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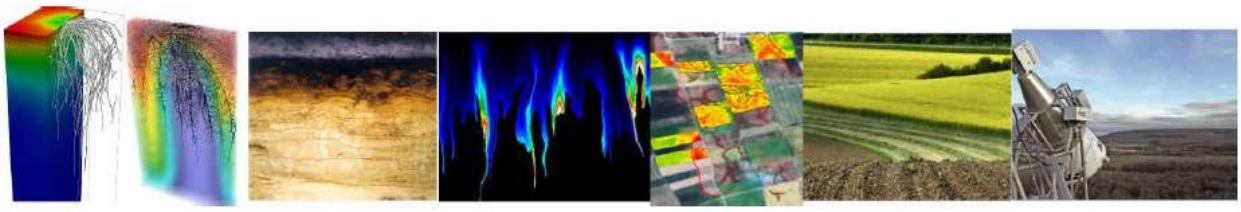

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MODELING THE STORAGE OF ORGANIC CARBON IN CONSTRUCTED TECHNOSOLS

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With the increase of global population and the threat of climate changes caused by anthropogenic gas emissions, high pressure has been put on arable lands in order to cover the needs for both food and bioenergy production. Conversion of degraded lands for such purposes represents a sustainable solution, implying the restoration of several ecosystem services which have been impaired. Construction of Technosols on degraded lands have been investigated in order to increase soil fertility and biological activity, using various organic and inorganic industrial by-products. Field trials have demonstrated the interest of this remediation technique for the production of non-food biomass and the improvement of soil biodiversity. Moreover, the construction of Technosols with materials rich in organic carbon may also represent a way to store carbon in soils for a long-time, thus alleviating the emissions of greenhouse gases associated to the traditional end-of-life of these products. However, the processes of organic matter transformation and mineralization in these newly formed soils are largely unknown. We collected data on soil organic C evolution over 12 years on two experimental sites in Lorraine, France, where different Technosol profiles were created from thermally-treated cockery soil, paper sludge and green waste compost. Data were compared to the one from natural soils in the same region, and to the available data from other constructed Technosols in the literature. RothC model (Coleman and Jenkinson, 1996), describing the evolution of soil organic carbon divided in five pools of organic matter, was adapted to the specific constraints of the constructed Technosols (*e.g.* with possible evolution of soil density and soil depth). The adapted model was used to predict the evolution of soil organic carbon on both experimental sites, both at short-term over the last 12 years and on the long-term over the whole 21st century. Our results suggest that the stock of organic C in the top 30 cm of constructed Technosols can reach the level usually observed in natural soils with similar climate and plant cover in less than 10 years. This evolution was well described by RothC model when taking into account the various types of organic matters introduced in the Technosols. Despite this fast degradation at the surface of the soil, the total amount of organic C stored in the whole profile of the Technosol (100 cm) remained significantly higher than the corresponding value in natural soils. Constructed Technosols could therefore be a way to optimize soil ecosystem services associated to carbon storage, *e.g.* global climate regulation. Further investigations and new modelling approaches are however needed to precise the dynamics of soil organic carbon in these newly formed soils, particularly regarding the influence of climate changes expected in the next decades.