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Soil organic carbon content is related to climatic temperature and soil properties in maize cropland

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INTRODUCTION

The Mollisol region of Northeast China has a large soil organic carbon (SOC) storage which is important for maintaining soil fertility. SOC is susceptible to various environmental factors; however, the responses of SOC content to environmental factors in different soil layers of cropland remain unclear, particularly in deep soil layers.

OBJECTIVES

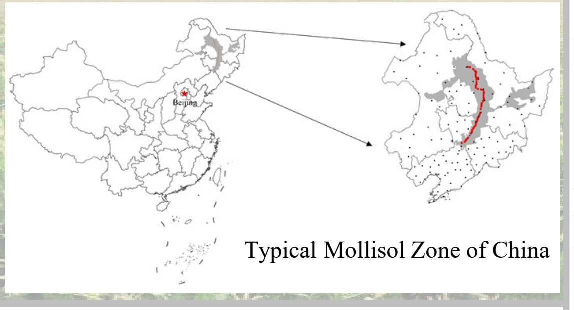
- Assess the responses of organic C content within bulk soil and aggregates to environmental factors in different soil layers.
- Create structural models to dissect the critical effect paths of environmental factors on SOC content in different layers.

APPROACH

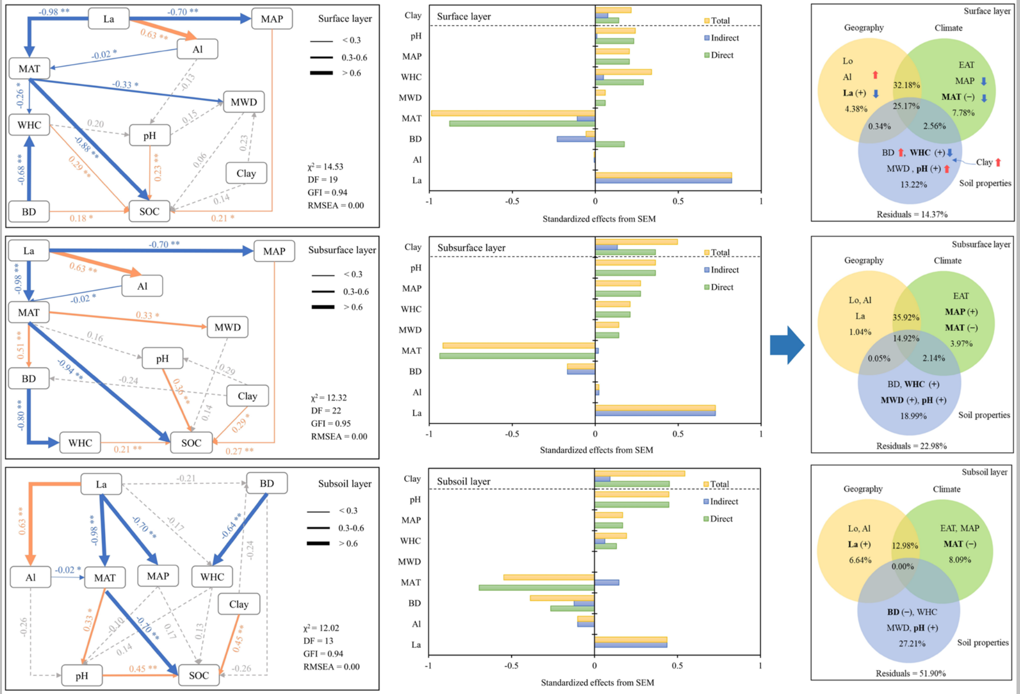
- The 138 soil samples from the surface, subsurface, and subsoil layers among 46 sample.
- 12 environmental factors were selected and divided into three aspects: (1) geography, including longitude (Lo), latitude (La), and altitude (Al); (2) climate, including effective accumulated temperature (EAT), mean annual temperature (MAT), and mean annual precipitation (MAP); and (3) soil properties, including bulk density (BD), soil water-holding capacity (WHC), pH, soil total porosity (TP), stability of soil aggregates (mean weight diameter, MWD), and clay content.
- Soil aggregates were separated into four fractions: (i) > 2000 μm, (ii) 250−2000 μm, (iii) 53−250 μm, and (iv) < 53 μm aggregates.
- Applied redundancy analysis (RDA), structural equation model (SEM), and variation partitioning analysis (VPA).

STUDY AREA

Soils had been subjected to a monocropping system with maize (*Zea mays L.*) for at least ten or more years.

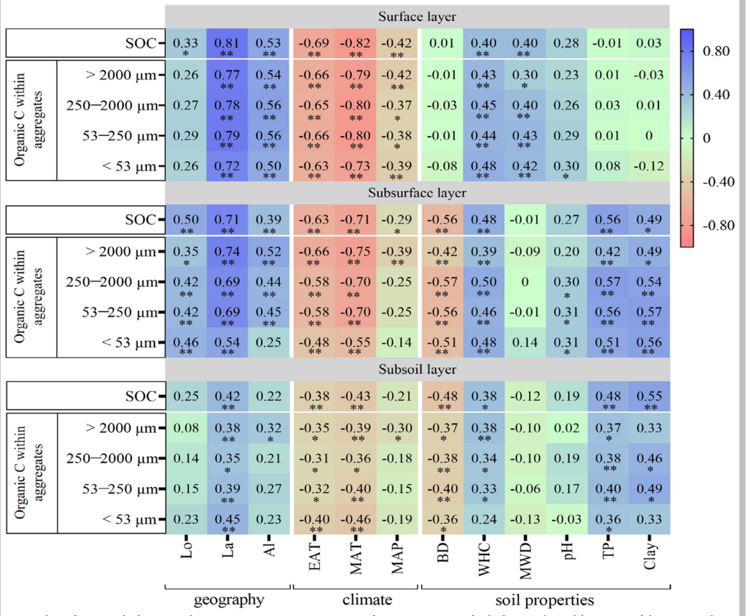


RESULTS



Structural equation models for dissecting the critical effect paths of environmental factors on SOC content in surface, subsurface and subsoil layers.

RESULTS



Relationships between organic C within bulk soil and aggregates and environmental factors in surface, subsurface and subsoil layers.

CONCLUSIONS

- Climate was main driver of SOC content in surface and subsurface layers, and soil properties was main driver in subsoil.
- Organic C within > 53 μm aggregates was more sensitive to environmental factors.

Relevant Publication

Influence of environmental factors on soil organic carbon in different soil layers for Chinese Mollisols under intensive maize cropping (accepted by ***Science of the Total Environment***)