

# Soil physical data

When using these data, please cite:

Mainka, M.; Bakker, L.; Maier, A.; Ruethers, J.; Bakke Westergaard, K.; Fior, S.; Frossard, A.; Griepentrog, M.; Van de Broek, M.; Wilken, F; Dötterl, S.; Alexander, J.; Magnabosco, C. (2025): Arctic Greening Database. v0.1. GFZ Data Services.  
<https://doi.org/10.5880/fidgeo.2025.074>

## Introduction

In this data sheet all measured soil physical variables per soil plot depth increment, soil pit horizon and bioplot are shown. These data entail the sample id, plot id, site id, clay content, silt content, sand content, water content, percent coarse fraction, percent stones

Table 1. General information

|                        |                                                                    |
|------------------------|--------------------------------------------------------------------|
| project_name           | ETH+ Arctic Greening                                               |
| creation_date          | 2024-12-04                                                         |
| last_modification_date | 2025-03-05                                                         |
| sampling_period        | 2022-07-09 – 2023-08-09                                            |
| creator                | Annina Maier                                                       |
| contact_1              | annina.maier@usys.ethz.ch                                          |
| contact_2              | <a href="mailto:sdoetterl@usys.ethz.ch">sdoetterl@usys.ethz.ch</a> |
| number_samples         | 497                                                                |
| processing_status      | ongoing                                                            |
| upload_status          | ongoing                                                            |

Table 2. Variable overview

| variable               | explanation                                                                                                                                                                                                | unit |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| plot_id                | plot_id of a respective observation                                                                                                                                                                        | -    |
| sample_id              | sample_id of a respective observation                                                                                                                                                                      | -    |
| sand_pct               | sand content of the bulk soil                                                                                                                                                                              | %    |
| sand_pct_predicted     | Indication if the sand content of the bulk soil in the sand column was observed or predicted using a DRIFT spectroscopy calibrated model. For details see soil spectroscopy metadata                       | -    |
| siltclay_pct           | Sum of silt and clay content of the bulk soil                                                                                                                                                              | %    |
| siltclay_pct_predicted | Indication if the $\Sigma$ silt and clay content of the bulk soil in the siltclay column was observed or predicted using a DRIFT spectroscopy calibrated model. For details see soil spectroscopy metadata | -    |
| water_content_pct      | water content of the bulk soil                                                                                                                                                                             | %    |
| cf_pct                 | coarse fraction percentage of the bulk soil                                                                                                                                                                | %    |
| stones_pct             | stone content percentage of the bulk soil                                                                                                                                                                  | %    |

## Methods

### *Sample processing*

Following soil sampling, all soil samples together with all above- and belowground biomass samples were stored at -20 °C until analysis. The collected soil samples were partially thawed, homogenized using a chisel and hammer and split into four representative portions of equal weight. From these portions, one portion was dried in the oven at 30 °C for 96 h, another was dried in the oven at 105 °C for 48 h and two portions were again stored at -20 °C. Particle size distribution analyses were carried out with 30 °C dried and sieved soil samples (< 2 mm).

### *Particle size distribution (Clay, Silt, Sand content)*

Particle size distribution into the size fractions for sand (2000 µm > sand > 63 µm), silt (63 µm > silt > 2 µm) and clay (2 µm > clay) was determined according to Miller and Schaetzl (2012), using a laser diffraction particle size analyzer (PSA). Hereby, approximately 0.5 g of soil (0.2 - 0.5 g for fine soils until a maximum of 2.5 g for very sandy soils) were weighed into glass vials. To these, 3 ml of 6 % H<sub>2</sub>O<sub>2</sub> were added. The samples were placed in a water bath at 40 °C. An additional 3 ml H<sub>2</sub>O<sub>2</sub> were added into the vials over the course of the following two subsequent days. After, samples were dried at 60 °C in an oven so that H<sub>2</sub>O<sub>2</sub> could evaporate completely. Once samples were dry, 7 ml of 10 % (NaPO<sub>3</sub>)<sub>6</sub> were added into the vials. The vials were then sealed and placed on a shaker for a minimum of 3 h, or overnight, at 150 rpm. Samples were then measured on a PSA (Beckman Coulter – LS 13 320)

### **Water content**

The weight difference between the wet and the 105 °C dried soil sample was calculated as the water mass lost during drying. This weight was then related back to the total wet soil weight to get the total water content.

### *Coarse fraction and stone content*

The 30 °C dried soil samples were sieved through a 2 mm sieve. The amount of material > 2 mm was related to the total amount of material > 2 mm and < 2 mm gained after sieving and this was determined to be the coarse fraction percentage. The material > 2 mm was then washed and dried again. After drying, the volume of material > 2mm was determined by examining volumetric differences before and after the material was added to a volumetric cylinder filled with water. This volume was then related to the total frozen sample volume to obtain stone content percentage.

## References

NA