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Observation of the vertical resolution of the MAGPROX soil profile kappameter SM400 - A first approach

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The newly developed instrument (MAGPROX SM400 ZHInstruments, Brno, Czech Republic) enables continuous real-time in situ measurements of the vertical distribution of magnetic susceptibility in soils. The basic measurement principles were described by Petrovský et al. (2004). The present study aimed at determining the vertical resolution of the instrument. This question required knowledge of the exact dimensions of the magnetic body of investigation. Although the usage of solid synthetic samples includes the disadvantage of uncertain comparability with natural conditions, it seemed to be the only possibility to guarantee the required conditions. Cylindrical steel tube samples with defined lengths (0.5 cm, 1 cm to 10cm) provided known dimensions with defined boundaries and constant susceptibility. With decreasing layer thickness, a decay of the signal height was observable. This is due to the fact, that the increasing influence of the nonmagnetic surrounding of the sample reduced the susceptibility values. When the investigated layer was thinner than the maximum width of the signal increase at the transition to the layer, the susceptibility signal could not reach its true maximum height. Thin magnetic layers lead to a reduction of the susceptibility signal. The same applies to an increasing distance between a magnetic body and the pick-up coil (Petrovský et al., 2004). Both effects should be considered during the interpretation of susceptibility curves measured with the soil kappameter SM400. However, to correct the signal regarding the layer thickness, we have to know the real thickness of the layer. The turning points of the increasing and decreasing part of the signal curve were used for an estimation of the real thickness of magnetic layers. The calculated gradient of the signal curve provided an opportunity to determine the position of the turning points of the curve. The knowledge of the vertical distances

between the turning points and the maximum of the signal allows the estimation of the thickness of a magnetic layer. The method enables the interpretation of a very simple vertical distribution of magnetic susceptibility measured in situ using SM400. For more complicate distributions, further mathematical processing or more laboratory experiments are necessary. The work was carried out in the frame of the MAGPROX project (EVK2-CT-1999-00019).