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# Climate change effects on soil organic carbon changes in agricultural lands of Spain

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Climate is a key factor to explain changes in soil organic carbon (SOC) at regional scales. Experimental data have showed that spatial and temporal changes in soil temperature and moisture modify microbial activity and thus SOC decomposition. Furthermore, precipitation amount and distribution have a main impact on crop growth and residue production. According to predictions based on atmosphere-ocean general circulation models (AOGCM) for the next decades in the Mediterranean region, air temperature will significantly increase and precipitation decrease with a significant impact on SOC turnover. However, in agricultural systems, the study of the impacts of climate on SOC dynamics is a complex task since climate effects will be determined by both soil characteristics and management practices. The establishment of soil monitoring networks within a specific region is a recommended approach to study the interactive effects of climate, management and soil on SOC changes. However, in large areas, the establishment and maintenance of these networks can imply significant cost and time. A lower cost and time consuming approach can be the use of soil organic matter (SOM) models. The use of process based SOM models linked to spatial data through geographical information systems (GIS) permits to integrate the spatial variability of the parameters that control SOM dynamics. This approach can be appropriate for Spanish conditions where the complex orography results in a large range of local climates. Moreover, the large agricultural heterogeneity in terms of management systems could have a noteworthy impact on the effects of climate on SOC turnover in Spanish agroecosystems. Thus, in this study we used the Century model to analyse the impact of climate on SOC changes in a representative area of 40498 km2 located in northeast Spain. The spatial distribution of the different land use categories and their change over time was obtained from the European Corine database. Soil parameters needed by the system were obtained from the European soil map (1 km x 1 km). Climate change data was produced by the Meteorology State Agency (Ministry of the Environment and Rural and Marine Affairs of Spain) according to two AOGCMs (ECHAM4 and CGCM2) forced by two IPCC emissions scenarios (SRES: A2 and B2). The model predicted an increase in SOC storage in the 0-30 cm soil depth in all the climate change scenarios tested. Under climate change conditions, Spanish agricultural soils could act as potential atmospheric C sinks. However, the adoption of certain management practices could maximize the sequestration of atmospheric $CO_2$.