

**Título:** MODELLING OF THE TOPSOIL ORGANIC CARBON CONTENT BY ANALYSING THE POTENTIAL OF SPECTROSCOPIC TECHNIQUES FOR DIGITAL SOIL MAPPING

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**Resumen:** Soil research is being driven by a need to understand the role of soil in the global climate change. The scientific community and policymakers have been expressed the need for spatially referenced information about soil organic carbon distribution. It represents the largest terrestrial carbon pool, being one of the most relevant components in the carbon cycle budget and climate change feedbacks. The advances in computer science have brought enormous potential for improve the manner in that soil maps were produced. The use of new statistical approaches showed the potential of digital soil mapping to inference the spatial distribution of organic carbon content with a limited sampling point scheme. Recently, digital soil mapping has been complemented with visible and infrared spectroscopy, which provides an effective tool to obtain soil organic carbon concentration of soil samples and overcomes the high cost and time-consuming typical of traditional chemical methods.

The work here realized aims to develop statistical methods to quantify the topsoil organic carbon content and stocks in three study cases by using spectroscopic data as a tool for digital soil mapping frameworks. In the first study case we developed a statistical approach to map organic carbon content at regional scale in topsoils from Galicia (NW Spain) and we explored the capacity of spectroscopy for predict soil organic carbon content. In the second study case we pass to continental scale aimed to improve the accuracy of the current approaches. In

such manner, we developed a spatially non-stationary approach that allows to map soil organic carbon content at European scale and also identify the factors more relevant for soil organic accumulation/degradation across Europe. Finally, we evaluated the capacity of digital soil mapping methods for monitoring and for the quantification of the soil organic carbon stocks expected for future times under different climate change scenarios. We used for such purpose legacy data from Santa Cruz Island (Galapagos), a place under a special protection status where the effects of climate change were pinpointed as one of the major threats for the ecosystems of this area.