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Microstructure differentiation in a Typic Argiudoll in the Pampean Region of Argentina under conventional and no-till agricultural systems. Two converging pathways to a similar organic matter content.

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In the Pampean Region of Argentina no-till has been rapidly and extensively adopted by farmers, constituing at present the usual system in agricultural lands. Among the different advantages of the system, particularly a clear reduction of soil erosion processes, it is also considered that no-till improves soil porosity and increases the content of soil organic matter. In this paper, the microstructure and the organic matter of the upper part of the A horizon of a silty-loamy Pampean Typic Argiudoll under two agricultural management systems (SD: no-till; LR: disk ploughing) and in two non cultivated situations (NLv and NLp), are compared. In all cases micromorphological analyses revealed a marked vertical anisotropy constituted by three microstructural levels in the first 10 cm of the soil (here named layers I, II and III), though the characteristics of those layers differ among the studied situations. Synthetically, NL situations showed a predominance of packing voids and biological features; the SD treatment is characterized by a subsurface layer with laminar aggregates and a predominance of horizontal planar voids; the LR treatment shows a crust development at the surface, low porosity determined by horizontal planar voids and vesicles, together with a lower content of organic residues. According to the micromorphometric quantification done by image analyses, total porosity (area occupied by voids larger than 50 μm) in NL situations represents around 30% of the samples. Total porosity is lower in both cultivated situations and does not differ significantly between them (26 % in SD and 23 % in LC). Nevertheless, some differences are observed in the proportion

of different types of voids; particularly in the SD treatment horizontal planar voids are more abundant than in other situations, representing 87% of pores larger than 50 μm. On the other hand, and according to the methods used in this work, there were no significative differences in the quantity and quality of organic matter in the soil comparing SD and LR systems. In this context, it is considered that the long lasting laminar structure developed in the SD system and the temporary surface crust in the LR system are acting in a converging way, both restricting the mixing of organic and mineral phases of the soil. In SD a high accumulation and conservation of the organic compounds occur at the surface, but the biological activity after 10 years of cultivation was not strong enough to incorporate it at more than a few mm of depth. In LR, after plowing, there is a deeper incorporation of OM, but collaterally a higher degradation occurs. In this way the final balance of the OM in the A horizon appears to be similar in both systems. The similarity in the organic pool between both situations seems to be reflected also by a similar aggregate stability obtained with the Henin method.