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Topsoil organic carbon in China is mainly affected by internal nitrogen and external temperature

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As a major carbon emitter, China's decarbonisation will contribute to global climate action. The verification of topsoil C distribution in China and its influence factors was an urgent problem for the carbon neutrality of China. To address this issue, topsoil (0-20 cm) and climate data for 7,857 sites were selected. The soil organic carbon (SOC) distribution in forestland, grassland, and farmland in seven districts of China was analyzed. The correlations and contribution rates of external (elevation-E, temperature-T, and rainfall-R) and internal factors (fractal dimension-D, soil total nitrogen-STN, soil total phosphorus-STP, pH, and C/N ratio) were explored. We found that SOC in China gradually increased from the west to east, with a mean value of 11.20 g kg⁻¹. The SOC content in northeast China was higher than elsewhere in the country. The SOC of different land use types followed the order of forestland > farmland > grassland ($P < 0.05$). All of the factors influencing SOC, with the exception of R, had distinct differences in their spatial patterns and land use types. The most important internal factor was STN, followed by STP, while the most important external factor was T, followed by R. The factor that made the greatest contribution to the SOC was STN. There was a relationship between the SOC distribution and the Hu Huanyong Line, the 6.5-10.5 °C contour line in the south of China. These results provide theoretical support for soil C cycle and prediction research, which will enable the issues surrounding climate change in China to be confronted.

Key words: soil organic carbon, distribution pattern, internal factors, external factors, China