Climate Extremes and Soil Nutrients

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Climate extremes, such as droughts and floods, have a profound influence on soil health and nutrient dynamics, often leading to adverse consequences for food security and environmental sustainability. Prolonged droughts, characterized by reduced water availability, can induce a decline in soil moisture levels, impacting microbial activity and nutrient cycling. This, in turn, contributes to reduced nutrient availability, particularly affecting vital elements such as nitrogen (N), phosphorus (P), potassium (K), and soil organic carbon (SOC). Understanding the complex relationships between climate extremes and soil nutrient decline is essential for developing strategies to mitigate the potential risks to food security and ecosystem functioning.

To comprehensively investigate the role of climate extremes on soil health and nutrient content, this research aims to utilize advanced statistical and machine learning tools to analyze the impact of drought duration, intensity, and severity, on the decline in essential soil nutrients such as nitrogen (N), phosphorus (P), potassium (K), and soil organic carbon (SOC). By assessing variations in nutrient levels under different drought conditions, this study seeks to provide key insights into the soil resilience, aiding the development of sustainable practices for maintaining soil fertility and mitigating environmental stressors on it.

If you are interested in this project, please feel free to contact Dr. Mehdi H. Afshar (mehdi.afshar@tuhh.de) for further details.

Figure 1. Conceptual representation of the impacts of moderate/extreme droughts on soil nutrients and vegetation health conditions (Zheng et al., 2023).

References:

Zheng, C., Bochmann, H., Liu, Z., Kant, J., Schrey, S. D., Wojciechowski, T., & Postma, J. A. (2023). Plant root plasticity during drought and recovery: What do we know and where to go?. Frontiers in Plant Science, 14, 1084355.