



TropSOC Database

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1. Licence

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2. Citation

When using the data please cite:

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The data are supplementary material to:

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 - TropSOC database v1.0. Copernicus GmbH.

<https://doi.org/10.5194/essd-2021-73>, 2021.

3. Data Description

We provide version 1.0 of an open access database created as part of the project “**Tropical soil organic carbon dynamics along erosional disturbance gradients in relation to variability in soil geochemistry and land use**” (**TropSOC**). TropSOC v1.0 contains spatial and temporal explicit data on soil, vegetation, environmental properties and land management collected from 136 pristine tropical forest and cropland plots between 2017 and 2020 as part of several monitoring and sampling campaigns in the Eastern Congo Basin and the East African Rift Valley System. The results of several laboratory experiments focussing on soil microbial activity, C cycling and C stabilization in soils complement the dataset to deliver one of the first landscape scale datasets to study the linkages and feedbacks between geology, geomorphology and pedogenesis as controls on biogeochemical cycles in a variety of natural and managed systems in the African Tropics.

3.1. Sampling method

Sampling procedures are described in each metadata description .pdf file accompanying a specific .csv file that represents a methodologically distinct subset of the database. A general overview of field sampling procedures and design is given in the related submission to ESSD which describes the dataset as a whole.

3.2. Analytical procedure:

Analytical procedures are described in each metadata description .pdf file accompanying a specific .csv file that represents a methodologically distinct subset of the database.

3.3. Data processing

Data processing and quality control are described in each metadata description .pdf file accompanying a specific .csv file that represents a methodologically distinct subset of the database.

4. File description

4.1. File inventory

Datasets are given as tab-delimited .csv files. For each .csv file the metadata describing data structure and assessment methods are given in a .pdf file of the same name. Moreover, additional .pdf files for each main section of the database (basic information, forest, cropland, and microscale meteorology) are given, providing an overview of the structure within each section. Note that the ‘**basic information**’ section of the database provides the linkages between individual data, e.g. from soil analysis and the location and/or soil depths where these samples were acquired (for linkages see also Figure 1).



Figure 1. Overview of linkages between datasets in the TropSOC database v1.0. Note that for each data .csv-file an .pdf-file is given detailing the metadata of the respective data sheet.

4.2. File naming convention

Files are numbered hierarchically and named following the domain of the data with being part of: 1 Basic Information; Forest Data; Cropland Data; Micrometeorological Data.

Table 1. Structure of the TropSOC database. For each topic a .pdf file is given that entails an overview for the available data sets. Each dataset comprises a data-containing .csv file and an additional metadata-containing .pdf file of the same name.

| | |
|--|--|
| Introduction & structure of the data base | 0_intro_structure.pdf |
| 1. Basic information 1.1. Location and basic background information for all plots and points where data were collected 1.2. Data base internal connection between location of plots and points and soil data from different soil depths | 1_basic_information.pdf 11_plots_points.csv/pdf 12_sample_identifier.csv/pdf |
| 2. Forest 2.1. Vegetation 2.1.1. Forest inventory 2.1.2. Forest inventory aggregated 2.1.3. Fresh leaves chemistry 2.1.4. Fresh leaves chemistry aggregated at species level 2.1.5. Litter fall 2.1.6. Litter fall aggregated to seasonal values 2.1.7. Litter fall aggregated to annual values 2.1.8. Root biomass 2.1.9. Root biomass aggregated to seasonal values 2.1.10. Root biomass aggregated to annual values 2.1.11. Root productivity 2.1.12. Root productivity aggregated to seasonal values 2.1.13. Root productivity aggregated to annual values 2.2. Mineral soil layers 2.2.1. Soil carbon and nitrogen including organic matter fractions 2.2.2. Physicochemical soil properties from laboratory analyses 2.2.3. Physicochemical soil properties from NIR-MIR spectroscopy 2.3. Organic soil layers 2.4. Pu soil inventory 2.5. Soil experiments 2.5.1. Incubation experiments 2.5.2. Microbial biomass and enzyme experiments 2.5.3. ¹⁴ C data from bulk soil and CO ₂ measurements 2.6. Parent material 2.7. Soil profile descriptions | 2_forest.pdf 211_forest_invent.csv/pdf 212_forest_invent_agg.csv/pdf 213_fresh_leaves.csv/pdf 214_fresh_leaves_agg.csv/pdf 215_litter.csv/pdf 216_litter_seasonal.csv/pdf 217_litter_annual.csv/pdf 218_root_biomass.csv/pdf 219_root_biomass_seasonal.csv/pdf 2110_root_biomass_annual.csv/pdf 2111_root_prod.csv/pdf 2112_root_prod_seasonal.csv/pdf 2113_root_prod_annual.csv/pdf 221_soil_carbon.csv/pdf 222_soil_phy_chem.csv/pdf 223_soil_spec.csv/pdf 231_soil_organic_layer.csv/pdf 241_pu_inventory.csv/pdf 251_incubation.csv/pdf 252_microbiology.csv/pdf 253_c14.csv/pdf 261_rocks.csv/pdf 271_profiles.csv/pdf |
| 3. Cropland 3.1. Biomass & management 3.1.1. Biomass yield based on plot data 3.1.2. Land management data 3.2. Mineral soil layers 3.2.1. Soil carbon and nitrogen including organic matter fractions 3.2.2. Physicochemical soil properties from laboratory methods 3.2.3. Physicochemical soil properties from NIR-MIR spectroscopy 3.3. ²³⁹⁺²⁴⁰ Pu soil inventory 3.4. Soil experiments 3.4.1. Incubation experiments 3.4.2. ¹⁴ C data from bulk soil and CO ₂ measurements | 3_cropland.pdf 311_biomass.csv/pdf 312_management.csv/pdf 321_soil_carbon.csv/pdf 322_soil_phy_chem.csv/pdf 323_soil_spec.csv/pdf 331_pu_inventory.csv/pdf 341_incubation.csv/pdf 342_c14.csv/pdf |
| 4. Micrometeorological data 4.1. Locations of meteorological stations 4.2. Daily meteorological data from six meteorological stations 4.3. High resolution 5 min triggered precipitation data | 4_meteo.pdf 410_meteo_locations.csv/pdf 420_meteo_daily.csv/pdf 430_meteo_pcp_tig.csv/pdf |

4.3. Description of data tables

Data tables including, units, parameters, naming routines and description are given in each metadata description .pdf file accompanying a specific .csv file that represents a methodologically distinct subset of the database.

5. References

The dataset is described in detail as part of the following submission:

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 - TropSOC database v1.0., Copernicus GmbH. <https://doi.org/10.5194/essd-2021-73>, 2021.

The following references use part of the data presented here for a scientific interpretation:

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.

Kidinda LK, Olagoke FK, Vogel C, Kalbitz K, Doetterl S. Patterns of microbial processes shaped by parent material and soil depth in tropical rainforest soils. *Soil Discussion (pre-print)*. <https://doi.org/10.5194/soil-2020-80>, 2020.

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.

Wilken F., Fiener P., Ketterer M., Meusbürger K., Muhindo D.I., Van Oost K., Doetterl S. Assessing soil erosion of forest and cropland sites in wet tropical Africa using $^{239+240}\text{Pu}$ fallout radionuclides. *Soil Discussion (pre-print)*. <https://doi.org/10.5194/soil-2020-95>, 2020.