



## **Parent rock material is influencing the efficiency of comparative soil color and VisNIR analysis for estimating total carbon, nitrogen and pedogenic oxides**

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Soil color originates from organic matter, moisture content and mineralogy e.g. oxides. We observed that soil color and VisNIR analysis is suitable to analyze several soil parameters but varying parent rock materials affects results of the analysis. A set of 150 top soil samples (0-20 cm) was collected from four different sampling areas in the larger region of Trier, south-west Germany. The sampling areas covered different geological parent rock materials, i.e. devonian schist, shell limestone, black jurassic sandstone, and Rotliegend (red beds). Soils were analyzed using a color measurement instrument (CR-410, KONICA MINOLTA) and a VisNIR spectroradiometer (ASD Field Spec 4). To this end, sieved (2 mm) and air-dried soil samples were spread on a tray to take repeated measurements. From the analytical data we estimated total carbon, total nitrogen, total hydrogen, and pedogenic oxides. The CIE 1976 ( $L^*$ ,  $a^*$ ,  $b^*$ ) color space was used for color description and analysis. Dependent on the different included parent rock materials the  $L^*$ ,  $a^*$ , and  $b^*$  values are positively or negatively correlated, for example with the total C content or the pedogenic oxides. Statistical analysis of the whole dataset showed weak correlations and small  $R^2$  (OC:  $R^2 < 0.01$  for all data), while analysis of the subsets, separated by the different parent rock materials, revealed good correlations and increased  $R^2$  (OC:  $R^2 > 0.12-0.42$ ). This research suggests that the  $L^*$ ,  $a^*$ , and  $b^*$  values are appropriate for rapid estimation of the C, N, H, and pedogenic oxides. The relation of soil color and soil properties is further influenced by soil use (arable land vs. grassland). Consequently, soil color is useful for the estimation of several soil parameters but it is necessary to calibrate models depending on the parent rock material and land use.