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

2.5.3. Forest – Soil experiments – ^{14}C data from bulk soil and CO_2 measurements

When using these data, please cite the sources of the original publication of the data:

Doetterl S., Asifiwe R.K., Baert G., Bamba F., Bauters M., Boeckx P., Bukombe B., Cadisch G., Cizungu L.N., Cooper M., Hoyt A., Kabaseke C., Kalbitz K., Kidinda L., Maier A., Mainka M., Mayrock J., Muhindo D., Mujinya B.B., Mukotanyi, S.M., Nabahungu L., Reichenbach M., Rewald B., Six J., Stegmann A., Summerauer L., Unseld R., Vanlauwe B., Van Oost K., Verheyen K. Vogel C., Wilken F., Fiener P. Organic matter cycling along geochemical, geomorphic and disturbance gradients in forests and cropland of the African Tropics - Project TropSOC Database Version 1.0. *Earth System Science Data* XXX, DOI XXX, 2021.

Bukombe B., Fiener P., Hoyt A., Doetterl S. Controls on heterotrophic soil respiration and carbon cycling in geochemically distinct African tropical forest soils. *Soil Discussion (pre-print).* https://doi.org/10.5194/soil-2020-96, 2021.

Reichenbach M., Fiener P., Garland G., Griepentrog M., Six J., Doetterl S. The role of geochemistry in organic carbon stabilization in tropical rainforest soils. *Soil Discussion* (*pre-print).* https://doi.org/10.5194/soil-2020-92 , 2021.

Introduction

The dataset comprises a unique sample identifier and 10 additional variables that provide information on radiocarbon signatures (^{14}C) of bulk soil and respired gas assessed during the incubation experiment performed on TropSOC's tropical forest soils. Variables 4 to 7 give information regarding ^{14}C in soil samples, while variables 8 to 11 comprise ^{14}C data from respired CO_2 during the incubation experiment of corresponding soils. Missing values are indicated by -9999. Note: details regarding plots and plot design where the soil samples were collected 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	C_soil	SOC content of the composite bulk soil	%
3	N_soil	SON content of the composite bulk soil	%
4	FMC_soil	fraction modern carbon of the bulk soil	%
5	err_FMC_soil	error of fraction modern carbon of the bulk soil	-
6	delta_14C_soil	delta ^{14}C of the bulk soil	‰
7	err_delta_14C_soil	error of delta ^{14}C of the bulk soil	‰
8	FMC_CO2	fraction modern carbon of CO_2	%
9	err_FMC_CO2	error of fraction modern carbon of CO_2	-
10	delta_14C_CO2	delta ^{14}C of CO_2	‰
11	err_delta_14C_CO2	error of delta ^{14}C of CO_2	‰

Methods

As part of our experiments to assess heterotrophic respiration (see Bukombe et al. 2021), ^{14}C radiocarbon dating was used to estimate the fraction of modern carbon in bulk soil and respired gas to give an estimate on the relative age of C in both phases. For this, a composite soil sample stemming from field replicates of the incubated bulk soil samples and their according CO_2 respiration measurements were analysed for ^{14}C activity. After four days of pre-incubation at the start of the incubation experiment, CO_2 gas samples were analysed for ^{14}C (expressed as the percentage of modern C [pM-^{14}C %]). For both soil and gas samples, an equivalent sample of roughly 1 mg C was sealed into an evacuated Pyrex tube and reduced to graphite. Sample preparation backgrounds were subtracted based on measurements of ^{14}C free coal. The radiocarbon signature of the graphite was measured with accelerator mass spectrometry using a MICADAS Mini Carbon Data System (IonPlus, Switzerland) at the Accelerated Mass Spectrometry facility at Max Planck Institute Jena (Jena, Germany). At the same time, all soil and gas samples were analysed for total C using an elemental analyser (ANCA-GSL PDZ Europa, Crewe, UK) coupled to an isotope ratio mass spectrometer (IRMS) (2020, SerCon, Crewe, UK) to assess $^{13/12}C$ ratios. Radiocarbon results were then corrected for isotopic fractionation according to the conventions of (Stuiver and Polach, 1977), with $\delta\ ^{13}C$ values measured on the prepared graphite using the AMS spectrometer. Radiocarbon concentrations are given as fractions of a modern oxalic acid standard and conventional radiocarbon age following the conventions of Stuiver and Polach (1977). For a scientific interpretation of these results see Reichenbach et al. (2021) and Bukombe et al. (2021).

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References

Bukombe B., Fiener P., Hoyt A., Doetterl S. Controls on heterotrophic soil respiration and carbon cycling in geochemically distinct African tropical forest soils. *Soil Discussion (pre-print).* https://doi.org/10.5194/soil-2020-96, 2021.

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