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Soil organic carbon stocks in climatic and soil regions of Turkey mapped by a pedology-based GIS procedure

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An original GIS-based procedure was developed to map SOC stocks across four study areas representing different bioclimatic regions of Turkey, Northeastern Anatolia (NEA), Thrace (THR), Central Anatolia (CA), and Southeastern Anatolia (SEA), over a total surface of around 148,000 km^2. A dataset of 4151 georeferenced topsoil (0-20 cm) soil organic carbon (SOC) point samples was used, along with climate, soil type, and land cover maps.

C-Stock maps were elaborated independently in each study region. Average C-Stock values were assigned to "landscape" polygon units representing combinations of WRB soil type, land cover, and climate, based on the point data included in such units. The obtained values were extrapolated to similar landscape units for which point data were not available. This procedure allowed highlighting the effects on soil carbon of contemporary land cover. The effects of past and recent land use were incorporated by acquiring historical information on land management in traditional landscape systems (Anthroscapes) and its contribution to preserve the current soil carbon reserves. The overall total calculated C-Stock was 486.8 Tg with an average value of 31.5 Mg ha^{-1}. Average SOC stock values per hectare were highest (47.1 Mg ha^{-1}) in the cool-humid NEA, lowest (22.1 Mg ha^{-1}) in the semi-arid SEA, and moderately low (27.3 and 25.6 Mg ha^{-1}) in the dry continental CA and in the Mediterranean THR regions.

Averaging carbon stock data over landscape units (nested climate, soil, land cover information), instead of using polygons to summarize gridded data obtained by spatial interpolation made the output maps and data more easily interpretable and usable to support the development of sustainable land management policies and to link carbon sequestration to other ecosystem services targets. The findings can be used for the definition of realistic carbon sequestration and soil health targets considering the potential determined by local climate and soil conditions, and land use.

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