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Effect of dry-rewetting stress on functional response of soil prokaryotic communities in alpine meadow soil

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Recent predictions warn about an increased frequency of extreme drought events followed by heavy rainfall. Despite soil microorganisms are important contributor to emissions of greenhouse gases, little effort has been paid to incorporate them in predictive models for future climate change. Our study has been focused on functional response of prokaryotic community composition in alpine meadow soil from the Qinghai-Tibet Plateau under dry-rewetting stress. Mountain meadows are of great interest as they are vulnerable to increased drought events. We incubated soils treated by various frequencies of rewetting and durations of desiccation. Emission rates of greenhouse gases (CH4, CO_2 and N2O) were measured every week using gas chromatography method. Soil samples were taken each month to investigate diversity of soil prokaryotic community using metabarcoding of eDNA. We observed that rewetting of soil after short-term/long-term drought led to higher emissions of greenhouse gases. Diversity of soil prokaryotes increased in soils under short-term drought and soils rewetted after long-term drought. Our results revealed that various genera belonging to same phylum can have different functional response to the dry rewetting stress during the five-month incubation. In conclusion, results of our study suggest that prokaryotes that are well adapted to extremely stressful conditions such as long-term desiccation may release more greenhouse gasses in a positive feedback loop and that this prospect should be considered when modeling climate change.