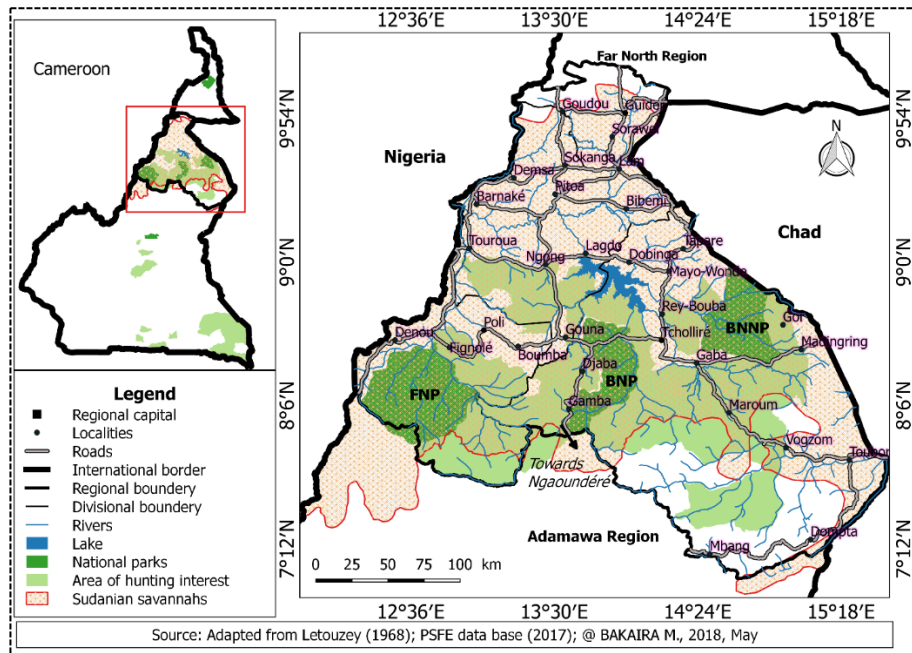
Figure 1. Location of study area

References

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