

## **DETERMINATION OF SOUTHERN ALTAI GEOGRAPHY PROPITIIOUSNESS EXTENT FOR TOURISM DEVELOPMENT**

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**Abstract:** Relief has its personal significance for tourism development. This is natural component, indicating the type of touristic use, which is approved by its basic position as a landscape component. The object of the research of this article is a recreational area of Southern Altai. Southern Altai as a part of the Altai Mountains is characterized by a variety of climatic conditions, landscape uniqueness and complexity of their space-time organization. Hypsometry determines the observability and attractiveness of the territory, vertical roughness of relief defines variety of scenery, horizontal roughness of relief determines variety and passes ability of the territory, slope angles define the prime cost of the recreational engineering constructions, exposure defines amount of solar energy.

**Keywords:** relief, landscape, tourism development, southern Altai Mountains, Kazakhstan

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### **INTRODUCTION**

Relief has its personal significance for tourism development (Wendt, 2011; Ilies & Wendt, 2015). This is natural component, indicating the type of touristic use, which

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is approved by its basic position as a landscape component (Castaldini et al., 2005; Ilieş & Josan, 2009; Herman & Wendt, 2011). The object of the research of this article is a recreational area of Southern Altai.

Southern Altai as a part of the Altai Mountains is characterized by a variety of climatic conditions, landscape uniqueness and complexity of their space-time organization. The absolute height, vertical roughness of relief or height relationship (m), horizontal roughness of relief –the distance where the relief shape changes from convex to concave (km), slope angles (degrees), and slope exposure should be taken into account while relief estimation (Bredihin, 2016).

*Hypsometry* determines the observability and attractiveness of the territory, variety of landscape elevations. The cognitive and psycho-emotional effects are closely connected with observability.

*Vertical roughness of relief* defines variety of scenery, panorama, and aesthetic satisfaction from the relief, an extent of pass ability and accessibility of the territory. In winter period it influences the frequency, speed and range of avalanching,

*Horizontal roughness of relief* determines variety and passes ability of the territory, possibility of vacationers and stuff transportation, creation of infrastructures connected with recreation. During the winter period it defines the ski-run length, pass ability of the territory. On the strongly rugged landscapes small and abrupt slopes prevail.

*Slope angles* define the prime cost of the recreational engineering constructions, pass ability of the territory; amount of solar energy and luminance depend upon the ratio of slope, which should be taken into account while recreational activities organization. During the winter period it determines the possibility of ski-run planning.

*Exposure* defines amount of solar energy and luminance – on the slopes of south exposure this indicators are higher, on the slopes of north exposure - lower. The completeness of exposure spectrum allows choosing places for recreational activities for people of various ages. On the slopes of south exposure snow is loose, melts quickly, skiing season is shorter and on the slopes of north exposure - vice-versa, other exposures take intermediate position (Garms, 2014).

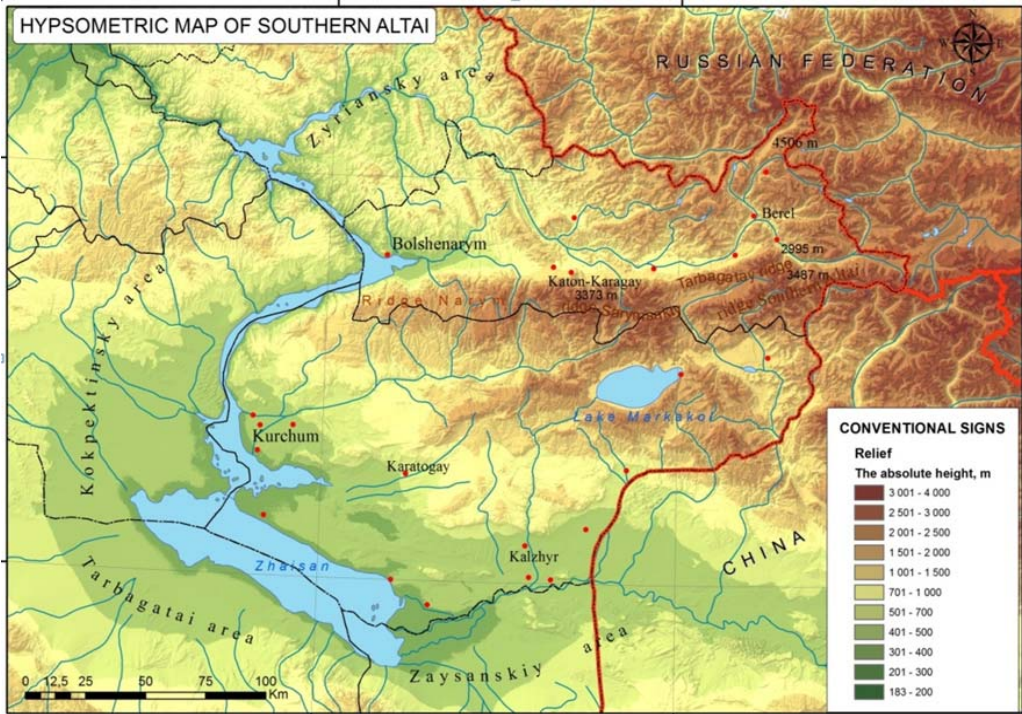
## **AIMS AND BACKGROUND**

Between basic methods are analysis of the natural expeditions researches (July-August 2016), generalization of library materials, excursion method and geoinformational methods of research with ArcGIS software implicated using with mapping (Ilieş et al., 2015; Herman et al., 2016). For impartial assessment the work was executed in the ArcGIS 10.1 (ESRI Inc.) software package, the use of which allows making needed manipulations with the available digital cartography materials and satellite images aimed at geo-informational system (GIS) and deep tridimensional analysis on the GIS basis. As basic GIS data the vector layers of digital chart of the world (DCW) on the scale of 1:1 000000 (hydrographic network, borders) as well as digital relief model with 500 m step of the SRTM project (Shuttle Radar Topography Mission) are used.

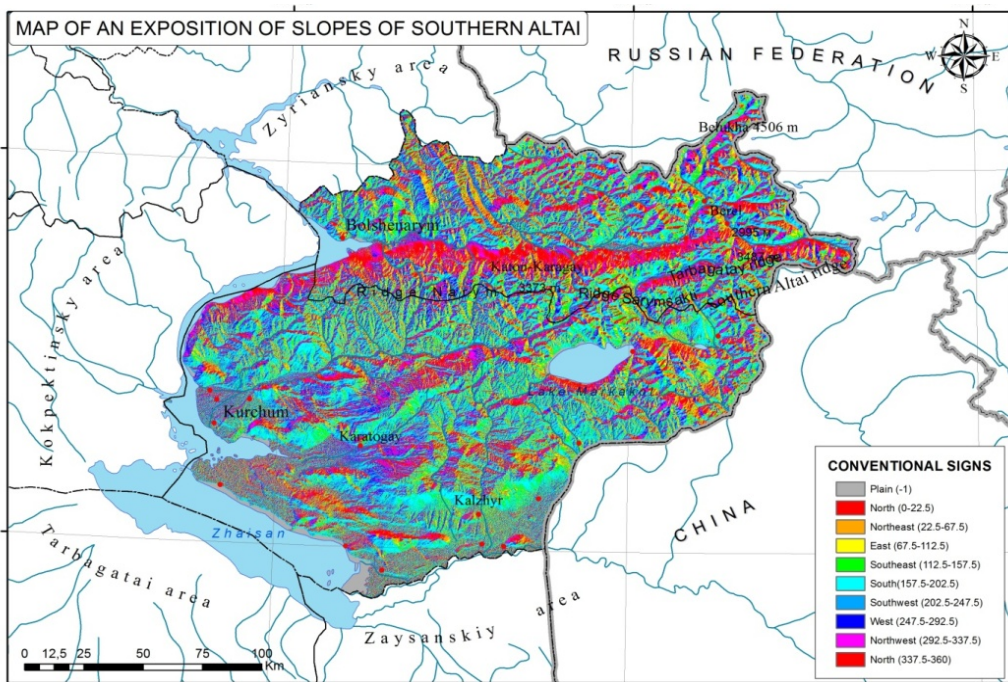
Digitizing of natural recreational areas borders was done in the ArcGIS and the geo data base of the researched territory was created (Yegorina & Loginovskaya, 2016). On the basis of digital relief model the range of digital thematic maps of the most significant morphometric features was created (Figure 1, 2).

## **EXPERIMENTAL**

With help of ArcGIS raster slope exposure reclassification operation the statistics of the prevailing exposures for each natural recreational area (table 1) was calculated.



**Figure 1.** Hypsometric map of Southern Altai



**Figure 2.** Slop exposure map of Southern Altai

**Table 1.** Share of slope exposures (%) by the natural recreational areas of the Southern Altai

Area	Levelled	N	N-E	E	S-E	S	S-W	W	N-W
Katon-Karagay		20,5	9	6,2	10,2	19,3	14	8,4	12,3
Markakol	4	11,5	8,7	7,3	13,7	27	12,2	7,1	8,6
Kurchum		13,5	4,6	5,3	10,3	25,5	17,2	9,7	14
Terektinsky		17	13,5	9,1	11,6	16	12	9,1	11,6

Southern Altai is located between the Bukhtorma river on the north, Zaysanlake and Cherny Irtysh on the south. The Irtysh valley separates it from the Kalbinsky ridge on the west side. On the east it borders on the Ukokplateau. To the west and south-west from these place two chains of mountain ridges are located. They are separated by the Kurchum and Karakoba rivers. The west border of the Southern Altai goes through the mountain chain Holzun. Its relief is hilly. The upper part consists of wide hilly heights. More higher the bold mountain tops are observed. The south slopes are sheer and strongly rugged (Saparov & Zhensikbayeva, 2016).

The relief features, bio-climate conditions, natural landscape attractiveness, development level of this complex analysis allowed us pointing out 3 groups of touristic recreational areas. To the first group belong mountain ridges Tarbagatay (2739 m), Sarymsakty (3373 m), Naryn (2400 m) which are included into northern mountain part and are marked by the population density and transport accessibility, rich in natural and anthropo-genous resources.

The level of the development and transport accessibility allow developing many tourism and recreation types in Katon-Karagay region. There is Berkutaul Mountain, which means eagle dwelling in Kazakh language; it is second popular mountain in Southern Altai among the alpinists and tourists after the Belukha Mountain. Berkutaul Mountain is located in the southern-western Altai province of the Bukhtorma-Naryn area, in the Sarymsakty ridge, 18 kilometers to the south-west from the Katon-Karagay village of the Katon-Karagay administrative area of the East Kazakhstan region. It's clear faceted pyramided top, obviously standing out against surrounding mountains, rises to the 3373 m height, representing the highest top of the Southern Altai. There is hut-shelter built by alpinists at the foot of Berkut-Aul Mountain Every 9. May the alpine is held here, in which till 100 alpinists are taking part. The autumn climbing is also traditional. Berkutaul Mountain is quite convenient with its relative accessibility. Only 16 km day-time crossing separates you from the nearest Topkain village located near the regional highway (Yegorina, 2002).

The ridges Southern Altai (3483 m), Sarytau (3300 m), Kurchum (2644 m) building the southern part belong to the second group. The density of big glaciers and tops of different complexity degree, contrast of mountain landscape allow developing alpinism and mountain tourism here. An analysis of the gathered material during the research showed that for mountain tourism development in this region it is necessary to use hypsometric and glaciological resources of the Kurchum, Kalzhyr, Kara Ertys and other rivers' basins rationally. The third group includes territories, characterized by the strong combination of touristic recreational potential and transportation accessibility (Yegorina et al., 2016). Here, between the Azutau and Sarytau ridges, on the height of 1449 m, the Markakol basin is located (Figure 3).

The high part of this territory on the east, gradually going down to the west turns into hilly area. There are the tiny, shallowbottoms, and boggy lakes observed between the mountains tops. The soft landscape, various reliefs, softwood forests attract local

tourists (Shaw, 2004). The higher mountains, the more popular they are for tourists. It is believed, that the most attractive relief for tourism is relief with an absolute height more than 1500 m, slope angles 30-35°, depth of vertical roughness not more than 800 m, and horizontal roughness not less than 0.8 km. Alpine relief corresponds this requirement in the research region mainly (Yegorina, 2015).

Despite of the internal processes the big role in the varieties of alpine relief shaping played mountain glaciations. In the highland, on the height of more than 3000 m the ridges centerline is peaked. Kars, horn peaks, pikes make top shapes quite fanciful. The river valleys are represented by troughs. Between the terminal moraines of glaciers in valleys the vast intermorainial cavities or outwash plains are located. The ridges tops are adorned with snow fields and glaciers, there is vast accumulation of slopes (Zhakupov et al., 2015).



**Figure 3.** Devisualization in ArcScene 10 program of the Markakol lake area of the Southern Altai region

In the middle altitude reliefs shaping the big role play water-erosion processes. Mountains are split with deep erosion river valleys. The vertical roughness of the relief is from 300 to 800 m. The horizontal roughness is from 1.2 to 0.8 km. The angles change from 12° to 40°. The tops of the mountain ridges are mainly flat. There represent ancient plantain surface. The middle altituderelief is estimated by 78 geomorphologic criteria and is considered to be favorable for touristic activities. On the south-east of the across boundary area in the Markakol national park and Katon-Karagay national park the depth of the relief roughness is from 300 to 600 m.

On the near 2000 m altitude an ancient peneplain is abundant – the hilly high-altitude plain which is rich in moraine deposit. The high-mountain relief differs by contrast, aesthetic appearance, attractive view, but does not suit for mass tourism. Due to the severe bioclimate (Ungureanu et al., 2015), low atmosphere pressure and

inaccessibility the touristic activities in the high-altitude relief areas of trans-border Altai territory is possible for prepared and healthy people only (Geta et al., 2015).

Thus, natural recreational areas of Southern Altai have favorable relief for tourism development. The Kurchum and Katon-Karagay regions have propitious relief roughness for alpinism development. The Belukha Mountain (4506 m) itself is paramount object for alpinism. Climbing this mountain is very popular. Other favorable objects are ridges Sarymsakty (Berkutaul mountain – 3373 m), Southern Altai, Kurchum, the Tarbagatay ridge, Saur-Tarbagatay mountain system (Swarbrooke et al., 2003).

### CONCLUSIONS

Summarizing the above, the significance of relief shapes for touristic recreational development on the Southern Altai territory may be expressed by the following statements:

- Natural recreational areas possess favorable relief for tourism development;
- The relief features influence significantly the attractiveness of the touristic territory;
- There is propitious relief on the main part of the researched region for various touristic activities development, including extreme and sports types and kinds;
- Relief and composing geological materials become often natural sightseeing, making the region attractive for recreation;
- The low-mountain relief has important health-related function while recreation use of the territory, particularly while terrenkur planning;
- Geomorphologic features make appearance and view of the territory and cause the choice of the place for touristic infrastructure construction;
- Relief is the top priority factor, limiting or determining one or another touristic branch in the territory use.

The following recommendations for mountain tourism in Southern Altai are worked out:

- To create basic network of main touristic objects, which undermines the network of stationary tourist bases, inns, shelters, camping, motels, touristic and sports centers and other main objects of tourism infrastructure;
- To develop the most favorable alpinism and climbing objects: Saur Tarbagatay, Kutchum, Southern Altai, Berkutaul ridges;
- There is the highest Altai top Belukha (Muztau) – the symbol of Altai – on the Kazakhstan – Russia border. This mountain is believed to be sacred in various cultures. Buddhists, for instance, believe that the legendary Shambhala is here. Moreover, this is one of the most visited mountain tops by alpinists. In this regard, the creation of alpinism camp in Belukha area is recommended;
- To create ski park on the Berkutaul mountain, which is the second popular mountain of Southern Altai among alpinists and tourists after Belukha, to work out the ski park scheme;
- It is necessary to build strategy of steady Southern Altai tourism development, aimed at the legal, organizational and economical environment creation for mountain tourism and recreation development and rolling out into the international tourist service market;
- To shore up and develop extreme ski bases in Katon-Karagay state national natural Park.

There can be other tourism types in the researched transboundary mountain region developed, such as alpinism or skiing, there are conditions for climbing, hang gliding and many other types of recreational activities connected with relief (Godde, 2000).

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