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Vegetation spectral indexes of space filming as indicators of parameters of soils of Left-bank Forest-steppe region

Objective. Study of the role of agricultural vegetation as indicators of soil cover. **Methods.** Remote (indicators of brightness of the space image, spectral vegetative indices NDVI, NDWI, MSI, GI) and statistical (mathematical processing of the received data). **Results** The possibilities of space removal in the determination of soil parameters are shown through spectral vegetative indices indirectly through vegetation. **Conclusions** The methods of mathematical statistics prove the possibility of space removal to record changes in the content of potassium and nitrogen in the soil indirectly through vegetation.

Key words: soil cover, remote sensing, space taking, vegetation cover, spectral vegetative indices.

Formulation of the problem. Vegetation, which is the natural environment, but also solves, forms the outer surface of tasks related to economic activity-primarily reflected in space removals, in particular agriculture [4, 8]. It is precisely that it is an indicator of the soil of the main features that are used under the curve, the forms of relief, etc. [3]. A great deal of decoding of vegetation on cosmicity is to determine the properties of the soils in their images - the tone of the image and brightness. Has a decryption of cultivated vegetation. The most reliable vegetation cover of the decryption, especially the state of agricultural crops, is due to the spectral brightness during the v-cultures, which reflects the quality of soils, their use of multidimensional images, the specificity of the soil and the structure of the soil. In contrast to the photos in the red and near early phases of development of crops, vegetation is not infrared. The set of different types conceals, but, on the contrary, emphasizes the features of vegetation and the structure of vegetation cover distribution of soil characteristics and structure reflect the structure of soil cover. The soil cover [2, 5]. Remote probe - Significant significance for the soil identification of agricultural objects is significant by the decoding of the cultural cultivar itself, based on the use of dynamical and economic vegetation. The state of crops can be used for space information [10]. Space evacuation-evidence of the quality and soil fertility, the structures are used not only during the study of soil cover [1, 6, 7]. The phytoindication capabilities of remote sensing methods do not replace the traditional ones, but complement them as an important and organic component of the overall agro monitoring system and contribute to the most effective solution to the problems of agricultural production [9].

The purpose of the research is to study the indicative role of agricultural vegetation in identifying the soil cover indicators. **Research methods.** The object of exploration - chernozems are typical medium-humus heavy-loamed washed, navy and non-eroded in the forests of the test field near the village. Cherkasy Tyshki Kharkivsky District, Kharkiv Oblast. At each point of sampling of vegetation and soil samples, the brightness of the space image in each range of the satellite sensor LandSat is set and the value of the spectral coefficients NDVI, NDWI, MSI, GI is calculated. In corn samples, the chlorophyll content is definitely determined, and the N-tester devices are removed. The coordinates of the sampling points are determined in advance and entered into the memory of the navigation device in order to identify them directly in the field. During field trials samples of soil from the surface (0-10 cm) were selected in accordance with standardized methods using GPS devices. In soil samples, the total content of humus was determined by the Tyurin method, mobile compounds of potassium using the modified Machigina method and the rest of the soil parameters. **Research results.** The statistical analysis of the data was conducted using the Statistica application package. The first step in the analysis of experimental data was the application of the pair correlation method. Statistical data processing revealed the following results. Analysis of the pair correlation once again confirmed the density of the relationship of humus content with the data of space removal in all ranges of light (Table 1). In addition, for a periode, when the field was covered with vegetation - corn (filming on July 3, 2014), the correlation of humus

content with only the average infrared filming channels can be traced. Sufficiently high and significant correlation coefficients have demonstrated the correlation of chlorophyll content in plants with all vegetation indices - NDVI, NDWI, MSI and GI (0.54, 0.46, -0.77, 0.45, respectively) (see Fig. Table 1).

1. data correlation matrix on regular basis in 2014

2. matrix of correlation of soil and vegetation indicators on an irregular network with data of remote sensing

Fig. 1. NDVI (a) and GI (b) vegetation index cartograms

The next step in the research was a mathematical analysis of the data obtained from the non-regular network. The statistical analysis to a greater extent confirmed the patterns that were discovered by us earlier and noted new trends. Again, there is a close correlation between the content of humus in the soil and all channels of the multispectral space scan (Table 2). It has been found that the humus content substantially correlates with the 3 spectral indices NDWI, MSI and GI. It should also be noted that there are significant correlations between the content of potassium in the soil and all of our spectral indexes. Quite close interconnection is obtained between the content of ammonium nitrogen in the soil and the content of nitrogen in plants and the content of chlorophyll, which has a close relationship with more of the spectral range of the shooting. The conducted analyzes testify that at this stage of research the possibility of space removal in the determination of the geospatial distribution of potassium content in the soil was established through spectral vegetation indices; Nitrogen distribution (especially ammonia nitrogen) - due to chlorophyll content in plants, which is determined by the majority of cosmic removal channels; And the humus state - as a direct removal of not occupied by the vegetation of the field, and indirectly through vegetation, especially in distant spectral ranges. A separate stage of research is the determination of the state and structure of the soil cover in terms of agricultural vegetation, which can be estimated by satellite removal. For all calculated spectral indexes, a general tendency of the conditional "horizontal strip pattern" for this field (Fig. 1) is observed, which corresponds to the drawing of an archival ground map (Fig. 2). Cartograms of spectral indices can to some extent determine the structure of the soil cover, since they are almost similar to the drawing of the archival ground map of this field. It can also be argued about a certain indicative role of agricultural rol-in-line in the recognition of soil cover. It was established that the maximal values of the spectral vegetative indices NDVI and GI (the most physiologically developed plant) corresponded to the southern and northern narrow-neck stripes in the field, where the unsteady and sooty soils are distributed. Conversely, those parts of the field where the indicated indices were minimal, that is, the vegetation was suppressed, represented by weakly and medium-tempered soils. Consequently, the calculation of the spectral vegetative indexes proved the effectiveness of the phytonidy-causing functions of the agricultural rosiness in the identification of the soil cover of eroded and undiluted soils.

Fig. 2. Archive ground map of the test in-Lyon

Conclusions

Methods of mathematical statistics in the zone of the middle infrared range. The possibility of space removal was established. Phytomagnetic possibilities were established to evaluate the potassium and nitrogen state of the soil in the soil surface structure, indirectly, through the indices of vegetative, eroded, embroidered and unmixed soils. Those and because of the spectral vegetation indices. Because of the data of remote sensing of the mass-space shoot. Once again it is possible to prove a high correlation coefficient with humus, to estimate the humus soil condition, it is possible to carry out the diagnostics of other direct removals of soil free soil from soil vegetation due to the space removal of salt surfaces and through vegetation, in particular, forest vegetation.

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