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CARBON DISTRIBUTION ALONG THE PROFILE OF A COMPOST-AMENDED ANTHROPOGENIC SOIL: EVIDENCE FROM A CHRONOSEQUENCE STUDY

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Soil fertility and C stocks of anthropogenic soils formed during land reclamation activities may be enhanced by amendment with municipal waste compost (MWC). Although the positive effects of compost application to arable soils is well recognized, little is known on how land rehabilitation practices effect C dynamics in such relatively young soil systems. Within the framework of a long-term experiment, this work aims at evaluating temporal and spatial dynamics of compost-derived organic matter (OM) with respect to the major processes involved in OM cycling in an anthropogenic landfill covering soil amended with MWC. We investigated long-term C dynamics in such systems by collecting landfill covering soil samples at different depths, from a 10 year chronosequence. Compost application enhanced the C stocks of amended topsoils, and $\delta^{13}C$ values showed that compost-derived organic matter was distributed throughout the soil profile. The addition of compost to the superficial layer resulted in a significant input of soluble organic compounds subject to leaching. Sorption isotherms for compost-derived water-extractable OM onto mineral materials used for landfill covering as well as the accumulation of lignin-derived phenolic biomarkers suggest that sorptive preservation contributed to increasing C content of deeper soil horizons with time. Nevertheless, changes in the content of non-cellulosic carbohydrates in soils and their respective water-extractable fractions suggest that a proportion of compost-derived, labile organic matter fraction is leached through the soil profile and potentially lost from the soil system, particularly in the years immediately after compost application.