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Soil cover structures represented on large-scale maps by DSM techniques.

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Since the second half of the 20th century the soil mapping has being developed in Russia as related to the concept on the soil cover structure (pattern) proposed by V.M. Fridland (1972, 1977). According to this concept the soil combinations (SC) are represented on maps as systematized units of soil cover at different hierarchical levels. The given paper describes the experience of reflecting the soil cover structure (SCS) on digital large-scale soil maps. The object of mapping is a microstructure of soil cover - soil combinations represented by heterogeneous (2-4 components) areas commensurable with mesorelief elements. The territory under survey (24 km2) is located within the zone of soddy podzolic soils on mantle loams (Klin-Dmitrov ridge). The study was aimed at estimating the dependence of the soil data obtained in field (988 field descriptions) on the state of soil-forming factors by using a regular grid with step of 28.5m. As factor bases are used: (1) a digital model of relief and its derivative multi scales topographical variables, (2) a multispectral Landsat 7 ETM+ image. Based on a comprehensive analysis of relations between soil and its forming factors it seemed reasonable to interpolate the results of point observations of the soil status for all grid elements. The tools of multidimensional statistics (discriminant analysis) permitted to predict probabilities of the given soil cover status for every operational unit. As the size of soil profile (1x1m) is smaller than that of the cell for factor bases (28.5x28.5m), so the probabilities were interpreted as a share of soil area diagnosed by point observations in the soil combination. For SCS mapping the uncertain soil variables were used with account of probabilities of available indicators not only for predominating but also for accompanying components of soil cover within every operational cell.

Under consideration are two mutually supplemented versions of compiling the maps of soil combinations. (1) The soil status is estimated by integral characteristics of the soil profile (soil subtypes). The soil combinations for pixel were defined by the probabilities ratio of their affiliation to each of model characteristic. (2) Initial soil status is estimated by grouping the morphological features of the profile (thickness of humus and podzolized horizons, gleying, washing away/over degree, etc.) aiming to specify elementary soil-forming processes. Soil combinations were determined by the probability of diagnostic indices of one or another process in the operational unit. It is worth emphasizing that the SC prediction on the SCS map proves to be more precise (68.5%) than that on the map of dominant soil subtypes (33%). It is shown that the perspective way of identifying the soil cover structure is connected with characterization of local soil-forming processes and their subsequent interpretation. Specific indication of every process helps increasing the accuracy of DSM outputs. The content and contours of soil combinations on the digital map well agree with the existing soil map at the scale 1:10 000. Thus, a set of digital maps provides multi-variable reflecting the soil cover structure: areas of the studied soil properties, soil combinations formed by the state of these properties, factors determining the causes for spatial variability of soil properties and the univocal correspondence degree between soil and indicators.