

## **Thermogravimetric soil analysis** (Brief description of method)

Thermogravimetric soil analysis was developed to describe soils in natural ecosystems uninfluenced by human activity. It helps to diagnose use-related changes in soils and is intended to support the development of new, economically attractive soil use technologies entailing low risks, as well as advancing environmental protection.

The method takes as its point of departure the dynamics of weight losses occurring when air-dry soil samples are heated from 25°C to 1000°C. Data analysis provides information on the carbon, nitrogen, clay and carbonate content of the sample. It is also possible to determine the biodegradable and humified components of soil organic matter (SOM) and the volume of bound water.

Typical relationships were found to exist between the SOM components and bound water in soils under natural vegetation. They reflect soil formation features and characteristic changes resulting from soil use for agriculture and forestry. Where the samples reveal deviations in these relationships from those found in natural soils, the deviations are used to evaluate pedogenetic variations based on standard international criteria independent of soil uses.

The method does not require any consumables, and the input is minimal. It is sufficient to weigh a sample and begin the analysis procedure. Where required, series of samples may be analysed fully automatically over a period of several days. Compared with traditional methods, thermogravimetric soil analysis is less costly and provides additional information about various parameters.

Special application software permits simple evaluation of the thermogravimetric data. It calculates sample properties (C, N, clay and carbonate content), SOM (total, proportions of readily decomposable and humified components, etc.), displays correlations between the SOM components and presents the evaluation results with verbal assessments and conclusions.

Test routines verify the applicability of the algorithms used to evaluate the results and monitor their accuracy. The evaluation program may be adapted to the peculiarities of interpreting single samples by selecting the relevant options. Independent program modules monitor the admissibility of such modifications, pinpointing error-critical results.

The software collates and displays in an error list any measurements outside calibration ranges and disproportions between SOM components. Disproportions also influence the type of evaluation. Instead of soil properties and SOM quality parameters, the evaluation diagnoses changes in soil formation. The software incorporates previous findings from analyses of soil samples in all major climatic zones of central and eastern Europe and Siberia, selected tropical regions and Antarctica. This allows it to generate graphs documenting differences between the sample analysed and soils in natural ecosystems. Deviations may be linked at a click of the mouse. This generates verbal indications of pedogenetic disturbances, which are output in a table together with information on the probability of specific inferences.

No field-specific knowledge or soil analysis experience is required to apply the method or to use the evaluation program.

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