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Experimental design based on field spectrometry for characterization of fire-affected soils.

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Wildfires can modify physical and chemical properties of soils (Mataix-Solera et al., 2011; Badía et al., 2014). These disturbances involve changes in soil spectral properties, which can be analyzed by using field spectrometry (VIS-SWIR) (Montorio et al., 2008; Guerrero et al., 2010). The aim of this study is to present an experimental design for hyperspectral characterization of fire affected soils in laboratory conditions. We analyzed soil samples from Montes de Zuera area (Aragón, Spain) repeatedly affected by wildfires in the period of 1979–2008. Fourteen samples, seven from the burned zones and the corresponding control samples were collected in spring of 2013. Spectral analysis was performed on subsamples of around 130 g (fine fraction, particle size < 2 mm), previously dried in a stove at 105°C during 36 hours, and placed in crystal petri dishes (90 mm x 15 mm). The spectra were obtained using spectroradiometer ASD FieldSpec® 4 (spectral range from 350 nm to 2500 nm) combined with a Contact Probe ensuring homogeneity of observation and illumination conditions. Spectralon reference panel Labsphere® was used for conversion to reflectance values. The resulting reflectance is an average of the measurements corresponding to five random points of the subsample, each of them representing a mean value of 10 spectra. The averaging of spectra improves the signal to noise ratio and, at the same time, it minimizes the variations caused by the samples surface roughness. Statistically significant differences have been detected between burned and control soils. Reflectance increase of 12% (average for the whole spectrum) was observed in 70% of the samples: 16%, 15% and 10% increase in visible, NIR and SWIR respectively. Therefore regardless of the wildfire date, an increase of reflectance is observed in burned soils due to changes on soil properties. A detailed analysis of physical, chemical and biological properties of soils will be used in further research to explain the higher reflectance of fire-affected soils in the study area.