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Spatial probability of soil water repellency in an abandoned agricultural field in Lithuania

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Water repellency is a natural soil property with implications on infiltration, erosion and plant growth. It depends on soil texture, type and amount of organic matter, fungi, microorganisms, and vegetation cover (Doerr et al., 2000). Human activities as agriculture can have implications on soil water repellency (SWR) due tillage and addition of organic compounds and fertilizers (Blanco-Canqui and Lal, 2009; Gonzalez-Penaloza et al., 2012). It is also assumed that SWR has a high small-scale variability (Doerr et al., 2000). The aim of this work is to study the spatial probability of SWR in an abandoned field testing several geostatistical methods, Organic Kriging (OK), Simple Kriging (SK), Indicator Kriging (IK), Probability Kriging (PK) and Disjunctive Kriging (DK). The study area it is located near Vilnius urban area at (54 49' N, 25 22', 104 masl) in Lithuania (Pereira and Oliva, 2013). It was designed a experimental plot with 21 m2 (07x03 m). Inside this area it was measured SWR was measured every 50 cm using the water drop penetration time (WDPT) (Wessel, 1998). A total of 105 points were measured. The probability of SWR was classified in 0 (No probability) to 1 (High probability). The methods accuracy was assessed with the cross validation method. The best interpolation method was the one with the lowest Root Mean Square Error (RMSE). The results showed that the most accurate probability method was SK (RMSE=0.436), followed by DK (RMSE=0.437), IK (RMSE=0.448), PK (RMSE=0.452) and OK (RMSE=0.537). Significant differences were identified among probability tests (Kruskal-Wallis test =199.7597 $p<0.001$). On average the probability of SWR was high with the OK (0.58 ± 0.08) followed by PK (0.49 ± 0.18), SK (0.32 ± 0.16), DK (0.32 ± 0.15) and IK (0.31 ± 0.16). The most accurate probability methods predicted a lower probability of SWR in the studied plot. The spatial distribution of SWR was different according to the tested technique. Simple Kriging, DK, IK and PK methods identified the high SWR probabilities in the northeast and central part of the plot, while OK observed mainly in the south-western part of the plot. In conclusion, before predict the spatial probability of SWR it is important to test several methods in order to identify the most accurate.

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References

Blanco-Canqui, H., Lal, R. (2009) Extend of water repellency under long-term no-till soils. Geoderma, 149, 171-180.

Doerr, S.H., Shakesby, R.A., Walsh, R.P.D. (2000) Soil water repellency: Its causes, characteristics and hydro-geomorphological significance. Earth-Science Reviews, 51, 33-65.

Gonzalez-Penaloza, F.A., Cerda, A., Zavala, L.M., Jordan, A., Gimenez-Morera, A., Arcenegui, V. (2012) Do conservative agriculture practices increase soil water repellency? A case study in citrus-croped soils. Soil and Tillage Research, 124, 233-239.

Pereira, P., Oliva, M. (2013) Modelling soil water repellency in an abandoned agricultural field, Visnyk Geology, Visnyk Geology 4, 77-80.

Wessel, A.T. (1988) On using the effective contact angle and the water drop penetration time for classification of water repellency in dune soils. Earth Surface Process and Landforms, 13, 555-265.