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Spatial distribution of soil water repellency in a grassland located in Lithuania

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Soil water repellency (SWR) it is recognized to be very heterogeneous in time in space and depends on soil type, climate, land use, vegetation and season (Doerr et al., 2002). It prevents or reduces water infiltration, with important impacts on soil hydrology, influencing the mobilization and transport of substances into the soil profile. The reduced infiltration increases surface runoff and soil erosion. SWR reduce also the seed emergency and plant growth due the reduced amount of water in the root zone. Positive aspects of SWR are the increase of soil aggregate stability, organic carbon sequestration and reduction of water evaporation (Mataix-Solera and Doerr, 2004; Diehl, 2013). SWR depends on the soil aggregate size. In fire affected areas it was founded that SWR was more persistent in small size aggregates (Mataix-Solera and Doerr, 2004; Jordan et al., 2011). However, little information is available about SWR spatial distribution according to soil aggregate size. The aim of this work is study the spatial distribution of SWR in fine earth (<2 mm) and different aggregate sizes, 2-1 mm, 1-0.5 mm, 0.5-0.25 mm and <0.25 mm. The studied area is located near Vilnius (Lithuania) at 54° 42' N, 25° 08 E, 158 masl. A plot with 400 m2 (20 x 20 m with 5 m space between sampling points) and 25 soil samples were collected in the top soil (0-5 cm) and taken to the laboratory. Previously to SWR assessment, the samples were air dried. The persistence of SWR was analysed according to the Water Drop Penetration Method, which involves placing three drops of distilled water onto the soil surface and registering the time in seconds (s) required for the drop complete penetration (Wessel, 1988). Data did not respected Gaussian distribution, thus in order to meet normality requirements it was log-normal transformed. Spatial interpolations were carried out using Ordinary Kriging. The results shown that SWR was on average in fine earth 2.88 s (Coeficient of variation % (CV%)=44.62), 2-1mm 1.73 s (CV%=45.10), 1-0.5 mm 2.02 s (CV%=93.75), 0.5-0.25 mm 3.12 s (CV%=233.68) and in <0.25 mm 15.54 mm (CV%=240.74). This suggests that SWR persistence and CV% is higher in small size aggregates than in the coarser aggregate sizes. The interpolated maps showed that in fine earth SWR was higher in the western part of the studied plot and lower in the central area. In the 2-1 mm aggregate size it was higher in the southwest and lower at north and northwest area. In the 1-0.5 mm aggregate size it was lower in the central area and higher in the southwest. In the 0.5-0.25 mm aggregate size it was higher in the west part and lower in the north of the plot and. In the <0.25 mm no specific pattern was identified and the SWR was heterogeneously distributed. This suggests that the spatial distribution of SWR is very different according to the aggregate size. Future studies are needed in order to identify the causes and consequences of such dynamic.

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References

Diehl, D. (2013) Soil water repellency: Dynamics of heterogeneous surfaces, Colloids and surfaces A: Physicochem. Eng. Aspects, 432, 8–18.

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

Jordan, A., Zavala, L., Mataix-Solera, J., Nava, A.L., Alanis, N. (2011) Effects of fire severity on water repellency and agregate stability on mexican volcanic soils, Catena, 84, 136–147.

Mataix-Solera, J., Doerr, S. (2004) hydrophobicity and agregate stability in calcareous topsoils from fire-affected pine forests in south-easthern Spain, Geoderma, 118, 77–88.

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 Surfaces Process. Landforms, 13, 555–562, 1988.