**Plutonium concentrations link soil organic matter decline to wind erosion in ploughed soils of South Africa**

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# 1 Supplementary figures

Figure S: Linear correlations between soil N contents (Lobe et al., 2001) and 239+240Pu concentrations in the clay and silt soil fractions, here defined as the soil fractions <20 µm. Most plutonium samples depict replicate measurements; the corresponding concentrations are weighted means and the uncertainties either dominated by AMS counting statistics (weighted mean error) or external sources of uncertainty (standard error). For single measurements, the 1σ measurement uncertainty provided by the AMS facilities dominates the final uncertainty. (vertical error bars either represent 1σ from the mean of several replicates or a 1σ error-propagated uncertainty dominated by the AMS measurement uncertainty). Samples from sites that have been cropped before 1963 were excluded from the regression (greyed out data points).



Figure S2: Grain size data measured by Lobe et al. (2001) and Amelung et al. (2002). Uncertainties are 1σ standard deviations of the arithmetic means (*n* >2 replicates per sample).

# 2 Supplementary tables

Table S3: Ratios of 137Cs against 239+240Pu.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sample ID | | | 137Cs/239+240Pu | | |
| HS | 0 | /0-20 | 18.68 | ± | 2.33 |
| HS | 45 | /0-20 | 22.85 | ± | 4.25 |
| KR | 0 | /0-20 | 33.24 | ± | 3.54 |
| KR | 40 | /0-20 | 25.16 | ± | 5.06 |
| TW | 0 | /0-20 | 30.54 | ± | 2.58 |
| TW | 8 | /0-20 | 31.88 | ± | 3.78 |
| TW | 12 | /0-20 | 28.60 | ± | 2.61 |
| TW | 32 | /0-20 | 28.34 | ± | 3.26 |
| TW | 40 | /0-20 | 29.64 | ± | 3.25 |
| TW | 60 | /0-20 | 22.71 | ± | 3.14 |
| TW | 90 | /0-20 | 26.17 | ± | 4.89 |
|  | *Weighted average* | | *26.69* | *±* | *0.97* |

**Sample abbreviations include the agroecosystem (HS- Harrismith, KR – Kroonstad, TW – Tweespruit), years of cultivation, and sampling depth. Sample HS0/0-20 was not included into the calculation of the weighted mean (see main text for discussion).**

Table S4: 239+240Pu specific activies in topsoil samples and corresponding SOM data as published by Lobe et al. (2001).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | 239+240Pu | | | Bulk soil C | Bulk soil N |
| Sample ID | | | (mBq kg-1) | | | (g kg-1) | (g kg-1) |
| HS | 0 | /0-20 | 56.73 | ± | 1.23 | 20.6 | 1.60 |
| HS | 3.5 | /0-20 | 51.66 | ± | 1.02 | 11.0 | 1.04 |
| HS | 8 | /0-20 | 42.98 | ± | 0.87 | 13.5 | 1.11 |
| HS | 10 | /0-20 | 28.68 | ± | 1.23 | 10.6 | 0.94 |
| HS | 30 | /0-20 | 25.95 | ± | 0.39 | 9.28 | 0.88 |
| HS | 45 | /0-20 | 26.69 | ± | 1.24 | 8.62 | 0.79 |
| HS | 68 | /0-20 | 23.90 | ± | 1.88 | 6.75 | 0.66 |
| HS | 90 | /0-20 | 27.85 | ± | 0.58 | 6.33 | 0.66 |
| KR | 0 | /0-20 | 34.59 | ± | 0.72 | 7.97 | 0.85 |
| KR | 2.5 | /0-20 | 34.57 | ± | 0.75 | 5.28 | 0.61 |
| KR | 20 | /0-20 | 23.27 | ± | 0.48 | 3.96 | 0.49 |
| KR | 30 | /0-20 | 26.58 | ± | 0.81 | 2.85 | 0.46 |
| KR | 40 | /0-20 | 15.90 | ± | 0.31 | 3.38 | 0.45 |
| KR | 57 | /0-20 | 22.07 | ± | 1.44 | 2.92 | 0.43 |
| KR | 98 | /0-20 | 14.49 | ± | 0.31 | 2.68 | 0.40 |
| TW | 0 | /0-20 | 66.80 | ± | 0.90 | 11.7 | 1.12 |
| TW | 8 | /0-20 | 41.09 | ± | 1.27 | 7.10 | 0.73 |
| TW | 12 | /0-20 | 36.19 | ± | 0.51 | 6.44 | 0.67 |
| TW | 22 | /0-20 | 33.47 | ± | 0.82 | 5.83 | 0.58 |
| TW | 32 | /0-20 | 34.23 | ± | 0.63 | 5.30 | 0.61 |
| TW | 40 | /0-20 | 28.00 | ± | 0.45 | 4.42 | 0.52 |
| TW | 60 | /0-20 | 22.46 | ± | 0.37 | 5.32 | 0.60 |
| TW | 90 | /0-20 | 18.73 | ± | 0.65 | 4.32 | 0.54 |

**Sample abbreviations include the agroecosystem (HS- Harrismith, KR – Kroonstad, TW – Tweespruit), years of cultivation, and sampling depth. The quoted plutonium concentrations from replicate measurements are weighted means and the uncertainties either dominated by AMS counting statistics (weighted mean error) or external sources of uncertainty (standard error).**

# References

Amelung, W., Lobe, I., and Du Preez, C. C.: Fate of microbial residues in sandy soils of the South African Highveld as influenced by prolonged arable cropping, European Journal of Soil Science, 53, 29-35, 2002.

Lobe, I., Amelung, W., and Du Preez, C. C.: Losses of carbon and nitrogen with prolonged arable cropping from sandy soils of the South African Highveld, European Journal of Soil Science, 52, 93-101, 2001.