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soil organic carbon dynamics at regional scale: a review

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The increasing concentration of greenhouse gases in the atmosphere has led to the need for reliable estimates of the amounts of organic carbon (OC) that might be sequestered by soils. Indeed, the organic matter contained in the earth's soils is a large reservoir of carbon (C) that can act as a sink or source of atmospheric CO2. The world's soils represent a large reservoir of C of about 1500 Pg C. Needs of accurate estimates of this pool are of main importance, but their reliability depends upon suitable data and on the methods used to upscale point data to exhaustive spatial estimates. Therefore, precise assessments of soil OC stocks based on measurements over large areas are rather few. Large levels of OC spatial variability require very high sampling density to get accurate estimates. Moreover, total organic carbon consists of fractions having very different turnover times. In this review, we compare different techniques to obtain regional estimates of carbon stocks and of their dynamics and to study the relative influence of various controlling factors. Our objective is to present an overview of existing data and modelling approaches for soil organic carbon modelling at regional and national scales.