Organic matter cycling along geochemical, geomorphic and disturbance gradients in vegetation and soils of African tropical forests and cropland - Project TropSOC DATABASE_v1.0

2.3. Forest – Organic Soil Layers

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Introduction

The dataset comprises a unique sample identifier and 7 additional soil C and N variables describing forest L and O horizon at the plot level for TropSOC's forest plots. Missing values are indicated by –9999. Note: details regarding plots and plot design can be found in *2_forest.pdf.*

Data structure

No.	Variable	Explanation	Unit
1	sampleID	unique identifier of any soil or vegetation sample taken in the field	-
2	BD_O	bulk density of the organic soil layer	$g\ cm^{-3}$
3	mean_N	mean organic nitrogen content in mass percent	%
4	sd_N	standard deviation of mean organic nitrogen content in mass percent; note if no_N < 2 then N_SD is set to -9999	%
5	no_N	number of measurements available to calculate mean_N	-
6	mean_C	mean organic carbon content in mass percent	%
7	sd_C	standard deviation of mean organic carbon content in mass percent; note if n_no < 2 then sd_N is set to -9999	%
8	no_C	number of measurements available to calculate mean_N	-

Methods

Bulk density (BD) [variable 3]: Bulk density of the L and O horizon was assessed by sampling litter and organic soil layers of nine points along the border and in the centre of each forest plot. At each sampling point the thickness of the litter layer was measured with a ruler and then sampled within a 5 cm x 5 cm square. When the litter layer was too thin, the sampling square was expanded to 10 cm x 10 cm to retrieve enough sample material. The nine samples of each layer were combined to one composite sample representing a 40 x 40 m forest plot. Collected composite samples were then oven dried at 40 °C for 48 hours and subsequently weighted. The volume of each layer was calculated by using the averaged thickness of each layer multiplied by the square area of all nine sampling points. The bulk density of each layer was then calculated by dividing the dry weight of the composite sample by its volume. Note that due to Covid-19 lockdown in 2020 measures we were not able to sample the bulk density and O horizons of the felsic forest plots. Instead, we used average values of the O horizon at the according slope positions of the mafic and mixed sedimentary rock regions as a replacement.

Soil organic carbon and nitrogen [variables 4 to 9]: Carbon (C) and nitrogen (N) contents in the O soil layer were measured using 1 g of ground subsamples with a dry combustion analyser (Variomax CN, Elementar GmbH, Hanau, Germany) and a measuring range of 0.2 - 400 mg g^{-1} (to determine the absolute C or N mass in sample) and a reproducibility of < 0.5% (relative deviation). Recovery rates exceeding 97% and 91% were obtained across all samples for the mass as well as C and N concentrations, respectively. None of the soil samples showed any reaction when treated with 10 % HCl and are therefore considered free of carbonates. Consequently, total soil C and N content is interpreted as soil organic carbon (SOC) and soil organic nitrogen (SON) content.

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