



## **Are we overestimating organic carbon concentrations in soils containing inorganic carbon?**

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The concentration of carbon in soils is often measured via chromatographic analysis of elemental gases following dry combustion of a soil sample. This quantifies total carbon (TC), and, in soils which can be assumed to contain no inorganic carbon (IC), TC can be interpreted as organic carbon (OC). Soils containing IC are commonly subjected to an acid digestion to remove IC, prior to analysis for OC concentration; with IC being assigned as the difference between TC and OC.

However, the removal of IC reduces the sample mass. Therefore, analysing acid-washed samples reveals the carbon concentration of the non-inorganic carbon sample mass, rather than the actual sample mass, as is generally assumed. This results in the overestimation of OC concentrations and consequent underestimation of IC concentrations, although TC concentrations are correct. The magnitude of the error is proportional to both IC concentration, and the ratio OC/IC, and consequently is greater in carbonate-rich samples.

We present a revised protocol for accurately calculating OC and IC concentrations, using the carbon concentrations of the total sample and the acid-washed sample. The revised protocol is easily applicable to existing data, and corrects a known bias in apportioning carbon between organic and inorganic pools. Propagating the error through an example dataset from a semiarid environment, we find it can make a substantial (>10%) difference to estimated total OC pools. We recommend that this new protocol is used whenever elemental analysers are used to quantify OC concentrations in acid-washed sediments.