



Research Service Facility Routine Measurements & Analyses

Research in biogeochemical cycles and processes involves the investigation of chemical elements and their compounds as well as the calculation of elemental budgets in different ecosystem compartments. To quantify fractions of carbon, nitrogen, hydrogen, sulfur, phosphorus and other elements in liquid and solid materials, scientists cooperate closely with the analytical chemistry laboratory called "Routine Measurements & Analyses (RoMA)".

The "Routine Measurements & Analysis (RoMA)" laboratory as one of the institute's service facilities provides analytical primary data for scientists and young researchers, with main focus on carbon and nitrogen determination in environmental samples. Depending on the details in specific studies and ongoing research projects, RoMA customizes its analytical methods and applications.

Elemental analysis, for instance, is one of the common procedures done in RoMA. Much of our work involves the determination of carbon and nitrogen contents in a large variety of samples: soils, sediments, plant litter, plants, carbonates, chars, and other solid materials, as well as the analysis of dissolved organic compounds and soluble inorganic ions in different matrices. The exact quantification of organic and inorganic carbon is important for studying the effects of land use, land management, and biodiversity on

soil organic carbon (SOC) and dissolved organic carbon (DOC). Such investigations provide an insight into the variability of SOC stocks and how these stocks may affect regional and global carbon sources and sinks.

In addition to routine analyses, RoMA also develops and thoroughly tests new analytical methods. One example is the quantitative separation of organic and inorganic carbon in soils, a particularly difficult procedure due to the chemical characteristics of organic matter and mineralogical composition of the carbonates. The measurement includes an initial total carbon analysis integrating both fractions. Subsequently, a subsample of the soil is pretreated either with a non-oxidizing acid to destroy the carbonates, or with temperature-controlled heating to decompose the soil organic matter. The accuracy and precision of organic carbon determination in soil samples using the thermal pre-treatment method

Portrait of the Leader

Ines Hilke studied chemistry at the Martin-Luther-University in Halle and at the Dresden Technical University, where she specialized in water chemistry. She worked at the Faculty of Forest, Geo and Hydro Sciences at the TU Dresden. In 1998 she joined the Max Planck Institute for Biogeochemistry in Jena. She is leading the service facility "Routine Measurements & Analysis" since 2006. Her professional interests and activities comprise limnology, soil science as well as instrumental analytics.

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is outlined in a study of soil carbon storage in experimental grasslands (Steinbeiss et al., *Global Change Biology* (2008) 14, 2937–2949).

Additional measurements performed in the RoMA lab include:

- Analysis of hydrogen and sulfur contents in sediments, soils, and organics, providing information on the family of chemical compounds in the sample and the biological availability of these elements.
- Analysis of soluble ions using ion chromatography and continuous flow analysis. Anions and cations in solution can be measured, including fluoride, chloride, bromide, phosphate, sulphate, nitrate, nitrite, ammonium, sodium, potassium, magnesium, calcium, manganese.
- Isolation of mobile, easily available, or microbial fractions of carbon and nitrogen in water samples and in individual soil fractions. Unique fractions are obtained using various extracting agents such as cold water, hot water, salt solutions, or acids.
- Analysis of soluble carbon and nitrogen in dissolved organic and inorganic form.

The quality of our analytical data is continuously monitored. RoMA participates in the annual inter-laboratory comparison of VDLUFA (Federation of German Agricultural Investigation and Research Institutes) and is certified for carbon and nitrogen quantification in soil samples.

The RoMA team ensures careful management of samples, timely analyses, application of optimized analytical methods, and precise and accurate measurements to produce reliable data of excellent quality for large sample numbers.

In addition to the laboratory tasks, RoMA offers training courses for various age groups and people with different levels of expertise, cooperating closely with the nearby vocational training centre, the Jena University of Applied Sciences, and the Friedrich Schiller University. Thus, trainees and students can learn about the research commonly done in the institute and in particular in the scientific departments, which are supported by the central facilities.

Young academics are very welcome to contact our lab for an introduction to instrumental analysis.



Excellent primary data need a careful sample preparation and the profound knowledge of the analytical methods as well as the skilful handling and maintenance of the instruments. In case of elemental analysis, the exact weighing (Pictures left) of the homogenized sample material is important for subsequent measurements, just as the preventive maintenance of the auto-analyzer (Picture right).

Furthermore, chemical standards and certified reference materials are constantly used to ensure the accuracy and the long-term precision of the measurement results.