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Ortophoto and satellite imagery to monitoring biochar in mountain soils (NW of Cantabrian Range, Spain)

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In the Northwest of the Cantabrian Mountain Range the climate is oceanic and the vegetation cover should be mainly wood forests and heathlands. However, frequent wildfires have led to a progressive degradation of the vegetation cover by enhancing the development of extensive moorlands and pyrophytes species of high combustibility. Previous studies have proved that this intense fire history has altered the rates of carbon (C) transfer from vegetation to soil and carbon accumulation in soils. In this way, C stocks of 32 Mg/ha and 90 Mg/ha were measured in unburned and burned forest soils, respectively. The use of satellite imagery indexes (NDVI; fAPAR and LAI) showed a higher capability of C fixation in the unburned woodland biomass than in the burned one. On the other hand, the burned woodlands presented greater amounts of C stored in soils, mainly due to transfer processes promoted by the fires. Satellite imagery and ortophotography could be useful in order to monitor the C sequestration in soils. Several chemical bonds which represent different forms of soil organic C absorb energy from different wavelengths of the electromagnetic spectrum. The near infrared and visible bands reflectance values could be related to the amounts and types of soil carbon. In this work, we want to test the use of Landsat; Spot and MODIS satellite imageries and orthophotos to monitoring the pool of biochar in soils of wide mountain areas with high rates of C transfer from vegetation to soil, promoted by forest fires. 55 georeferenced soil samples, taken in an area 100 km2 located in the Northwest sector of the Cantabrian Range were crossed with ortophotos and satellite images taken in the winter season. Several spectrometric indexes related to soil properties (NDSI, NDBaI,), color indexes from the visible part of spectrum (SWIR) and values from visible and thermal infrared were calculated for each soil sample. Multivariate statistical analyses will be used to build models to relate the information derived from images to the concentrations of C in soils. The models will be regionalized to large scales using MODIS images.
Key words: Biochar; fires; soil carbon monitoring; remote sensing