

INVITATION TO THE PHD-COLLOQUIUM OF THE FACULTY OF GEOSCIENCES

Date: 11th May 2023 at 15:00

Room: IA 1/I23

Moderator: Claudia Romelli

15:00 to 15:10: Welcome and introduction

15:10 to 15:30: Isaac Asifiri

– Use of biochar for improving soil fertility in Ghana.

15:30 to 15:50: Markus Gornik

– Transformation Governance – Aspiration and Reality: The Development Process of the Ruhr Academy

15:50 to 16:10: Tanja Unger

– Inside a Middle Devonian carpet reef.

16:10 to 16:30: Jasmin Grifka

– Experiments in Reservoir-Wide Chemical Stimulation for Geothermal Reservoirs.

All interested parties are kindly invited to attend in the colloquium.

PHD-COLLOQUIUM OF THE FACULTY OF GEOSCIENCES WISE 22/23: ABSTRACTS

Use of biochar for improving soil fertility in Ghana.

Presenter: Isaac Asirifi

Soils in Africa's semi-arid and sub-humid tropics share common characteristics of acidity and poor nutrient contents, even though the main soil formation factor may differ. These conditions considerably affect crop productivity along Sub-Saharan Africa's agroecosystems. This study used an integrated soil management approach involving biochar and underutilized household and agro resources to improve the output of urban and peri-urban agriculture. The study to improve soil fertility and crop yield and enhance resource use efficiency in smallholder farms. Using Petroplinthic Cambisol soil from the Guinea savanna zone of Ghana, biochar was applied alone or in combination with other nutrient sources, including compost, kitchen ash and wastewater. These treatment effects were tested on soil nutrient availability, microbial function, and crop yields under laboratory, greenhouse and field conditions. The results showed an increased soil SOC (+97%) when biochar was applied alone. Combining biochar with compost or ash significantly improved the soil's fertility attributes, including pH, mineral nitrogen, available phosphorus and cation exchange capacity compared to the unamended control. Similarly, soil microbial biomass and extracellular enzyme activities for nitrogen and carbon cycling were improved. The improved chemical and biological properties increased lettuce, amaranth and soybean productivity in the weathered acidic soil. The study, therefore, demonstrated that the co-application of biochar with kitchen waste ash or compost efficiently alleviate limiting factors for crop yield in weathered tropical acidic soils. Advantageously, this treatment combination maximizes resource use efficiency on smallholder farms, particularly in these zones where agro-biomass remains abundant and underutilized.

Transformation Governance – Aspiration and Reality: The Development Process of the Ruhr Academy.

Presenter: Markus Gornik

The founding process of the Ruhr Academy on Smart Sustainable Metropolitan Transformation (RASSMT), as one of the flagship projects of the Ruhr Konferenz, lasted from May 2020 to May 2021. During this year, innovative narratives and concrete project proposals for the sustainability

transformation of the Metropole Ruhr have been conceived by a transdisciplinary alliance between leading actors of the region. However, the political legitimisation for the RASSMT by the state government ultimately failed to materialise. Since the polycentric Metropole Ruhr can now look back on a whole series of failed joint change agendas, the PhD project takes this as an opportunity to analyse the governance process of the RASSMT and place it in the context of its regional innovation ecosystem for sustainability transformation. To this end, methodological approaches from action-oriented geographical governance as well as transformation research are combined.

Inside a Middle Devonian carpet reef.

Presenter: Tanja Unger

Reef growth reached a Paleozoic acme regarding size and latitudinal distribution during the Devonian period (420-360 Ma). Organisms building reefs even settled in environments generally considered unfavourable, such as sediment-stressed environments. One example of such a sediment-impacted reef is the Klutert biostrome located in Ennepetal, Germany. Today this carpet reef is accessible by a cave system in three dimensions. The Klutert Cave is the 15th largest cave in Germany and the 5.8 km long paths span over an area of ca 400 x 250 m. The cave 'incrops' (cleaned walls, ceilings) provide access to ca 26,000 m² of rock surface enabling detailed studies of the reefal organisms and the internal structure of this carpet reef. The main reef builders are stromatoporoid sponges, tabulate and rugose corals associated with brachiopods, crinoids, gastropods, nautiloids, and trilobites. Based on the exceptionally high quality of preservation, a reef model is developed that reflects the complex internal structure of the biostrome and hence the response of the reef and its builders to environmental changes, especially the sediment flux.

Experiments in Reservoir-Wide Chemical Stimulation for Geothermal Reservoirs.

Presenter: Jasmin Grifka

Geothermal reservoirs often need stimulation to be economically feasible. Hydraulic stimulation has inherent seismic hazards and chemical stimulation doesn't work on the reservoir scale. This work investigates the possibilities to enhance the spatial scale of chemical stimulation while also reducing the toxicity of the used chemicals. Citric acid was found to be a good candidate for conventional chemical stimulation and has to be further tested in the field. The increase of the spatial scale of chemical stimulation will probably fail due to generation of fines.