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Soil electrical resistivity to characterize 3D soil organisation within a complex agricultural landscape

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Hedgerow network landscapes are present in a large part of western Europe. These contexts of agricultural landscapes in temperate climates are characterized by a complex soil organisation. The most systematic effect of hedges on soils, is a thickness increase of the A horizon uphill from hedges due to colluvial deposition, attributed to an anti-erosive effect of hedges (Carnet et al., 1979; Walter et al. 2003). This modification of soil at slope scale is tied to modifications of soil properties in the vicinity of hedges (Baffet, 1984; Lal, 1989a, b; Salvador-Blanes et al., 2005, Follain et al., 2006, 2007). But the present soil organisation at the landscape scale cannot be explained by considering only the existing soil surface topography and actual hedgerow network pattern (Follain, 2005): actual soil organisation is controlled by past and recent evolution processes, modulated by past and actual landscape structures. It appears clearly that classical approaches undertaken in 2D and under favorable conditions for soil accumulation, perpendicular to the hedges are not relevant to understand and estimate processes responsible of soil redistributions at the landscape scale. New 3D approaches require to be developed. This is possible by the contribution of subsurface geophysical methods, in particular the electric and electromagnetic methods (Michot, 2003), which can help us to finely characterize the space variability of soil physical properties, but also to locate disappeared landscape structures. The aim of this communication is to test the relevance of using subsurface geophysical methods to improve the space prediction of intrinsec soil properties in a complex agricultural landscape. A field experiment was carried out within an old agricultural area with a high density

of hedges. We establish a 3D map of the pedological cover by means of auger boring, to quantify spatial variations of soil horizon geometry and properties (soil horizon thicknesses, soil organic carbon) within the landscape in relation to anthropogenic landscape structures. Then, the results were combined to a high resolution electrical resistivity map to improve estimation of soil properties.