Towards understanding the wildfire dynamics and hot spots intensity in the central province of Cameroon: Contribution of Google Earth Engine (GEE) and spatial statistics analysis

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Abstract

Human activities are increasingly contributing to natural resources degradation particularly forest resources nowadays. These activities weaken or destroy these ecosystems. The study, through the geospatial tools of remote sensing and machine learning, investigated and assessed wildfire events its intensity in central Cameroon (Yoko and Nanga-Oboko municipalities) from 2003 to 2023. The use of Google Earth Engine's (GEE) platform and spatial statistics techniques such as Moran's I spatial autocorrelation, Getis-Ord Gi* hot spots analysis made it possible to assess the most vulnerable or non-vulnerable areas of these municipalities. It shows a strong presence of fire intensities (49.5 ha to 2651.7 ha) with a density ranging from 0 to 10.89 active fires (n) per km^2. The trend is upward for burned areas, and slightly downward for active fires (Mann Kendall and Sen's Slop statistics test) while for anomalies, 3.5 ha and 2n more were observed. November and December, February, and March, are the most prone fire months. The entire study area was subject to a high intensity of fires with an average of 1629.70 ha burned monthly and 931.26 ha considering the entire data series (2003–2023). Hot spots and strong areas spatial correlation (Moran's I = 0.009081; Z-Score = 15.454067; and $p < 0.001$) are observed in areas with a high fire occurrence. Therefore, the fire intensity areas are dependent on the width of the area burned. Thus, the frequency of fire is influenced by the location of the sectors. It will then be necessary to investigate the existing relative contributing approaches to the reduction of fire intensity by the various actors: human activities involved in the landscape restoration of promoting the right approaches.

Keywords: Cameroon, Google Earth Engine, human activities, Moran's I spatial autocorrelation, wildfire intensity

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