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

2.5.1. Forest – Soil experiments – Incubation experiments

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Introduction

The data set comprises a unique sample identifier and 7 additional variables that provide information regarding soil incubations conducted for selected TropSOC tropical forest soils. Missing data is indicated by -9999.

Data structure

No.	Variable	Explanation	Unit
1	sampleID	unique identifier of any soil or vegetation sample taken in the field	-
2	sample_weight	weight of the incubated sample	g
3	no	number of measurements during the incubation	-
4	incubation	duration of the incubation in days	dd
5	pre-incubation	duration of the pre-incubation phase in days	dd
6	C-CO2_SOC	weighted mean CO_2-efflux over the entire incubation period per SOC mass	µg CO_2-C g SOC^{-1} h^{-1}
7	C-CO2_soil	weighted mean CO_2-efflux over the entire incubation period per soil mass	µg CO_2-C g $soil^{-1}$ h^{-1}
8	RSD	weighted average of the relative standard deviation for the whole incubation period	-

Methods

Heterotrophic respiration was assessed in a laboratory incubation experiment using bulk soil samples from forest site soils across all geochemistry, topographic and depth gradients. 50 g of 12 mm sieved soil were weighed in a 100 ml beaker with soil moisture adjusted to 60 % of the water holding capacity, considering this to be the optimum water content level for microorganism activities (Rey et al., 2005). Each sample was put in a 955.5 ± 1.3 ml sealed mason jar with no further additives. Samples were then incubated at 20 °C, a temperature closest to the mean temperature of the study sites. Following a pre-incubation period of 4 days to allow for equilibration after rewetting, we incubated all samples for 120 days and sampled periodically every 1 to 10 days throughout the experiment with longer intervals towards the end of the experiment as respiration levelled out. This amounted to an average of twelve observations per incubated sample. 20% of the samples were incubated in triplicate to assess the average deviation between samples. Gas was sampled using a syringe, transferred with pre-evacuated vials and analysed for its CO_2 concentration using a gas chromatograph (Trace 1300, Thermo

Scientific, MA USA). The gas chromatograph was calibrated with five CO_2 standard gas mixtures (0, 500, 1000, 5000, and 10000 ppm CO_2) and measurements were corrected for ambient air CO_2 respiration. Generally, gas samples were taken after accumulating between 1000-3000 ppm CO_2. Before sealing to accumulate C, jars were flushed with fresh air before. After each measurement, jars were opened and covered with parafilm allowing for gas diffusion to avoid CO_2 saturation effects that could inhibit microbial activity, and to retain moisture between CO_2 accumulation periods. The resulting data average standard error of the mean replicate values was 9.6%. Incubation data was used to derive the specific potential heterotrophic respiration (SPR), expressed as CO_2-C per unit soil C, and CO_2-C per gram soil to derive total potential heterotrophic respiration (TPR). Data was analysed as the weighted average of SPR and TPR over the respective length of the experiment. For a scientific interpretation of these results see Bukombe et al. (2021).

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References

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