Short Reports

MODERN CONDITION OF LANDSCAPES IN VICINITIES OF THE RIVER SARMA AT COAST OF LAKE OF BAIKAL

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Natural and primarily bioclimatic conditions in the area of Middle Baikal in Preolkhonye are contrasting. In Preolkhon plateau the ancient "pre-baikal" geomorphological landscape with synchronous intermittent cover of wind-blown rocks that formed under subtropical conditions of the Late Cretaceous and Early Paleogene era are preserved. Ancient relief of the plateau is poorly preserved in modified form because of the dry climate and a more or less stable position of Preolkhon tectonic block, sandwiched between raised and lowered shoulder of Baikal Rift – Pribaikalsky range and Baikal depression. Here the crystalline schist, gneiss, marble and other metamorphic rocks are common [1]. Quaternary clastic weathering crust and their derivatives are widely represented. The remains of ancient clay and red-mottled weathering crusts are locally found. The weathering crust is covered by subaerial sediments from Neogene and Quaternary.

The shore of Lake Baikal near the Sarma river is included in the taiga and steppe zone, where light coniferous larch and pine forests coexist with steppe areas. On rock outcrops and rocky sections of the coast cryoxeropetrophytic fescue thyme steppe groups are common, in intermane depressions – complexes of Artemisia absinthium, Festuca valesiaca, Calamagrostis sylvatica, Stipa and Siberian wheatgrass, all merit special protection. There are endemic and relict plants here: Primula officinalis, Trifoliate oxytrope – relict species, whose age is about 15 million years, and other. As well as other rare medicinal plants under protection, for example: Caragana jubata (Pallas) Poiret; Rhodiola rosea L.

The characteristic elements of foothill trails vegetation of Malomorskoye coast are sparse steppe herbal larch. Lowlands are occupied by pine and larch- pine rhododendron and duschekia, cranberry and forb forests and secondary birch and pine and birch forests.

Endemic shrubs e.g. Cotoneaster brilliant Popov and Crataegus maximowiczii grow in the middle of the slopes of the Primorskiy range. Dark coniferous taiga (pine forests involving con fir, spruce and larch) is presented in fragments – in shaded ravines of the Primorskiy range. Under their canopy relics of the Tertiary deciduous forests are preserved, which were distributed in the region 15–20 million years ago: Anemone altaica and Anemone jenisseensis, Vibúrnum ópulus, Menispérmum daúricum and others.

In the fragmentary expressed subalpine zone of subgoletz elfin wood formation and mountain tundra of the Primorskiy range gravelly mountain tundra in conjunction with wastelands and sparse elfin cedar thickets are dominated.

In Preolkhonye soils of dry foothill steppes are widespread [2]. Formation of dry steppe landscape with chestnut soils is caused by the arid mountain zonation (position in the rain shadow). Associated soils are black soil and sod steppe soil. Lack of atmospheric humidity is compounded here by water conductivity of loamy and crushed stony soils. Consequence of extreme soil and climatic conditions is low biological productivity.

In summer of 2013 the authors conducted a landscape-geochemical work on the coast of Lake Baikal near the Sarma river, the Laninsky brook and other watercourses formed in the foothills of the Primorskiy Range near Sarminskiy goletz. Soils and surface waters of different origins have been sampled. Chemical analyzes of water and soil were conducted by conventional methods in a licensed chemical- analytical center of the Sochava Institute of Geography. Analyzes on the content of macro- and microelements were conducted by quantitative spectrometric methods with devices DFS-8 and atomic emission Optima 2000DV. The watercourses under consideration are popular recreation and tourism facilities, within their watersheds the tourist routes (Laninskaya and Sarminskaya trails) are scheduled. The river flow is formed in the foothills of the western slope of the Primorskiy Range. Annual rainfall in the steppe regions does not exceed 200–300 mm, increasing in the mountain taiga belt to 350–450 mm. Most of the heavy rain that falls occurs during the months of July and August. It is revealed, that the waters here are poor mineralized, the amount of ions in the water of the most sampled rivers varies from 40 to 128 dm^3. The sum of ions in the water from the flood ice and the bog of the Laninskiy brook is 54 and 33 dm^3, respectively. Mineralization of water increases in the area from the source to the mouth (40 to 71 dm^3). By the time the mineralization in the sector line of the Laninskiy brook varies as follows: 71 mg/12 dm^3 on June, 12, 128 mg/dm^3 on June, 26 and 112 mg/dm^3 on July, 14. In the anions we observed pronounced predominance of HCO_3 – 30–45 % eq. to (18–83 dm^3). In the cations – the predominance of Ca^{2+} – 24–34 % eq. to (4,5–8,7 dm3). Mg^{2+} content is in all samples below Ca^{2+} and makes 10–20 % eq.to (3,8–4,8 dm^3). The chloride content in the rivers of the study area varies from 5,1 to 16,5 % eq. to (5,3–5,6 dm^3). Number of SO_4^{2-} in waterways varies from 0,1–0,6 % eq.to (0,1–0,3 dm^3). The concentration of Na^+ ions in streams is 2,5–5,6 % eq. to (1,2–3,6 dm^3), and K^+ – 0,4–2,1 % eq. to (0,4–2,3 mg/dm^3).

According to the ionic composition the river waters of the area under consideration are related

to the waters of calcium bicarbonate class group of type III. An exception is the sample from the Laninskiy brook from June 26, this water belongs to the first class. We noted an increased content of Fe and Al in the waters of bogs and at the source of the Laninskiy brook exceeding MPC (for drinking water) at 5 and 10 times, respectively, due to the hydrous and kaolinite, which are dominated among clay minerals of the parent rocks.

According to the results of chemical analysis of soils sampled from the profile of Sarminskiy goletz on the Primorskiy range to Lake Baikal it is revealed that the content of Mn (0,6%), Ni (128 mg/kg), Co (59 mg/kg), and Cr (137 mg/kg) in soils near the tourist centers on the shore of Lake Baikal exceeds the maximum permissible limits in 4,2, 1,2, 1,4 – fold, respectively, due to the bedrock. Elevated concentrations of Pb (61 mg/kg) are found in podzolic soils near Sarminskiy goletz on the Laninskaya tourist trail that exceed the MPC twofold, which is associated with the parent rocks (Table).

Recently, the antropogenous pressure on landscapes of Preolkhonye increases significantly. There are many tourist facilities on the shore of Lake Baikal. Unregulated tourism is also developed. In order to prevent deterioration of the environment in the Olkhon there is a need in the complex analysis of the environment and regular monitoring of water and soil.

Macro- and microelements in soils of the Preolkhonye

Number	Vegetation	Soil	Floors	Fe	Ca	Mg	Ti	Mn	Ba	Sr	Cu	Ni	Co	Cr	V	Pb
				%					mg/kg							
1	Pinus pumila and Bétula nána	Podzols	AY	4,1	0,6	0,6	6,1	0,10	575	214	54	55	9	82	75	61
			E	3,6	0,2	0,4	7,5	0,07	330	168	12	33	4	63	63	14
			Bfe	6,2	0,2	0,5	9,9	0,07	458	198	21	55	6	83	100	14
2	Larch forest with Bétula nána Lédum palústre , ledun and Anophyte	Peety humic glay	Th	4,7	0,3	1,0	3,9	0,11	1159	147	105	62	19	61	61	13
			Bg	7,1	0,5	0,2	5,5	0,16	1349	164	126	64	22	103	115	11
3	Spruce forest with green moos	Peety humic	T	3,9	6,1	0,1	3,6	0,17	829	233	41	78	29	116	41	32
4	Steppes with Artemisia absinthium, Festuca valesiaca, Calamagrostis sylvatica,	Chestnut	AY	1,9	1,6	0,8	3,3	0,11	331	174	13	20	5	55	37	23
5	Volga fescue and Thymus	Chernozem shallow	AU	2,6	1,6	0,9	6,1	0,11	338	180	16	31	7	64	46	25
			BCA	5,1	4,1	1,8	5,8	0,60	478	349	62	128	59	111	78	19
6	Steppes with Stipa and Siberian wheatgrass	Chestnut	AU	5,1	8,6	2,2	5,5	0,31	485	275	79	107	25	137	97	23

Notes: Place № 1 – Laninskaya tousist trail in subgoletz zone; 2 – Laninskaya trail on mountain taiga; 3 – tourist trail in submountains, near the Laninskiy brook; 4 – tourist centers on the shore of Lake Baikal; 5 – summer sport camp on the shore of Lake Baikal; 6 – tourist trail in Sarmonskoye hollow.

References

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