**Session Proposal**

# Session Title

Can enhanced rock weathering capture and store atmospheric CO2? Its expectations and limitations.

# Session Organizers

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Name 2 Songlin Wu, Professor, Research Center for Eco-Environmental Sciences,Chinese Academy of Sciences.

# Session Description

This session will provide a scope for critical discussion about carbon dioxide removal by enhanced rock weathering (ERW) in agricultural soil.

In ERW, easily weathered minerals such as crushed basalt are mixed into the soil, and the weathering reaction of the minerals consumes CO2 and produces bicarbonate ion. Depending on the physical and chemical conditions, bicarbonate ions can take various fates, such as forming carbonates, returning to the atmosphere, or leaching into groundwater. Of these, the formation of carbonates and leaching into groundwater are considered fixations of CO2 in the soil. Since 2019, the number of ERW papers has been drastically increasing. However, the extent to which each factor contributes to CO2 fixation, such as soil moisture, soil chemical and physical properties, and agricultural practices, remains unclear. Similarly, the impact of crushed rock application on crop production is not fully understood. Additionally, significant uncertainty exists in estimating CO2 fixation, underscoring the necessity to explore methodological aspects and establish a suitable approach for evaluating CO2 fixation by crushed rock application.

In this session, the objective is to engage in a discussion of the processes and mechanisms underlying the ERW, to assess the lab and field scale findings obtained so far, and to elucidate the future challenges that lie ahead. This session is intended to foster future collaboration among the scientists studying diverse soils and ecosystems in the world.

# Format

Oral presentations,

# Proposed Speakers

Speaker 1, Dr. Jennifer Pett-Ridge, Lawrence Livermore National Laboratory, USA

Dr. Pett-Ridge leads the research on how microorganisms enable the accrual of soil carbon and the roles of specific microbial traits. Their research can help to prioritize soil management that conserves the carbon we have in soil reservoirs and develop new engineered approaches for CO2 capture, such as enhanced rock weathering.

Speaker 2, Dr. Katerina Donstova, Department of Environmental Science and Biosphere 2, The University of Arizona, USA

Dr. Donstova has been working at Biosphere 2, focusing on weathering processes and carbon cycling under the influence of abiotic and biological factors. Specifically, Donstova examines inorganic carbon sequestration during the dissolution of basalt covering Landscape Evolution Observatory slopes and the formation of spatial and temporal heterogeneity on the slopes due to its incongruent weathering.

Speaker 3, Atsushi Nakao, Department of Agricultural and Life sciences, Kyoto Prefectural University, Japan

He has been studying the element cycle in the soil, considering parent materials such as the dominant rock type of the region. He is developing a new methodology to quantify the amount of minerals (rocks) in soil, and this is expected to be performed at verification of the amount of crushed rock weathering in soil.

Speaker 4, Dr. Tom Reershemius, School of Natural and Environmental Sciences, Newcastle University, UK

Dr. Reershemius has been studying element cycling from soils across agricultural systems to the river-ocean system and relates this to greenhouse gas balance, nutrient availability, and soil health. In this context, he committed discussions of MRV (Masurement, Reporting, and Verification) methodology for carbon dioxide removal.

Speaker 5, Prof. Yo Toma, Research Faculty of Agriculture, Hokkaido University, Japan.

Prof. Toma has outstanding works on Carbon budget and methane and nitrous oxide emissions from agricultural lands in both cool and warm rainy regions.

Speaker 6, Tianran Sun, Professor of Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences.

Dr. Tianran Sun’s research focuses on soil organic matter preservation and restoration of soil carbon sequestration function. He is interested in redox-driven biogeochemical cycles in soil and their function in controlling greenhouse gas emissions, as well as the fate and transport of soil contaminants.