TRAINING CAPACITIES IN AGRICULTURE AND URBAN-RURAL INTERACTIONS
FOR SUSTAINABLE DEVELOPMENT OF MEGACITIES
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GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

DBG Deutsche Bodenkundliche Gesellschaft

WP. 4. PROFESSIONAL TRAINING

Code: GOE

TITLE: Isotopes in Ecosystem Sciences

In collaboration with the University of Goettingen and the German Soil Scientific Society

Academic coordinators *Dr. J. Dyckmans, Prof. Dr. M. Dippold*

Period of the year (2020)	*February 24th – 28th, 2020*
Duration in days/weeks	*5 days*
Number of class hours x day/week	*Total 40 hours*
Target participants	*Professionals*
Number of participants (max)	25
Forms of realization	Comprehensive classroom training in English with lab visits
Teachers	Jun.-Prof. Dr. M. Dippold, Dr. J. Dyckmans, PD Dr. R. Well, PD Dr. E. Blagodatskaya, Dr. S. Loeppmann, Dr. C. Banfield

The course provides a very broad background for isotope applications in ecosystem components including soils, plants, atmosphere, and microorganisms. Overview of various tracer methods and isotopes applications will be given. The specifics of stable and radioactive isotopes for investigations of ecosystem processes from submolecular to global scale are covered.

Topics of the course:

Introduction into Isotope Chemistry

Stable and radioactive isotopes: Types of ionizing radiation

Measurement of stable and radioactive isotopes

Compound-specific isotope analysis with HPLC and GC

Natural abundance methods: Fractionation and its applications

Possibilities, limitations, limits of detection, artefacts

Data analysis and pitfalls

Radiation protection and peculiarities of working with radionuclides.

Applications:

Global carbon cycles and turnover of soil organic matter (^{14}C, ^{13}C, $d^{13}C$, Bomb-^{14}C)

Plant soil interactions and rhizosphere research (^{14}C, ^{13}C, $d^{13}C$, ^{15}N)

Gas emission from soils ($d^{13}C$ of CO_2, CH_4, isotopologes N_2O and N_2)

Nutrient (^{15}N, ^{32}P, ^{33}P, K-Rb, ^{137}Cs) and water (^{2}H, ^{18}O) uptake into plants

Incubation experiments on soil respiration and decomposition of plant residues and pesticides in soil (^{14}C, ^{13}C, $d^{13}C$)

Migration and translocation studies (Br^-, Cl^-, ^{3}H, ^{2}H)

Estimation of soil erosion (^{137}Cs, ^{7}Be, ^{210}Pb)

Autoradiography and phosphor imaging for allocation studies (^{14}C, ^{32}P, ^{33}P)

Studies on sorption and exchange (^{32}P, ^{33}P)

Paleo reconstruction (^{13}C, ^{18}O, ^{2}H and ^{14}C dating)

Microbial growth and metabolism (DNA-/RNA-SIP with ^{13}C, ^{15}N and ^{18}O, position-specific labelling und metabolic flux modelling)