Advancing understanding and forecasting of soil organic matter dynamics to transform challenges into opportunities.

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Soil organic matter (SOM) provides agroecosystem services supporting both adaptation and mitigation to climate change. Its preservation and further accrual are key to increase resilience of food production to a changing climate, and to avoid an irreversible climate crisis. Recently our understanding of the processes and drivers of SOM formation and persistence has advanced within a coherent framework. Applying this framework can support the design of integrated measurement-modeling platforms to research and monitor SOM accrual and related co-benefits, as affected by agriculture management practices and climate change. I will present our latest framework to conceptualize SOM structure, formation, and persistence, and a coherent measurement-modeling approach we implemented and use. I will illustrate how SOM may affect soil properties which in turn determine the soil’s capacity for functioning and ability to provide desired outcomes including supporting plant productivity, and climate adaptation and mitigation. Finally, I will provide examples of applications of our approach to quantify and forecast SOM changes under regenerative agriculture.