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Application of digital soil mapping in Argentina: An example using apparent soil electrical conductivity

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Apparent soil electrical conductivity (ECa) has been used to capture soil data in several Argentinean Pampas locations. The aim of this study was to generate digital soil mapping on the basis of understanding the relation among ECa and soil properties in three farming fields of the southeast Buenos Aires province. We carried out a geostatistical analysis using ECa data obtained at two depths 0-30cm (ECa_30cm) and 0-90cm (ECa_90cm). Then, two zones derived from ECa measurements were delimited in each field. A soil-sampling scheme was applied in each zone using two depths: 0-30cm and 30-90cm. Texture, Organic Matter Content (OMC), cation-exchange capacity (CEC), pH, saturated paste electrical conductivity (ECe) and effective depth were analyzed. The relation between zones and soil properties were studied using nested factor ANOVA. Our results indicated that clay content and effective depth showed significant differences among ECa_30 zones in all fields. In Argentine Pampas, the presence of petrocalcic horizons limits the effective soil depth at field scale. These horizons vary in depth, structure, hardness and carbonates content. In addition, they influence the spatial pattern of clay content. The relation among other physical and chemical soil properties was not consistent. Two soil unit maps were delimited in each field. These results might support irrigation management due to clay content and effective depth would be controlling soil water storage. Our findings highlight the high accuracy use of soil sensors in developing digital soil mapping at field scale, irrigation management zones, precision agriculture and hydrological modeling in Pampas region conditions.