

# Chemical and isotope data on the deep regolith's source of mineral nutrients in mountainous temperate forest ecosystems. (<http://doi.org/10.5880/GFZ.3.3.2020.002>)

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## 2. Citation

**When using the data please cite:**

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### 3. Data Description

The data herein were used to trace the source and depth of nutrient uptake in two mountainous temperate forest ecosystems in southern Germany (Conventwald/ Black Forest and Mitterfels/ Bavarian Forest). Presented are phosphorus (P) concentrations from various P fractions of soil, saprolite, weathered bedrock and unweathered bedrock samples from drilling cores (depth: 20 m, site Conventwald (CON), and 30 m, site Mitterfels (MIT)) obtained by sequential extractions following the Hedley fractionation method. Further, the dataset contains strontium (Sr) and beryllium (Be) isotope data from drilling cores mentioned above.  $^{87}\text{Sr}/^{86}\text{Sr}$  data are provided for bulk samples of forest floor, soil, saprolite, weathered bedrock, and unweathered bedrock. For soil and saprolite samples, additional Sr isotope ratios of the water-soluble and the exchangeable Sr fractions are provided.

$^{87}\text{Sr}/^{86}\text{Sr}$ , beryllium concentrations (measured by Quadrupole-ICP-MS) and  $^{10}\text{Be}(\text{meteoric})/^{9}\text{Be}$  data from living leaves, needles, and stem wood (heartwood and sapwood of *Fagus sylvatica* and *Picea abies*) from both study sites are reported. Beryllium concentrations (measured by ICP-OES) and isotope ratios of amorphous oxides sequentially extracted from soil and saprolite at CON and MIT are provided. Soil pH at CON and MIT is also provided. Compiled concentrations of K, Ca, Mg and P and total deposition rates of atmospheric dust deposition are also included in the dataset.

The data presented here stem from sampling campaigns and analyses described in Uhlig et al. (2020) to which they are supplementary material to. Samples were mainly processed in the Helmholtz Laboratory for the Geochemistry of the Earth Surface (HELGES), the University of Bonn (P Hedley fractionation) and the University of Cologne - Centre for Accelerator Mass Spectrometry (AMS) ( $^{10}\text{Be}$  measurements).

Tables supplementary to the article, including data quality control, are provided in pdf and xls formats. In addition, data measured in the course of the study are also provided as machine readable ASCII files. All samples are indexed with an International Geo Sample Number (IGSN). Sample metadata can be viewed by adding the IGSN to the “<http://igsn.org/>” URL (e.g. [igsn.org/GFDUH00LT](http://igsn.org/GFDUH00LT)).

### 4. File description

Supplementary tables to Uhlig et al. (2020) are provided in pdf and xls formats. In addition, analytical data are provided as tab separated ASCII files. The first three rows in the ASCII files begin with “#” and contain licence and citation. In all files, values that were not measured are marked with “n.d”.

#### 4.1. Phosphorus fractions

Phosphorus concentrations (measured by ICP-OES and UV spectrometry) of leachates from sequential extractions of regolith and unweathered bedrock at CON and MIT for CON and MIT regolith profile are reported in file:

**2020-002\_Uhlig et al\_Phosphorus concentrations of leachates in regolith profile.txt**

The columns are mapped as follows:

| Column name               | Description   |
|---------------------------|---|
| sample ID                 | Sample identifier used in this study  |
| IGSN                      | International Geo Sample Number. Metadata of samples are available under: <a href="http://www.igsn.org">www.igsn.org</a> by adding the IGSN after igsn.org, e.g. igsn.org/GFDUH00LT |
| brief sample description  | Description of the sample   |
| mean depth (m)            | Mean sampling depth   |
| Sum Ptotal (ppm)          | Sum of P  |
| Pi resin (ppm)            | Inorganic phosphorus concentrations of resin extractable P (Hedley fractionation method)  |
| Po resin (ppm)            | Organic phosphorus concentrations of resin extractable P (Hedley fractionation method)  |
| Pi HCO <sub>3</sub> (ppm) | Inorganic phosphorus concentrations of HCO <sub>3</sub> extractable P (Hedley fractionation method)   |
| Po HCO <sub>3</sub> (ppm) | Organic phosphorus concentrations of HCO <sub>3</sub> extractable P (Hedley fractionation method)   |
| Pi NaOH (ppm)             | Inorganic phosphorus concentrations of NaOH extractable P (Hedley fractionation method)   |
| Po NaOH (ppm)             | Organic phosphorus concentrations of NaOH extractable P (Hedley fractionation method)   |
| Pi 1M HCl (ppm)           | Inorganic phosphorus concentrations of 1M HCl extractable P (Hedley fractionation method)   |
| Po 1M HCl (ppm)           | Organic phosphorus concentrations of 1M HCl extractable (Hedley fractionation method)   |
| Ptotal 14M HCl (ppm)      | Total phosphorus concentration of 14M HCl extractable P (Hedley fractionation method)   |
| Ptotal residual (ppm)     | Total phosphorus concentration of aqua regia extractable P from the residual  |

## 4.2. Isotopic composition

Sr isotope ratio (measured by MC-ICP-MS) of leachates from sequential extractions of soil and saprolite and bulk samples of regolith and rock at CON and MIT are contained in file:

***2020-002\_Uhlig et al\_Sr Isotopic composition of regolith samples.txt***

The columns are mapped as follows:

| Column name                            | Description   |
|--|---|
| sample ID                              | Sample identifier used in this study  |
| IGSN                                   | International Geo Sample Number. Metadata of samples are available under: <a href="http://www.igsn.org">www.igsn.org</a> by adding the IGSN after igsn.org, e.g. igsn.org/GFDUH00LT |
| brief sample description               | Description of the sample   |
| mean depth (m)                         | Mean sampling depth   |
| ( <sup>87</sup> Sr / <sup>86</sup> Sr) | Sr isotope ratio of leachates from sequential extractions, and bulk regolith and rock   |
| SD                                     | Standard deviation  |
| fraction                               | Water-soluble (mq-H <sub>2</sub> O), exchangeable (NH <sub>4</sub> OAc), bulk regolith or bulk rock   |

Be concentration (measured by ICP-OES),  $^{10}\text{Be}$  concentration (measured by AMS) and its isotope ratios of amorphous oxides from sequential extractions of soil and saprolite is contained in file:

***2020-002\_Uhlig et al\_ Be concentration and isotopic composition of regolith samples.txt***

The columns are mapped as follows:

| Column name                                       | Description   |
|---|---|
| sample ID   | Sample identifier used in this study  |
| IGSN  | International Geo Sample Number. Metadata of samples are available under: <a href="http://www.igsn.org">www.igsn.org</a> by adding the IGSN after igsn.org, e.g. igsn.org/GFDUH00LT |
| brief sample description                          | Description of the sample   |
| extractant  | Extractant used for sequential extraction   |
| mean depth (m)                                    | Mean sampling depth in meters   |
| Be (ppm)  | Be concentration (ICP-OES analyses)   |
| uncertainty (ppm)                                 | Uncertainty of the Be concentration (ICP-OES analyses)  |
| $^{10}\text{Be}_{\text{meteoric}}$ ( $10^6$ at/g) | Concentration of meteoric $^{10}\text{Be}$ (AMS analyses)   |
| uncertainty ( $10^6$ at/g)                        | Uncertainty of the meteoric $^{10}\text{Be}$ concentration (AMS analyses)   |
| $(^{10}\text{Be} / ^9\text{Be})$ ( $10^{-9}$ )    | Be isotope ratio  |
| uncertainty ( $10^{-9}$ )                         | Uncertainty of the ratio of Be isotope ratio  |

Sr (MC-ICP-MS) and Be (Q-ICP-MS and AMS) isotopic composition of plant samples at CON and MIT are contained in file:

***2020-002\_Uhlig et al\_Sr and Be Isotopic composition of plant samples.txt***

The columns are mapped as follows:

| Column name                                       | Description   |
|---|---|
| sample ID   | Sample identifier used in this study  |
| IGSN  | International Geo Sample Number. Metadata of samples are available under: <a href="http://www.igsn.org">www.igsn.org</a> by adding the IGSN Number after igsn.org, e.g. <a href="http://igsn.org/GFDUH00LT">http://igsn.org/GFDUH00LT</a> |
| sampling date                                     | Sampling date as YYYYMM   |
| brief sample description                          | Description of the sample   |
| Part analyzed                                     | Plant tissue used for analyses  |
| $(^{87}\text{Sr} / ^{86}\text{Sr})$               | Sr isotope ratio (MC-ICP-MS analyses)   |
| SD  | Standard deviation of Sr Isotope ratio from MC-ICP-MS analyses  |
| $^9\text{Be}$ (ng/g)                              | $^9\text{Be}$ concentration (Q-ICP-MS analyses)   |
| uncertainty (ng/g)                                | Uncertainty of $^9\text{Be}$ concentration (Q-ICP-MS analyses)  |
| $^{10}\text{Be}_{\text{meteoric}}$ ( $10^6$ at/g) | $^{10}\text{Be}$ concentration (AMS analyses)   |
| uncertainty ( $10^6$ at/g)                        | Uncertainty of the meteoric $^{10}\text{Be}$ concentration (AMS analyses)   |
| $(^{10}\text{Be} / ^9\text{Be})$ ( $10^{-9}$ )    | Be isotope ratio  |
| uncertainty ( $10^{-9}$ )                         | Uncertainty of Be isotope ratio   |

### 4.3. Soil pH

Soil pH at CON and MIT are provided in file:

***2020-002\_Uhlig et al\_Soil.txt***

The columns are mapped as follows:

| Column name              | Description   |
|--------------------------|---|
| sample ID                | Sample identifier used in this study  |
| IGSN                     | International Geo Sample Number. Metadata of samples are available under: <a href="http://www.igsn.org">www.igsn.org</a> by adding the IGSN Number after igsn.org, e.g. <a href="http://igsn.org/GFDUH00LT">http://igsn.org/GFDUH00LT</a> |
| brief sample description | Description of the sample   |
| mean depth (m)           | Mean sampling depth   |
| soil pH                  | Soil pH   |

### 4.4. Compilation of atmospheric dust deposition concentrations and rates

Estimates on atmospheric dry deposition fluxes at CON and MIT are provided in file:

***2020-002\_Uhlig et al\_Concentration and total deposition compilation on atmospheric dust deposition.txt***

The columns are mapped as follows:

| Column name           | Description  |
|-----------------------|--|
| K                     | Concentration of potassium   |
| Ca                    | Concentration of calcium   |
| Mg                    | Concentration of magnesium   |
| P                     | Concentration of phosphorus  |
| n                     | Number of data points in the respective reference  |
| Total deposition rate | Total, non-element specific mass flux of atmospheric dust deposition   |
| Comment               | Specification of data type (concentration of atmospheric dust or upper continental crust (UCC), weighted average and standard deviation of element concentrations, minimum or maximum of total atmospheric dust deposition rate) and units |
| Reference             | Data source  |

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