# EVALUATION OF LANDSCAPE ELEMENTS BY HYDROTHERMAL POTENTIAL OF THE SOIL ENVIRONMENT

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**Abstract**

*Dissected slope of mountains on the narrow elongated plot and rather narrow sloping land with a different slope than surrounding areas, but preserving the overall direction of the down grade of the landscape, creating go their conditions, structural conditions of growth factor to the HTP soil environment, is closely correlated with the structure of the soil. HTP allows to link together the potential of the soil environment and the function of substances of soil-plant system, structural self-organization of the first, which is expressed in non-equilibrium conditions of soil developing, which is stimulating environment with the presence of gradients of heat, moisture and density potentials. HTP structural coefficient of soil-to gives the opportunity to make more precise differentiation potential of the soil profile. Certain values of $K_{st}$for the mountain-forest brown soil sunder different ecosystems (forest, meadow) become in the range 0,202-0,566, 0,118-0,408.*

**Key words:** *hydrothermal regime, hydrothermal potential of soil, ecosystem of landscape, elements of relief, structural coefficient*

## INTRODUCTION

Nature allows the existence of two or more different ecosystems in the space that exists within the unified soil-climatic zone, as though it did not seem paradoxical. From the point of view of energy security of various natural models of wealthy when its sufficiency, which limits the growing of certain plant communities groups, and provides short-season (grasses) and long-cycle development (wood) [3,4,5,8]. But skillful combination of different ecosystems in the soil-climatic zones of landscape patterns of nature, especially in mountain soils, indicates the existence of mechanisms in nature careful, rational management of hydrothermal potential.

In nature, without fundamental changes in the hydrothermal regime, which is a limiting factor in soil formation, cannot be a change of vegetation (reforestation, a forestations, desertification, etc.), processes that occur continuously, in close correlation with the first [3,4,5,6,9,10,11]. Despite the multifunctional of processes can be distinguished hierarchical stages of transition. Merging models with adjacent-peripheral model happens in our case, with the adjacent ecosystem located in the hierarchy of the natural fertility of high-energy security-sufficiency [1,3,2,5,7]. Long joint development of various ecosystems possible with predominant influence of local, local phenomena associated with the location of landscape elements, which is important in the distribution of hydrothermal resources for mezzo relief mountainous areas.

Landscape elements occupied by different plants on hydrothermal regime differ due to the insistence of natural plant moisture from the soil layer. For herbaceous, shrub and tree species vary in size and transpiration of moisture from the soil, which is why there are the theoretical background to the method for determining the potential difference and the resultant shortage of moisture. So, for the coexistence of various ecosystems within the elementary area of the soil, soil environment should be formed with a different potential.

## SUBJECTS AND METHODS

To identify existing differences, it is necessary a parameter, giving the opportunity to evaluate digital local deviations from the average statistical indicators and exceptions. From the point of view of the above, acceptable option hydrothermal potential of the soil medium-HTP, proposed by the author, expressing the dialectical integrity of natural processes, or reversible processes occurring in the soil environment in native models under different ecosystems in the space-time format.

The object of research is selected from southern slope of Big Caucasus, area with brown mountain-forest soils. Administratively the territory is subject to the Ismayilli region. The area is situated at an altitude of 700-850 m and above. Location terrain is favorable for the development of deciduous relict forests and grass and trees and shrubs, is closely correlated with the distribution of hydrothermal resources and the spatial and temporal position of the relief elements.

Theoretically it is possible redistribution of climatic factors under the effective influence of local requirements. [10,12]. HTP provides an overview of reversible processes in the soil environment, but par genetic function of the parameter does not allow to carry out a clearer differentiation of reference for studies of mezo-level terrain. In this regard, there is need to introduce a new parameter $K_{st}$-factor structure of HTP developed by us.

Research methods based on the differentiation of the soil environment under different ecosystems at hydrothermal potential ($K_{st}$). $K_{st}$ is determined for the design layer of the soil, which depends on the type of vegetation, and is determined by experiment.

$K_{st}$ determined from the following expression:

$$k_{st} = W/T$$

Where, $W$ – soil moisture, mm; $T$ – is the temperature of the soil, $^{o}$C, F, K.

## RESULTS OF RESEARCHES

The situation provides a relatively long exposure to the elements of the relief energy source, the sun, the effect on plant community structure, defined-different compositions and phyto mass.

The difference, especially in the temperature range surface relief, led to the introduction geographers term "solar exposures exposition" landscapes.

Mid landscapes mostly forested. Slope denudation surface topography busy green moss forests developing on humus soil, green moss larch forests in humus soils, larch forests forbs-grass on the mountain-forest dark-colored soils, and finally, forbs-grass forest meadows on mountain meadow turf soils.

From the above analysis it is clear that the theoretical premise on the difference of soil moisture and temperature regimes environments, developing a variety of ecosystems is a basic concept, referring to that you can solve many spatial models natural-ecosystems mountain soils.

The characteristics of the areas where mountain-forest brown soils received in separate areas, the development of herbaceous, xerophytes, deciduous and mixed relict forests (Fig. 1).



Fig. 1. General view of systems and elements of the landscape mountain-forest brown soils.

For general characteristics of mountain areas regarding security electro thermal resources, as well as identifying areas of distribution of various ecosystems and areas of influence of the micro relief, in order to determine the extent of local effects on the accumulation and distribution of potential useful consideration of the landscape in a bulk format. This is made possible by using technical means available in the program Google Earth [Fig. 2].

From the study area terrain visualization in 3D [Fig. 2], the differences can be seen in the arrangement of the elements of the relief mountainous areas. As the main emphasis on ruggedness acts narrowly oblong, rather narrow, flat areas with a slope different from the surrounding areas, but preserving the general direction of the slope. It is on these shallow areas, a change of ecosystems, that is becoming common herbaceous plants, where the summer place to watch the complete drying of the soil surface to form a shallow (10 cm) in width shrinkage cracks up to 2 cm.

To carry out a comparative analysis in order to identify local differences in the distribution of energy a biotic factors, it is necessary to study the dynamics of temperature and humidity of the soil environment in the annual cycle.



Fig. 2. Overview of the study area landscape mountain area with a height of 1000 meters

The situation emerging in the soil composed of par genetic indicators that are temperature and moisture level of the soil.

As it turns out from the above analysis of environmental models common in the mountainous areas in the formation of hydrothermal potential of the soil environment, the dominant soil-forming factor is the relief; its location makes local space-time-difference form. Excellent conditions, creates a level of equilibrium soil-plant, non-standard, and the ratio of resources HTP within the limits of hydrothermal ecosystems landscape.

Studies conducted on the brown mountain-forest soils on the southern slope of Big Caucasus confirmed the theoretical background and natural geomorphologic analysis models of mountain areas, with respect to change in the ratio of hydrothermal indicators of soil due to the abrupt change in slope of the surface topography, on flat areas within the landscape, gave opportunity to state the following theoretical and methodological conclusions:

- Down the soil profile hardwood forests HTP value decreases. The top 0-20 cm layer potential difference with respect to the earth's surface is 0,94 snr. Character changes HTP tends to decrease in the soil profile under the forest ecosystem, and vice versa in the grass.

The average grade distribution of HTP on the profile of brown mountain forest soils of the southern slope Big Caucasus

| Element of relief, ecosystem | Depth, cm | Soil humidity, % | Soil temperature, ˚C | HTP snr | Weighted average of the HTP (in a layer 0-20 cm) |
|---|---|---|---|---|---|
| Sloping portions of the relief, meadow vegetation | 3 | 11,8 | 31,8 | 3,99 | 4,706 |
| | 5 | 16,5 | 27,5 | 4,80 | |
| | 10 | 18,2 | 25,6 | 4,93 | |
| | 15 | 18,8 | 24,4 | 4,86 | |
| | 20 | 18,5 | 24,1 | 4,72 | |
| The exposition of the slopes of the mountains, relict forests | 3 | 22,5 | 23,0 | 4,86 | 3,165 |
| | 5 | 22,3 | 20,8 | 4,36 | |
| | 10 | 23,3 | 19,8 | 4,34 | |
| | 15 | 20,5 | 19,0 | 3,66 | |
| | 20 | 22,4 | 18,6 | 3,92 | |

- HTP enables to link together the potential of the soil environment and functions of substances (chemical, biological, energy, water, etc.) with the structural self-organization of the first, which is expressed in non-equilibrium conditions of the soil: the presence of gradients of heat, moisture, and the concentration of potential mass transfer in the result of synergistically compatible elementary processes in a multifunctional mode.

Research indicates that the temperature distribution in the soil profile has decreasing trend, and vice versa humidity [10,12].This can be seen as compared with the individual soil profile sand by comparing the overall distribution graphs of temperature and humidity in depth. The as asynchronous schedules moisture and soil temperature shows the reversibility of these processes [10].

In Fig. 3 shows graphs of humidity and temperature in the soil layer of 0-20cm in soil environment sunder different cenoses.

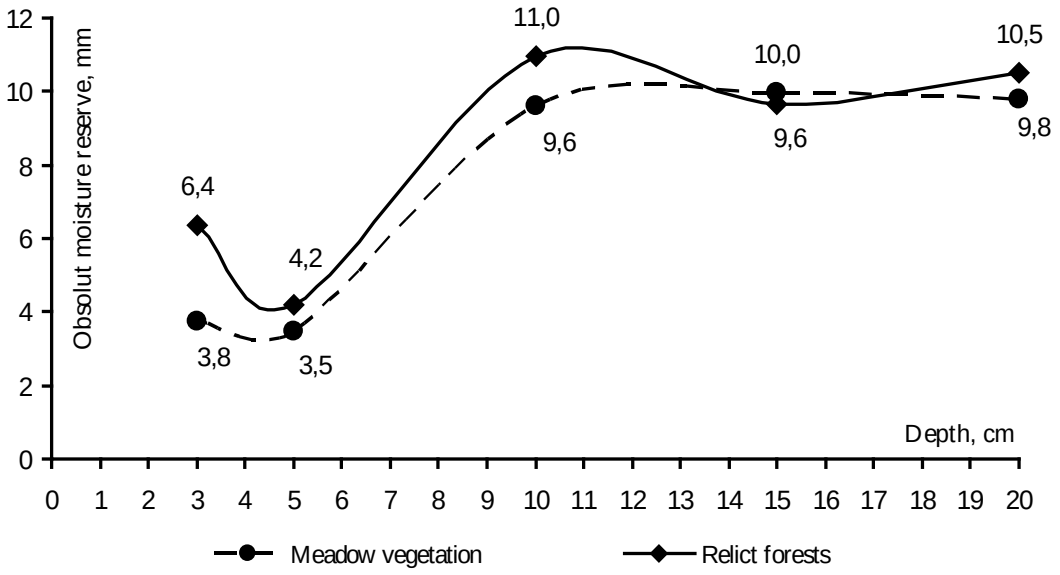


Fig.3. The distribution of temperature and humidity in the soil environment under different ecosystems

As can be seen from the graph, at a depth of 10 cm and below the reins observed accumulation of soil moisture, but quantitatively it 2 times more under forest cover.

To compare different soil profiles is advisable to use the integral curves. The result of this analysis is shown in Fig. 4.

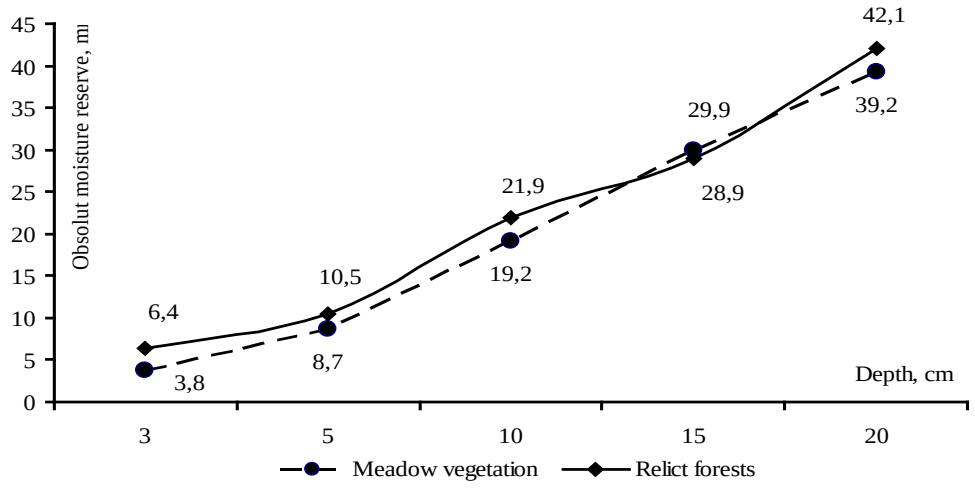


Fig.4. Integral curves of soils under different ecosystems

Analysis of the integral curves of the soil environment under different ecosystems shows that the humidity under forest vegetation is used more efficiently than under grass. And this is due to poor soil surface shading and strong transpiration humidity meadow vegetation.

In both cases, the integral curves shown in Fig. 1.2 shows a general characteristic of hydrothermal potential of the soil environment, but is not sufficient to illustrate the more profound differences exist under different ecosystems.

A fig. 4 show that the forest ecosystem at a depth of 15 cm is potential benefit of HTP is formed under the herbaceous vegetation with respect to the gum. At deeper soil horizons general trend resumes. Same graphic situation is observed in the curve humidity [Fig.3]. It follows that despite the fact that the curves characterize the different feedback processes are generally acceptable when rendering real processes occurring in the soil environment.

For in-depth analysis of hydrothermal potential of the soil under different cenoses need to plot the value of the coefficient on $K_{st}$, which is shown in Fig. 5.

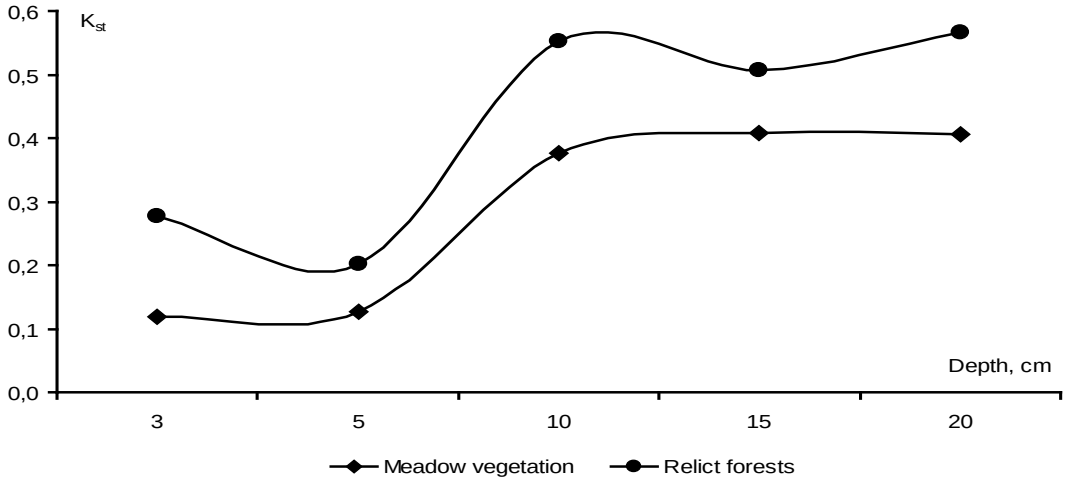


Fig. 5. Differentiation of the soil profile on the structural factor HTP-$K_{st}$

Analysis of soil profiles formed under forest and meadow vegetation shows that the observed at a depth of 15 cm a synchronicity graphs shown in a less pronounced form, because of what has been achieved vera clear polarization of polynomial curves. Comparative analysis of individual points of the curves shows that the difference between the oscillation in the range 1,24-1,92 units.

## FINDINGS

Dissected slope of mountain areas to narrowly oblong, rather narrow, flat areas, with a slope different from the surrounding areas, but preserving the general direction of the slope of the landscape and create other conditions, structural conditions of growth factor to the HTP soil environment, is closely correlated with the structure of the soil cover.

HTP allows to link together the potential of the soil environment and functions of substances soil-plant system, the structural self-organization of the first manifested in non-equilibrium conditions of the soil, stimulating environment with the presence of gradients of heat, moisture, concentrations of potential.

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