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Soil organic carbon projections in Mediterranean soils under climate change conditions

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Soil organic carbon (SOC) plays a vital role in ecosystem function determining soil fertility, water holding capacity and susceptibility to land degradation. In addition, SOC is related to atmospheric CO_2 levels with soils having the potential for C release or sequestration, depending on land use, land management, and climate. The Mediterranean region is expected to be highly affected by climate change, and it is expected that SOC decreases under climate warming conditions. Estimates of soil organic carbon stocks and changes under different climate scenarios and land use systems can also help to determine the vulnerability to land degradation.
In this work an assessment of changes in soil organic carbon for Sardinia, the second largest island of the Mediterranean Basin, is presented. The carbon dynamics were estimated for the whole island using the Rothamsted Carbon model and the A1b emission scenario provided by the Euro-Mediterranean Centre for Climate Change (CMCC). Almost 200 soil analysis data were used to calibrate and validate the model output for different land use typologies. After the calibration, a good agreement between soil C estimated from the model with the current climate and observed SOC data was found. Preliminary results show a general reduction in the soil C content with the A1b scenario projection (-18% in the 2100 vs 2000). The SOC reduction in the soils was higher in the forested and semi-natural ecosystems than agricultural areas. In addition, an increase of 4.3% in the CO_2 fluxes is expected at the end of the 21th century. The work allowed an estimation of the SOC projections for the current century under climate warming conditions, identifying the potential contribution of the several land use typologies. The methodological approach constitutes a first exercise where other processes, such as changes in land use, and in the net primary production need to be accounted for a more comprehensive approach in the SOC dynamics estimations and projections for the future.