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Temporal variability of soil water repellency in sandy luvisols under Scots pine and beech - influence of antecedent rainfall and temperatures

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Soil water repellency often exhibits pronounced temporal variation, which can hamper the assessment of repellency levels for a site, when samples taken at only one date are evaluated. Those temporal variations are often correlated to the season of the year, although the exact influential factors which govern the seasonal trend of repellency and the pertinent time scales are essentially unknown. The objective here was to elucidate the year-to-year temporal variability of soil water repellency at a forest site in the climatic conditions of central Europe and the relationships of soil water repellency with soil moisture, antecedent rainfall and temperatures prior to sampling. At the Kahlenberg site in Brandenburg, soil water repellency was assessed on samples taken in two consecutive years during summer, using the water drop penetration time (WDPT) and the ethanol percentage (EP) methods. The results indicated extremely high levels of repellency for both years, however, with pronounced temporal variation. Distinctly higher levels of repellency were observed in 2001 compared to 2002. This difference could only in part be ascribed to higher soil water contents in 2001 compared to 2002. Within the period of 5 days before sampling, antecedent rainfall and maximum daily temperatures were clearly higher in 2001 (with high repellency levels) than in 2002 (with lower repellency levels). On the other hand, for a period of 60 days before sampling, no differences in averaged weather conditions between both years were obseved. This suggests, that the time scales pertinent to changes in repellency levels could be short, in the order of few days. Oven drying at 105° C instead of 45° C resulted for the 2002 samples in highly increased levels of water repellency. Because the repellency level in the 2002-samples which were oven dried at 105° C largely resembles the repellency level of the 2001-samples after oven drying at 45° C,

it is proposed to measure “potential” water repellency, in the sense of the maximum repellency level which can be expected in a soil under field conditions, using samples which were oven dried at 105° C for three days.