INTEGRATING 'OMIC' DATA AND BIOGEOCHEMICAL MODELING: THE KEY TO UNDERSTANDING THE MICROBIAL REGULATION OF MATTER CYCLING IN SOIL

Young investigator group SoilReg Holger Pagel¹, Christian Poll², Marie Uksa², Jana Seifert³, Amélia Camarinha Silva⁴, Philipp Kügler⁵, Thilo Rennert⁶, Ellen Kandeler² & Thilo Streck¹

1 Institute of Soil Science and Land Evaluation, Biogeophysics – 2 Institute of Soil Science and Land Evaluation, Soil Biology – 3 Institute of Animal Science, Feed-Gut Microbiota Interaction 4 Institute of Animal Science, Young Investigator Group "Microbial Ecology" – 5 Institute of Soil Science and Land Evaluation, Soil Chemistry and Pedology holgerp@uni-hohenheim.de – www.uni-hohenheim.de/project/mikrobielle-regulation-von-bodenfunktionen-in-agraroekosystemen-soilreg-22

Background

Microorganisms control matter cycling and soil functions. Biogeochemical models that explicitly consider microbial dynamics can improve the understanding and prediction of soil functions such as carbon turnover, nutrient cycling and degradation of xenobiotics. Data provided by 'omic' methods can strongly facilitate the mechanistic representation of microbial dynamics in soil organic matter models. Such data have been, however, rarely used.

Challenges

How to improve the mechanistic representation of microbial dynamics in biochemical models?

How to integrate 'omic' data and models?

Case studies



General Concept

Identification of regulation mechanisms of matter cycling & Upscaling of biophysicochemical processes

'OMIC' Data

Metagenomics

- Identification of key functional groups and traits - Quantification of specific functional groups using functional marker genes

Transcriptomics/ Proteomics

- Identification of key enzymes and quantification of enzyme production rates

Stable Isotope Probing of Lipids, DNA/ RNA and proteins

- Identification of active microbes

- Quantification of turnover rates of microbial pools and of enzyme production rates - Identification and quantification of biochemical pathways and transformations





UNIVERSITY OF HOHENHEI



