TropSOC Database

4.2. Meteorological data – Daily meteorological data from six meteorological stations

When using these data, please cite the database and the key publication in ESSD:

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https://doi.org/10.5880/fidgeo.2021.009

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

Introduction

The dataset comprises a unique station identifier and 11 variables from six meteorological stations that provide information on date, year, month and day of the measurement records as well as precipitation, temperature, relative humidity, radiation and wind speed. Meteorological data has a daily temporal resolution for the period from August 2018 to November 2020. Only days that are covered by more than 90% of valid data records are included, days that do not fulfil this condition are indicated as missing values. Please see *410_meteo_locations.csv* and *410_meteo_locations.pdf* for the geographic location of the stations. Missing values are indicated by the entry: -9999.

Data structure

No.	Variable	Explanation	Unit
1	stationID	identification number of the station as given in *410_meteo_locations.csv*	-
2	station_name	station name as given in *410_meteo_locations.csv*	-
3	date	date of record	dd.mm.yyyy
4	year	year of record	yyyy
5	month	month of record	mm
6	day	day of record	dd
7	season	main seasons divided by precipitation; weak_dry: Dec – Feb; strong_rain: March – May; strong_dry: June – Aug; weak_rain: Sep – Nov)	-
8	pcp	sum of precipitation measured 1.0 m above ground	mm
9	temp	main air temperature measured 2.0 m above ground	° C
10	rel_hum	mean relative humidity measured 2.0 m above ground	%
11	air_pres	mean air pressure measured 2.0 m above ground	kPa
12	glob_rad	sum of global radiation measured 2.0 m above ground	kW m^{-2}
13	wind_spd	mean wind speed measured 2.0 m above ground	m s^{-1}

Methods

Quality assessment of weather station data was carried out by time series and double sum analysis (Figure 1 and 2). Double mass curves (Searcy et al. 1960) of all parameters show a nearly linear relationship between the monitored data of the stations, which is an indication for data quality and consistency of data monitored at all stations. Note that wind speed data show minor signs of systematic inconsistencies between the stations, which may be attributable to seasonal wind patterns or local changes at the measurement location (see Figure 2, wind speed).

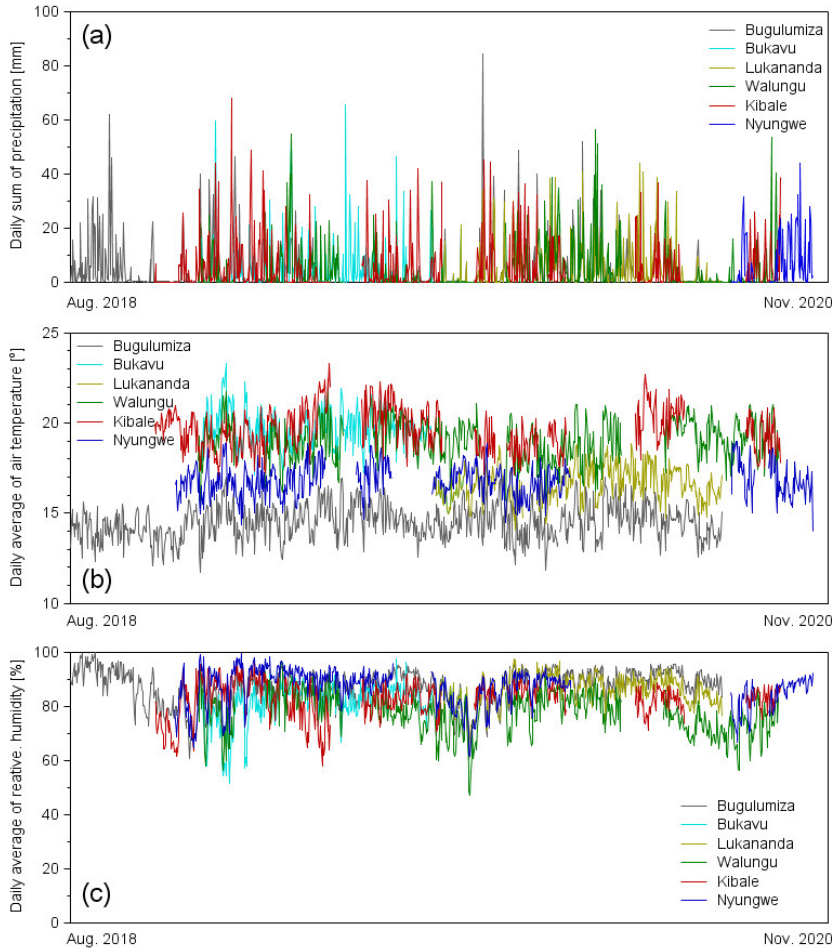

Figure 1. Time series of daily sum of precipitation (panel a), daily average air temperature (panel b), daily average relative humidity (panel c), daily average air pressure (panel d), daily sum of global radiation (panel e) and daily average of wind speed (panel f).

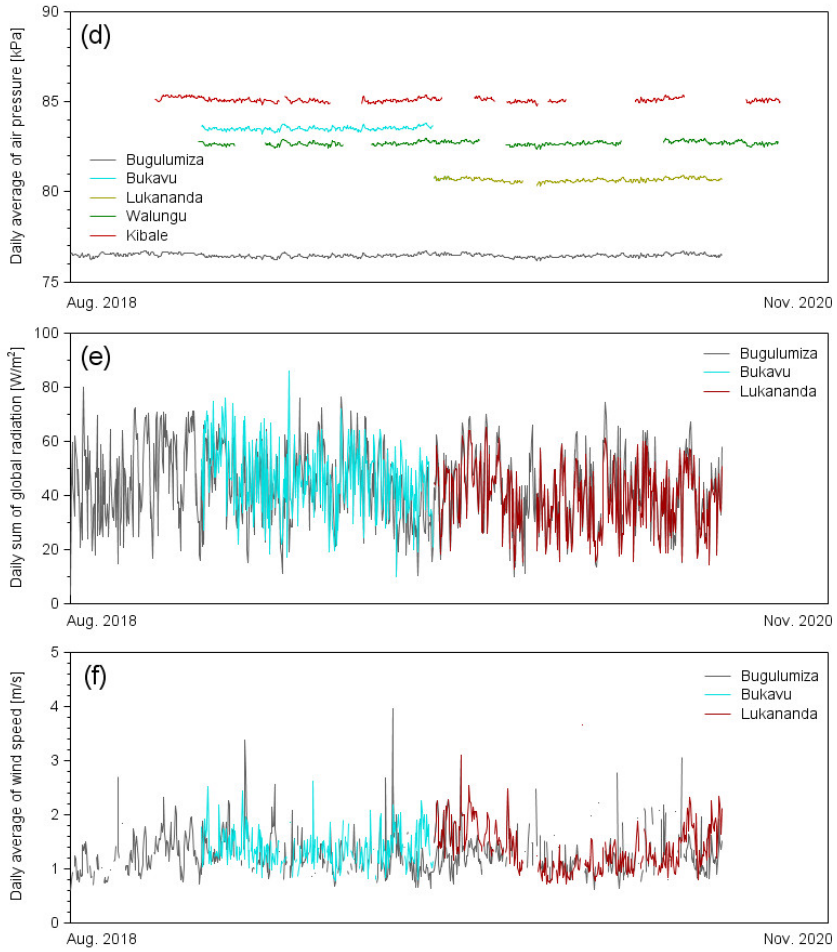

Figure 1. continued.

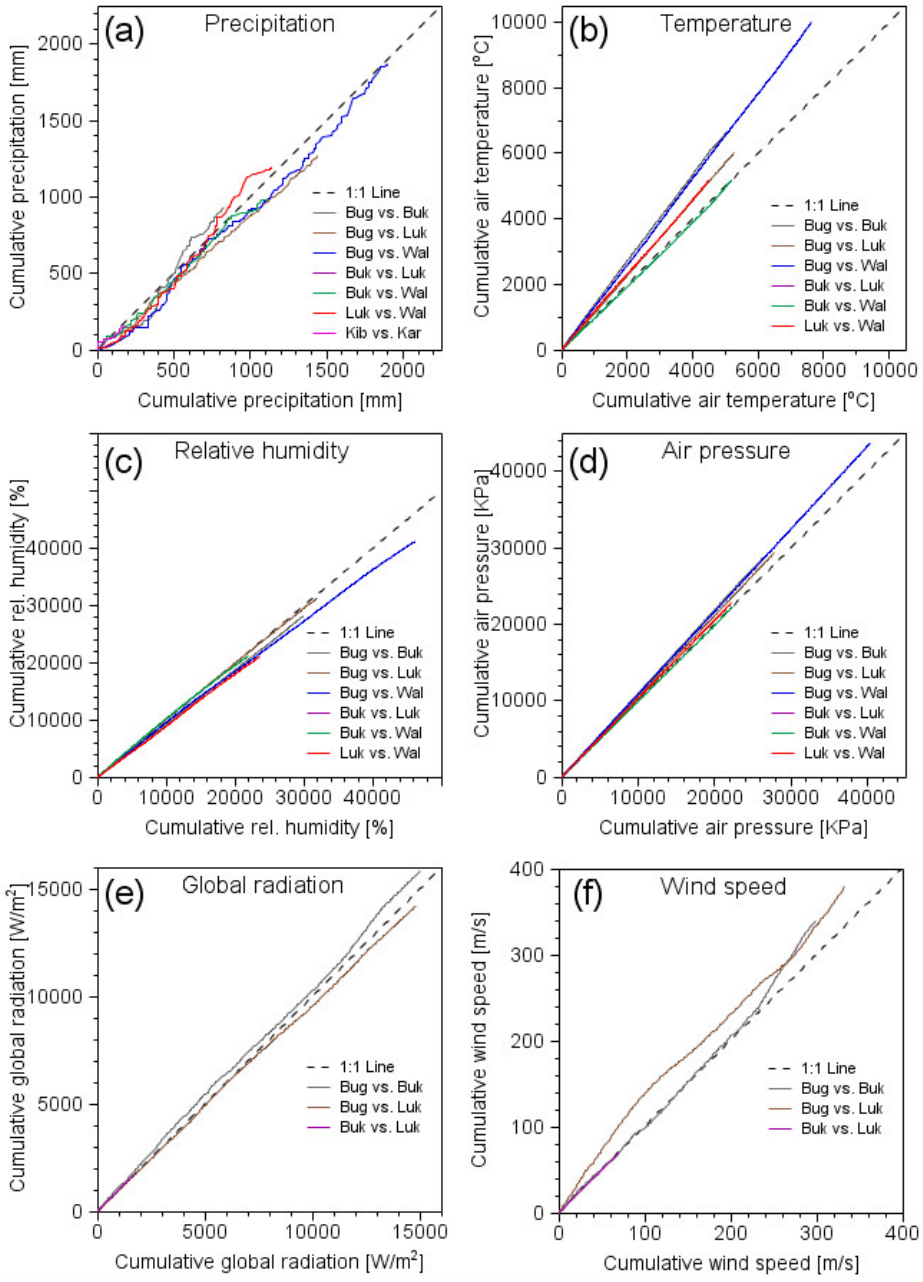

Figure 2. Double sum analysis using cumulative values of daily values of precipitation (panel a), air temperature (panel b), relative humidity (panel c), air pressure (panel D), global radiation (panel e) and wind speed (panel f). Abbreviations: Bug = Bugulumiza, Buk = Bukavu, Luk = Lukananda, Wal = Walungu, Kib = Kibale, Kan = Karanguru. Note that daily rainfall data of Karanguru was kindly provided by the AfReSlide project, Clovis Kabaseke, Mountains of the Moon University in Fort Portal, Uganda for validation purposes.

To illustrate the monthly coverage in precipitation and temperature data between March 2018 and November 2020 at all of the six different meteorological stations, we plotted the relative extend in data coverage per month in Figure 3 and 4.

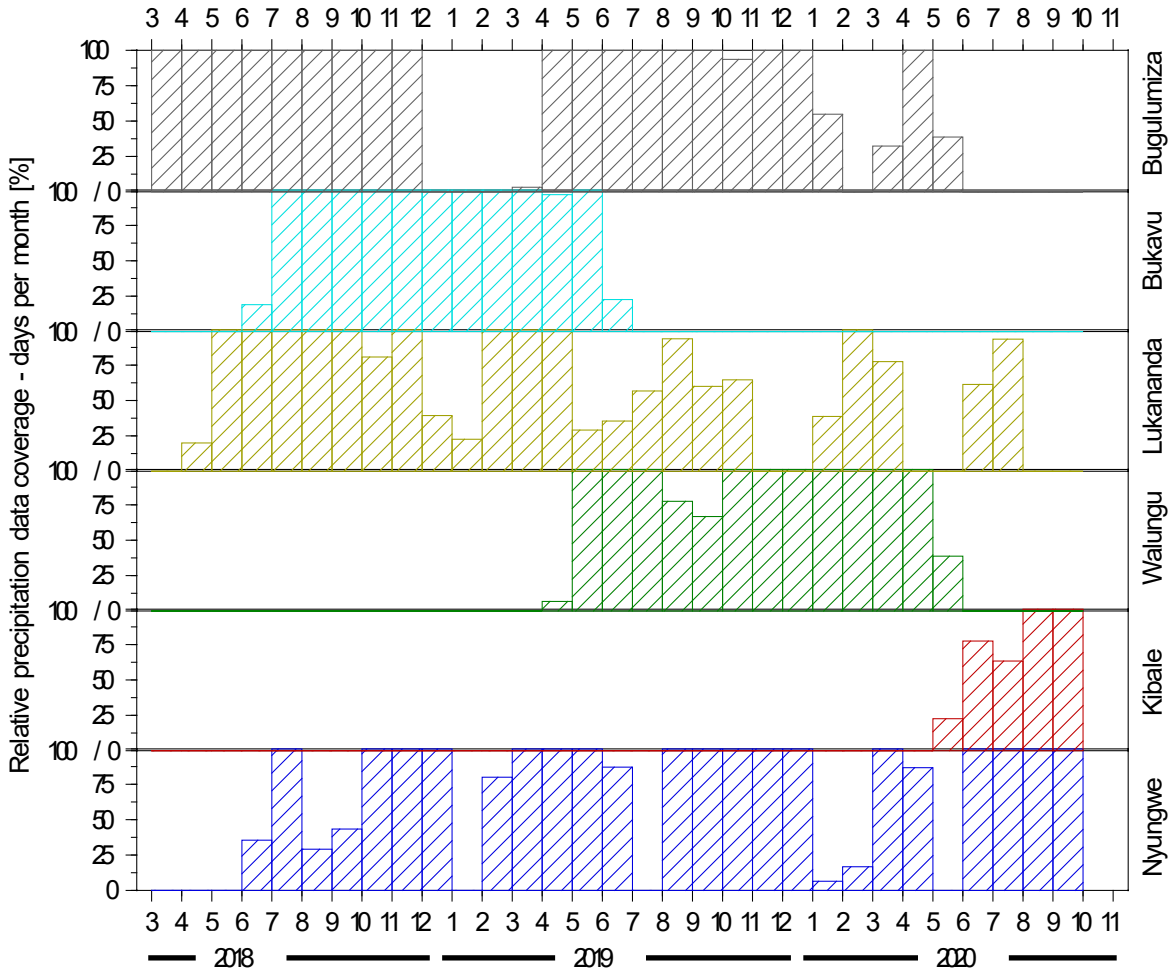

Figure 3. Relative data coverage of daily precipitation measurements for all month between March 2018 and November 2020 measured at the meteorological stations in Bugulumiza, Bukavu, Lukananda, Walungu, Kibale and Karanguru.

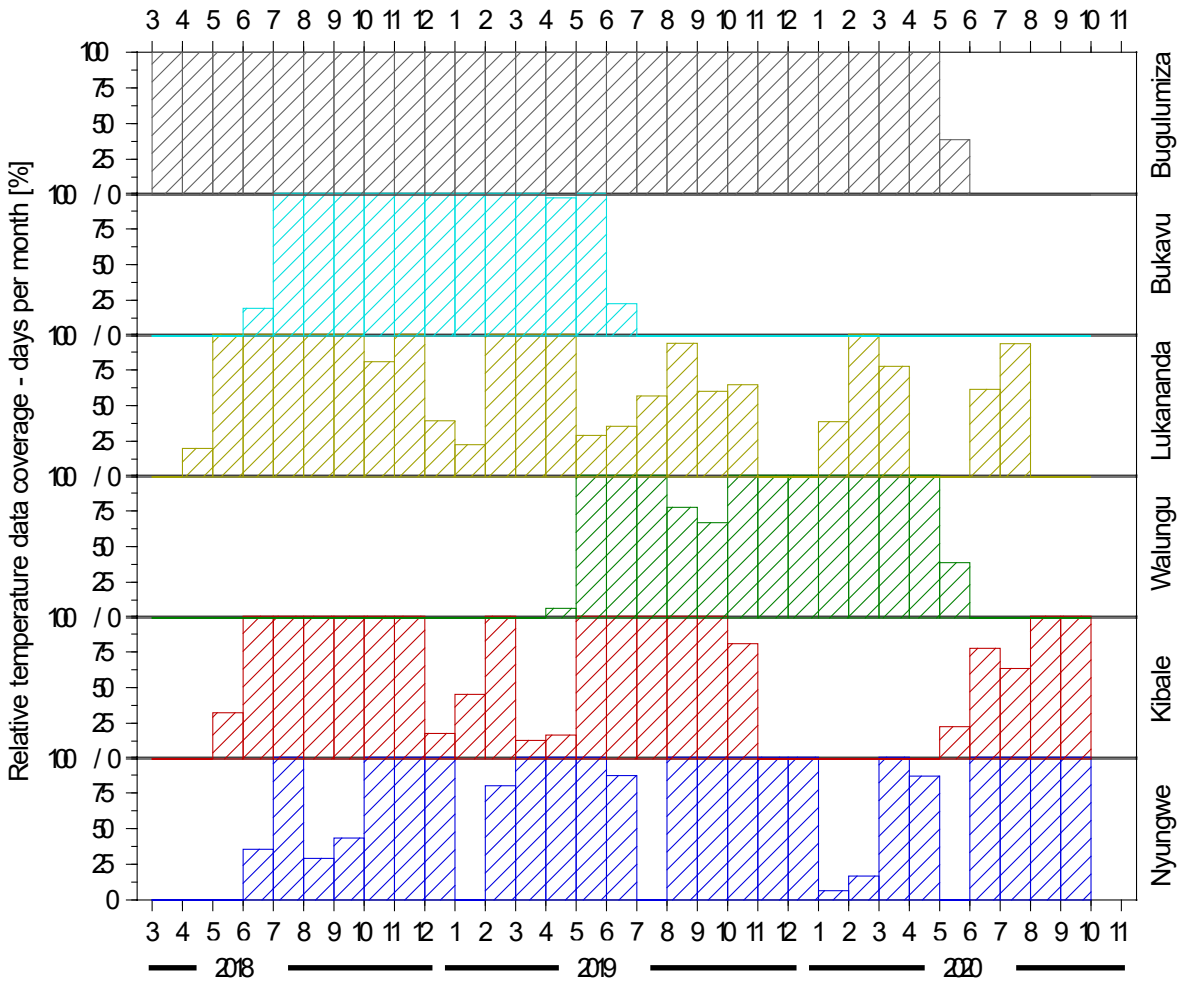

Figure 4. Relative data coverage of daily mean temperature measurements for all month between March 2018 and November 2020 measured at the meteorological stations in Bugulumiza, Bukavu, Lukananda, Walungu, Kibale and Karanguru.

Acknowledgment

TropSOC was funded via the Emmy-Noether-Program of the German Research Foundation (project ID 387472333). Micrometeorological data from three of our weather stations (Bukavu, Lukananda, Bugulumiza) were made available and are administered by the Trans-African Hydro-Meteorological Observatory (TAHMO). New and additional data can be acquired at https://tahmo.org.

References

Searcy, J.K., Hardison, C.H., Langbein, W.B., 1960. Double mass curves. Geological Survey Water Supply Paper 1541-B. US Geological Survey, Washington DC.