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Assessment of Temporal and spatial variability of soil hydraulic properties and its implications on soil water content predictions for a maize field in Northern Italy

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Use of hydrological models to simulate water movement from soil surface to groundwater requires intensive, time consuming and expensive soil related parameters collection, such as, water retention curve (WRC) parameters and hydraulic conductivity (K).Typically, soils to be characterized, , exhibit large variations in space and time as well during the cropping cycle, due to biological processes and agricultural management practices : tillage , irrigation , fertilization and harvest. Soil properties are subjected to diverse physical and chemical changes that leads to a non-stability in term of water and chemical movements within the soil as well to the groundwater. The aim of this study is to assess the variability of soil hydraulic properties dynamics over a cropping cycle. The study site is a surface irrigated Maize field (typical in this area) located in Secugnago (45°13'31.70" N, 9°36'26.82 E), in Northern Italy-Lombardy region. The field belongs to the Consortium Muzza Bassa Lodigiana, within which meteorological data together with soil moisture were monitored during the cropping season of 2015 . To investigate soil properties variations, both measurements in the field and laboratory tests on both undisturbed and disturbed collected samples were performed. Soil samples were taken from different locations within the study area and at different depths(0cm , 20cm and 40cm) as well at different growth stages of the plant ,after irrigation events or tillage and as well after harvest. During three measuring campaigns, for each soil samples several parameters were monitored (Organic matter , bulk density) together with soil-water related parameters (Soil water retention curve parameters , saturated hydraulic conductivity). Soil water retention curves parameters were measured following the evaporative method, using the Hyprop (Hydraulic Property Analyzer; UMS Munich, 2010). Parameters were assessed using Hyprop-fit software, by fitting data to Brooks and Corey and Van-Genuchten equations. The saturated hydraulic conductivity was measured in the laboratory using KSAT-UMS falling head method. Results show that soil properties, often considered as static within hydrological models simulations could be subjected to significant changes, with implications on infiltration and soil moisture movement modeling.