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GEMAS: CNS concentrations and C/N ratios in European agricultural soil

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A reliable overview of measured concentrations of TC, TN and TS, TOC/TN ratios, and their regional distribution patterns in agricultural soil at the continental scale and based on measured data has been missing – despite much previous work on local and the European scales. Detection and mapping of natural (ambient) background element concentrations and variability in Europe was the focus of this work. While total C and S data had been presented in the GEMAS atlas already, this work delivers more precise (lower limit of determination) and fully quantitative data, and for the first time high-quality TN data. Samples were collected from the uppermost 20 cm of ploughed soil (Ap horizon) at 2108 sites with an even sampling density of one site per 2500 km² for one individual land-use class (agricultural) across Europe (33 countries). Laboratory-independent quality control from sampling to analysis guaranteed very good data reliability and accuracy. Total carbon concentrations ranged from 0.37 to 46.3 wt% (median: 2.20 wt%) and TOC from 0.40 to 46.0 wt% (median: 1.80 wt%). Total nitrogen ranged from 0.018 to 2.64 wt% (median: 0.169 wt%) and TS from 0.008 to 9.74 wt% (median: 0.034 wt%), all with large variations in most countries. The TOC/TN ratios ranged from 1.8 to 252 (median: 10.1), with the largest variation in Spain and the smallest in some eastern European countries. Distinct and repetitive patterns emerge at the European scale, reflecting mostly geogenic and longer-term climatic influence responsible for the spatial distribution of TC, TN and TS. Different processes become visible at the continental scale when examining TC, TN and TS concentrations in agricultural soil Europe-wide. This facilitates large-scale land-use management and allows specific areas (sub-regional to local) to be identified that may require more detailed research.