



National magnetic database for the topsoil samples from Bulgaria

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Establishment of topsoil magnetic database on a national scale provides important source of information, necessary for the purposes of soil classification; soil drainage; as an indirect estimate of the total soil carbon and initial planning in precision agriculture. Five hundred and ten topsoil samples from the upper 20cm of natural unpolluted soils from the territory of Bulgaria have been characterized by detailed magnetic measurements, including mass-specific magnetic susceptibility; frequency dependent magnetic susceptibility, Anhysteretic remanence, Isothermal remanence and their ratios; hysteresis parameters and ratios; as well as soil reaction (pH). Histograms of the measured parameters per soil type and for the whole database reveal specific peculiarities and dependence from different factors. According to the results from the factor analysis, 77% from the total variance can be explained by four factors. The main factor is dominated by the contribution from concentration-dependent magnetic parameters. The second factor reflects the role of fine-grained pedogenic magnetic fraction; while the third one is determined by the properties of the parent material. The fourth factor is governed by the effects from the internal structural peculiarities of the magnetic particles. The results from cluster analysis reveal the role of soil type and geology for the observed magnetic characteristics. The first two clusters separate soils, developed on volcanogenic/volcanic rocks and loess sediments. The third cluster is dominated by the soil type variable and includes mainly Cambisols, developed on different parent rocks. The fourth cluster separates soils developed on sedimentary rocks. The results emphasize the major role of geology (parent material) for the magnetic signature of topsoil samples on a national scale using sampling density of 1sample/200km².