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Short term spatio-temporal variability of soil water-extractable calcium and magnesium after a low severity grassland fire in Lithuania.

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Fire has important impacts on soil nutrient spatio-temporal distribution (Outeiro et al., 2008). This impact depends on fire severity, topography of the burned area, type of soil and vegetation affected, and the meteorological conditions post-fire. Fire produces a complex mosaic of impacts in soil that can be extremely variable at small plot scale in the space and time. In order to assess and map such a heterogeneous distribution, the test of interpolation methods is fundamental to identify the best estimator and to have a better understanding of soil nutrients spatial distribution. The objective of this work is to identify the short-term spatial variability of water-extractable calcium and magnesium after a low severity grassland fire. The studied area is located near Vilnius (Lithuania) at 54° 42' N, 25° 08 E, 158 masl. Four days after the fire, it was designed in a burned area a plot with 400 m2 (20 x 20 m with 5 m space between sampling points). Twenty five samples from top soil (0-5 cm) were collected immediately after the fire (IAF), 2, 5, 7 and 9 months after the fire (a total of 125 in all sampling dates). The original data of water-extractable calcium and magnesium did not respected the Gaussian distribution, thus a neperian logarithm (ln) was applied in order to normalize data. Significant differences of water-extractable calcium and magnesium among sampling dates were carried out with the Anova One-way test using the ln data. In order to assess the spatial variability of water-extractable calcium and magnesium, we tested several interpolation methods as Ordinary Kriging (OK), Inverse Distance to a Weight (IDW) with the power of 1, 2, 3 and 4, Radial Basis Functions (RBF) – Inverse Multiquadratic (IMT), Multilog (MTG), Multiquadratic (MTQ) Natural Cubic Spline (NCS) and Thin Plate Spline (TPS) – and Local Polynomial (LP) with the power of 1 and 2. Interpolation tests were carried out with Ln data. The best interpolation method was assessed using the cross validation method. Cross-validation was obtained by taking each observation in turn out of the sample pool and estimating from the remaining ones. The errors produced (observed-predicted) are used to evaluate the performance of each method. With these data, the mean error (ME) and root mean square error (RMSE) were calculated. The best method was the one which had the lower RMSE (Pereira et al. in press). The results shown significant differences among sampling dates in the water-extractable calcium ($F= 138.78$, $p< 0.001$) and extractable magnesium ($F= 160.66$; $p< 0.001$). Water-extractable calcium and magnesium was high IAF decreasing until 7 months after the fire, rising in the last sampling date. Among the tested methods, the most accurate to interpolate the water-extractable calcium were: IAF-IDW1; 2 Months-IDW1; 5 months-OK; 7 Months-IDW4 and 9 Months-IDW3. In relation to water-extractable magnesium the best interpolation techniques were: IAF-IDW2; 2 Months-IDW1; 5 months- IDW3; 7 Months-TPS and 9 Months-IDW1. These results suggested that the spatial variability of these water-extractable is variable with the time. The causes of this variability will be discussed during the presentation.

References

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