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Chemical composition and quality of some river of Mongol Altai

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ABSTRACT: Main ions and quality of Hovd River and, its subrivers were studied.

Keywords: Hovd River, main ions, mineralization

INTRODUCTION

The surface water of Mongolia is classified into three groups according to its watershed; Arctic Ocean, Pacific Ocean and Continental watershed. The continental watershed involves 68 % of the surface area of Mongolia and 40 % of water capacity. The system of Khovd River is in Khyargas Lake Basin. The system of Khovd River involves 99 % of surface area of Bayan-Ulgii province, 21.0 % of surface area of Khovd province and 21.0 % of surface area of Uvs province. Khovd river is the seventh longest and the fifth largest river in Mongolia. Its source is the top glacials of Altai Tavan Bogd Mountains and it flows to Khar-Us Lake. Several other rivers, Tsagaan, Ikh, Uigar, Sogoo, Sagsai, Khatuu, Khavchig, Shijigt, Uliastai, Shurag, Shiver, whose sources are in the glacials of Altai Tavan Bogd mountains flow to Khovd river.

G.N. Potanin /1883/, B.A. Smernov /1932/, N.D.Bespalov /1951/, Sh.Luwsandorj /1959, 1968/, D.Dawaasuren /1961/, N.Tsend, Sh.Sodnombaljer /1964/, J.Tserensodnom /1971, 1975/, B. Tsendee /1980/, B. Ariyadagva /1985/ did hydrochemical studies from the points of the sample from Hovd river. According to the classification of O.A.Alekin from that research result Khovd river and its subrivers and lakes waters belong to the group of hydrocarbonate with low mineralization and low hardness water. Beside that do some research and summerize some materials, determine the composition water from Mongol Altai mointain, water gualified estimation, defermine pollution source, collect some etalon materials.

EXPERIMENTAL

Hydrochemical studies of the water samples were done using methods of O.A.Alekin (1973), U.U.Lurie (1971-1947) V.Leite (1975), L.P.Sokolova (1989), L.A.Reznikov (1970), D.Darimaa (1985), A.Munguntsetseg (2003). We have taken samples from the points of Khovd river and its subrivers, and determined the location of groundwater by JPS until October, 2010. We did chemical composition analysis complex in Barnayl Laboratory of water institution in Russia



Figure 1. The points of the sample

RESULTS AND DISCUSSION

The results of a chemical experiments are shown in Table 1.

Hovd River: the average sum of its water ions are 207, 55 mg /dm³. For anions there were hydrocarbonate ions of (85.4-91.5) mg/dm³, sulphate ions of 31.00 mg/dm³, chloride ions of 4.3 mg/dm³.

For cations there were 15.03 mg/dm³ of calcium ions, 15.03 mg/dm³ of natrium and calium ions and 8.51 mg/dm³ of magnesium ions. The relation of cations and anions was HCO₃⁻ > SO₄²⁻ > Cl⁻; Na⁺+K⁺ > Ca²⁺> Mg²⁺. The average hardness is 1.45 mg-eq /dm³.

The average sum of its water ions 52,9 mg/dm³. For anions there were hydrocarbonate ions 37.80 mg/dm³, sulphate ions 0.80 mg/dm³, chloride ions 1.4 mg/dm³. For cations there were 10.00 mg/dm³ calcium ions, 1.5 mg/dm³ natrium and calium ions and 1.4 mg/dm³ magni ions. The relation of cations and anions - was HCO₃⁻ > Cl⁻ >SO₄²⁻; Ca²⁺ >Na⁺+K⁺ > Mg²⁺. The average hardness is 1.45 mg-eq /dm³. According to the classification of O.A.Alekin, this river belongs to the group of hydrocarbonate, class of calcium type and with low mineralization.

Table 1. Chemical composition of Hovd river and water its river bed

№	The point of the sample		Main ions (mg/dm ³)						Σ _u mg/dm ³	Index of Alekin
			Na ⁺ +K ⁺	Ca ²⁺	Mg ²⁺	HCO ₃ ⁻	SO ₄ ²⁻	Cl ⁻		
1	Potanin ise river	2010.09.25.	1.50	10.0	1.40	37.8	0.8	1.4	52.9	C ₁ ^{Ca}
2	Ih uigar river	2010.09.26.	11.96	26.6	2.04	115.9	1.0	3.57	149.11	C ₁ ^{Ca}
3	Tsagaan river	2010.09.27.	19.87	30.0	6.24	144.4	3.1	19.6	223.21	C ₁ ^{Ca}
4	Ih turgen waterfall	2010.09.27.	5.75	22.0	1.8	68.8	1.30	12.1	106.0	C ₁ ^{Ca}
5	Ih turgen river	2010.09.27.	7.13	33.5	1.56	100.0	1.50	15.4	151.98	C ₁ ^{Ca}
6	Tsengel sum (Hovd river)	2010.09.28.	2.00	7.0	1.30	28.1	0.80	2.1	41.3	C ₁ ^{Ca}
7	Sogoo river (ulaan hus sum)	2010.09.29.	14.03	30.0	4.80	127.5	2.0	13.6	191.94	C ₁ ^{Ca}
8	Hovd river (Bayn-olgi aimag)	2010.09.29.	16.33	33.5	4.56	132.5	4.50	17.7	209.09	C ₁ ^{Ca}
9	Shurag river	2010.09.30	20.54	40.0	11.2	169.5	23.0	19.9	284.14	C ₁ ^{Ca}
10	Hurgan lake	2010.09.27.	23.92	23.8	2.5	115.9	2.01	17.7	185.83	C ₁ ^{Ca}
11	Sirgaliin hooloi	2010.09.27.	16.79	26.2	3.96	110.6	2.10	18.4	178.04	C ₁ ^{Ca}
12	Hoton lake	2010.09.28.	17.15	19.6	4.44	106.9	2.30	10.5	160.89	C ₁ ^{Ca}
13	Tolbo lake	2010.09.30.	136.8	60.5	24.9	512.4	40.3	64.1	839.01	C ₁ ^{Na}
14	Har -Us lake	2010.09.28	233.9	186.3	26.7	823.5	177.5	152.0	1600.1	C ₁ ^{Ca}
15	Hurgan lake	2010.09.27.	23.92	23.8	2.5	115.9	2.01	17.7	185.83	C ₁ ^{Ca}

Potanin Ise River. There are many ise rivers in Mongol Altai. They located in 3100-3200 m high. There are 250 ise rivers and cover area is 514 km². The largest river is Potanin ise River of Bogd Mountain. Its length is 25 km and cover area is 47.2 km². The water temperature was -0.14 c0 and measured by automatic thermometers. The joint research team headed by T. Kadota who worked as a research worker in Center for Astronomy of Japan and G.Davaa, as a director, department of Hydrology, Meteorology and Environmental studies installed and marked the poles on the Potanin Glacier to asses the glasier ise accumulation, glacier melt, the amount of precipitation, the temperature and changes to the levels of glacial lake.

Tsagaan River (White). It begins from Potanin icy river of Tavan Bogd mountains and flows into the Hovd River. The average sum of its water ions is 223.21 mg/dm³. For anions there were hydrocarbonate ions of 144.4 mg/dm³, sulphate ions is 3.10 mg/dm³, chloride ions of 19.60mg/dm³.

For cations there were 24.51 mg/dm³ of calcium ions, 22.0 mg/dm³ natrium and calium ions and 19.87mg/dm³ of magnesium ions. The relation of cations and anions - was HCO₃⁻ > Cl⁻ >SO₄²⁻; Ca²⁺ >Na⁺+K⁺ > Mg²⁺. The average hardness is 2.702 mg- eq /dm³.

Ih turgen waterfall: The average sum of its water ions 106.06 mg/dm³. For anions there were hydrocarbonate ions of 68.8 mg/dm³, sulphate ions is 1.3 mg/dm³, chloride ions of



Picture 2. Potanin Ice River

12.10 mg/dm³. For cations there were 22.0 mg/dm³ of calcium ions, 5.75 mg/dm³ sodium and calcium ions and 1.8 mg/dm³ of magnesium ions. The relation of cations and anions - was HCO₃⁻ > Cl⁻ > SO₄²⁻; Ca²⁺ > Na⁺+K⁺ > Mg²⁺. The average hardness is 1.26 mg- eq /dm³.

Sogoo River. The average sum of its water ions 191.94 mg/dm³. For anions there were hydrocarbonate ions of 127.5 mg/dm³, sulphate ions is 2.4 mg/dm³, chloride ions of 13.60 mg/dm³. For cations there were 30.0 mg/dm³ of calcium ions, 14.03 mg/dm³ sodium and calcium ions and 4.8 mg/dm³ of magnesium ions. The relation of cations and anions - was HCO₃⁻ > Cl⁻ > SO₄²⁻; Ca²⁺ > Na⁺+K⁺ > Mg²⁺. The average hardness is 1.9 mg- eq /dm³.

Tolbo Lake. The average sum of its water ions 839.01 mg/dm³. For anions there were hydrocarbonate ions of 512.4 mg/dm³, sulphate ions is 40.3 mg/dm³, chloride ions of 64.10 mg/dm³. For cations there were 30.0 mg/dm³ of

calcium ions, 60.5 mg/dm³ sodium and calcium ions and 24.9 mg/dm³ of magnesium ions. The relation of cations and anions - was HCO₃⁻ > Cl⁻ > SO₄²⁻; Na⁺+K⁺ > Ca²⁺ > Mg²⁺. The average hardness is 5.1 mg- eq /dm³. According to the classification of O.A.Alekin Tolbo lake belong to the group of hydrocarbonate with high mineralization, class of sodium and hardness water.

Hoton lake. The average sum of its water ions 141.54 mg/dm³. For anions there were hydrocarbonate ions of 106.90 mg/dm³, sulphate ions is 2.3 mg/dm³, chloride ions of 10.50 mg/dm³. For cations there were 19.60 mg/dm³ of calcium ions, 17.15 mg/dm³ sodium and calcium ions and 4.44 mg/dm³ of magnesium ions. The relation of cations and anions -was HCO₃⁻ > Cl⁻ > SO₄²⁻; Na⁺+K⁺ > Ca²⁺ > Mg²⁺. The average hardness is 1.35 mg- eq /dm³.

Hurgan Lake. The average sum of its water ions 185.83 mg/dm³. For anions there were hydrocarbonate ions of 115.9 mg/dm³, sulphate ions is 20.1 mg/dm³, chloride ions of 17.70 mg/dm³. For cations there were 23.80 mg/dm³ of calcium ions, 23.92 mg/dm³ sodium and calcium ions and 2.50 mg/dm³ of magnesium ions. The relation of cations and anions - was HCO₃⁻ > Cl⁻ > SO₄²⁻; Na⁺+K⁺ > Ca²⁺ > Mg²⁺. The average hardness is 1.4 mg- eq /dm³. According to the classification of O.A.Alekin Hoton and Hurgan lake belongs to the group of hydrocarbonate with low mineralization, class of calcium type of 1 water.

Sirgaaliin hooloi. The average sum of its water ions 178.04 mg/dm³. For anions there were hydrocarbonate ions of 110.6 mg/dm³, sulphate ions is 2.1 mg/dm³, chloride ions of 18.40 mg/dm³. For cations there were 26.20 mg/dm³ of calcium ions, 16.79 mg/dm³ sodium and calcium ions and 3.96 mg/dm³ of magnesium ions. The relation of cations and anions- was HCO₃⁻ > Cl⁻ > SO₄²⁻; Na⁺+K⁺ > Ca²⁺ > Mg²⁺. The average hardness is 1.6 mg- eq/dm³. According to the classification of O.A.Alekin Sirgaaliin hooloi belongs to the group of hydrocarbonate with low mineralization, class of calcium type of 1 water. The mineral content of Buraat River is the highest with 346.31 mg/dm³, and Altai Tavan Bogd is the lowest 94.84 mg/dm³ where the

other rivers are varying between 141.64 and 282.68 mg/dm³. There is shown the ascilation of elements : Cu- 0,0036-1,01 mg/dm³ , Ni- 0.002 mg/dm³, Mn-0.0035-1.012 mg/dm³, Al- 0.020-1.270 mg/dm³, Fe – 0.040 -0.300

mg/dm³, Zn-0.001-1.014 mg/dm³, Pb-0.030-0.094 mg/dm³, and Ni 0.0002 mg/dm³. The contents of all microelements were in the range of allowed amounts for trinking water.

Table 2. Water elements of Hovd river and its river bed.

№	The point of sample	Elements mg/dm ³									
		Mn	Zn	Co	Al	Mo	Fe	Pb	Hg	Ni	Cu
1	Hovd river (Bayn-olgi aimag)	0.0035	0.032	0.0003	0.100	-	-	0.036	-	-	0.003
2	Potantin ice river	0.010	0.001	0.0002	-	-	0.150	0.054	0.002	0.002	0.014
3	Tsagaan river	0.170	0.001	-	0.590	0.030	0.200	0.056	-	-	0.018
4	Ih uigariin gol	1.012	1.014	-	1.270	-	0.300	0.054	-	-	1.013
5	Tsengel sum (Hovd river)	0.012	0.014	-	0.020	0.030	0.040	0.094	0.002	-	0.013

CONCLUSIONS

1. The water of Khovd River meets the requirements of MNS 0900-2005 for drinking water with its chemical composition and the physical properties. The refore the water of Khovd River best suites as drinking water for domestic and agricultural use.
2. Khovd and other rivers have low organic, medium carbon dioxide and high oxygen contents. Khovd River belongs to the group of hydrocarbonate and calcium type of low alkaline and medium mineralized water.
3. Khovd River is saturated with calcium carbonate in all seasons except summer and the carbon dioxide alkaline property is the highest in winter. But it is still not harmful for the river constructions.

4. Khovd river delivers 419.89 thousand tons of minerals to Khar us lake.
5. Khovd River has ecologically clean water with natural background.

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