Variability of Soil Organic Carbon and radiocarbon in a Mediterranean benchmark Vertisol

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Introduction

Soils show generally properties having both horizontal and vertical spatial variability. Vertisols are commonly considered soils with a low level of variability. However, several recent surveys have demonstrated that such low variability is only apparent and argillo-pedoturbation process is not so efficient in increasing the vertical spatial variability of Vertisols at pedon scale. The aims of our survey were: i) to investigate the variability of Soil Organic Carbon (SOC) distribution in a mega-pit of a Mediterranean benchmark Vertisol; ii) to obtain radiocarbon data for a bowl in the mega-pit; iii) to find a suitable model to explain the genesis of that soil.

Study area

The study area is in central Sicily, Italy (37°60′N; 13°90′E). The climate is semiarid Mediterranean with a dry period of 5–6 months. The soil udometric regime is xeric, bordering on aridic, and the thermometric regime is thermic. The soil parent material is a deposit of colluvial origin; the soil is a Calcic Vertisol (Hypereutric, Pellic). Land use is Eucalyptus wood.

Material and Methods

To fit the purposes of our survey we use a mega-pit (5 m wide; 2 m deep) of the Vertisol that was described and sampled according to both the Williams' method (1996) and the sequence of genetic horizons. In the mega-pit was also identified and sampled a bowl (Eswaran and Cook, 1988). All the soil samples were analyzed in lab for main physical and chemical parameters, including also SOC and humic acids characterization and both total and available metals. Only humic acids extracted from samples of the bowl were analyzed for ^{14}C obtaining dates in BP.

Results and discussion

We found a normal increase of ^{14}C dates with depth. The radiocarbon dates range from 106±0.55 in the topsoil to 3,650 ± 55 in the bottom part of the soil. SOC and humic acids show a different trend and a clear variability not only in the bowl but also in the whole mega-pit. Such findings indicate that the soil profile is characterized by weak influence of argillo-pedoturbation on soil formation and evolution. The pedogenetic interpretation of such results could be grounded instead on the water movement through the soil.

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