Towards an Fate of Soil Climate under Global Changes: Modeled Projections for Soils of Serbia

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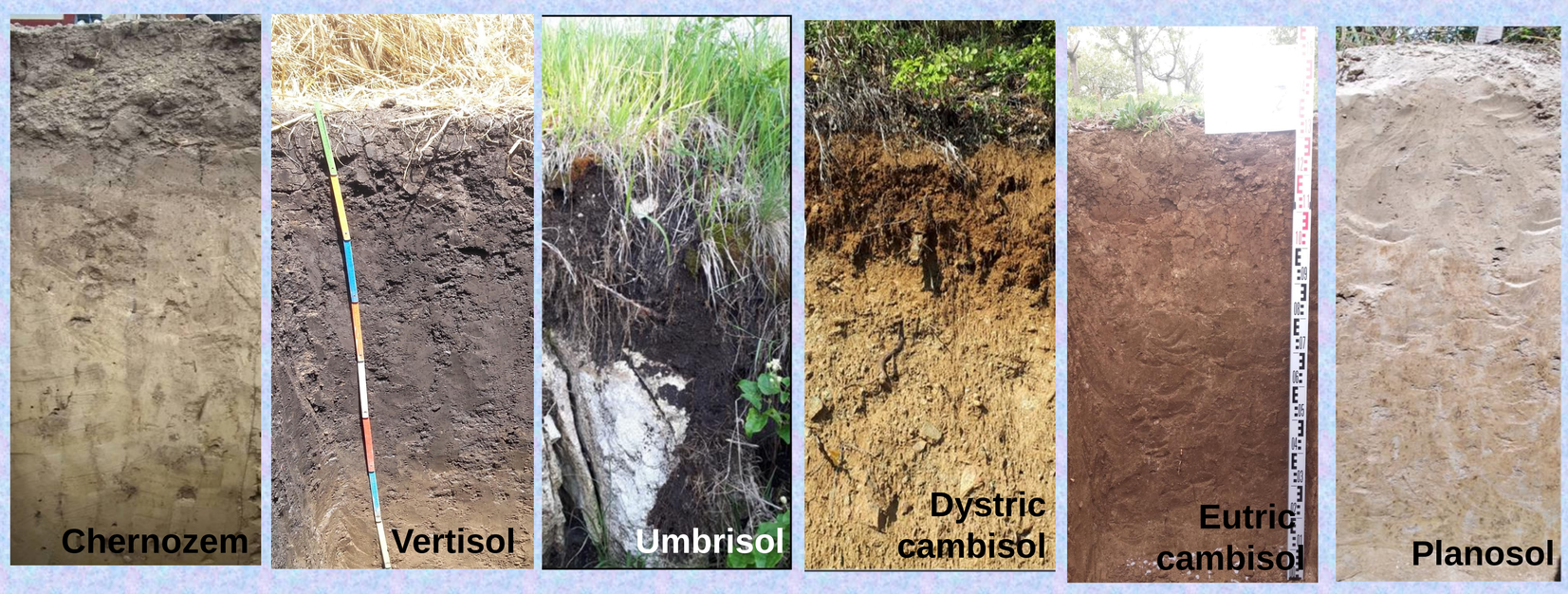
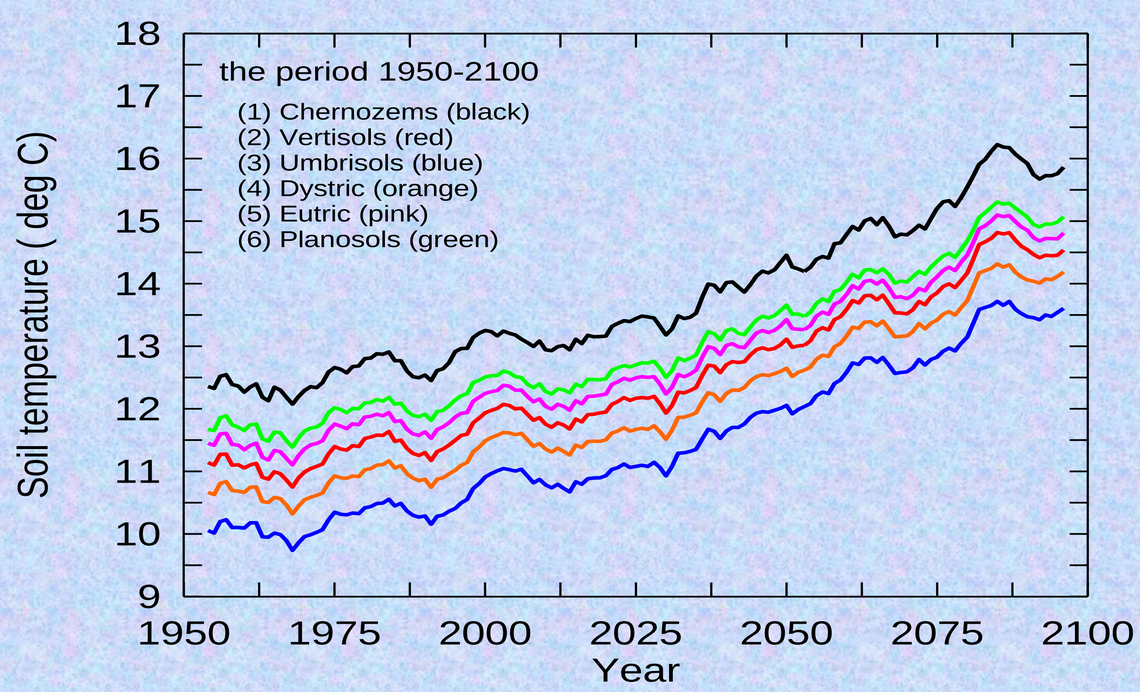
INTRODUCTION

Complex soil temperature and moisture feedback to changes in air temperature and precipitation are significantly associated with climate change. A number of factors influence on soil temperature: solar radiation, air temperature, topography, soil water content, soil texture and the plant cover. Over the few past decades climate changes in Serbia are characterized by higher temperatures and weather extremes. Climate change is significantly associated with changes in air temperature and precipitation influencing complex soil temperature and moisture feedback.

MATERIAL AND METHODS

The study area is Serbia, located between latitudes 41°and 47° N and longitudes 18° and 23° E. Time series used in this study were obtained by the downscaling of climate simulations from ECHAM5 general circulation model coupled with the Max Planck Institute Ocean Model. The dynamic downscaling was implemented using the EBU-POM regional climate model, based on Eta model coupled with Princeton Ocean Model. Soil temperature and moisture dynamics were calculated with NOAH land surface model using soil and climate data from 150 sites. Changes were analyzed for the periods 2021–2050 and 2071–2100 with respect to the reference period 1961–1990. Six soil types in Serbia were included in the study: chernozems, vertisols, umbrisols, dystric cambisols, eutric cambisols and planosols.





RESULTS

Depending on soil type, emphatic increase of soil temperature from 2.8-3.5°C until 2100 year is projected for 0-40 cm layer. Also, a relative soil moisture decrease from 5.4–9.6% is observed for the same period. In the deep soils, layer 40–100 cm will be exposed to the highest water loss. vertisols, umbrisols and dystric cambisols proved to be less sensitive to climate change than chernozems, eutric cambisols and planosols.

CONCLUSION

Projected higher temperatures and weather extremes will lead to inevitable changes of soil processes and evolution, biodiversity, vegetation cover and agricultural production. Expected human responses are switch in production zones, increased irrigation, land use change and sustainable intensification of agriculture.

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