

Composition of the surface waters of Lovozerskiy district (Murmansk region)

A. R. Kotelnikov., G. M. Akhmedjanova, A. M. Kovalskii, N. I. Suk
 Institute of Experimental Mineralogy RAS, Chernogolovka
kotelnik@iem.ac.ru, fax: 8 (496) 524 4425, tel.: 8 (496) 524 44-25

Key words: surface water, geochemical investigation, ecology.

Citation: Kotelnikov, A. R., G. M. Akhmedjanova, A. M. Kovalskii, N. I. Suk (2011), Composition of the surface waters of Lovozerskiy district (Murmansk region), *Vestn. Otd. nauk Zemle*, 3, NZ6052, doi:10.2205/2011NZ000182.

During the field seasons 2006–2010 in July and August there were sampled surface water from natural and engineering collectors of Lovozerskiy district of Murmansk region. Analyses of water samples were carried out using methods ICM-AES, ICP-MS, photocolometry and potentiometry. Some elements (Cl, F) and parameters (T, pH) were measured directly during the field trip. The results of particular investigation of parameters of natural and engineering waters in different collectors in various seasons.

Table 1. The compositions of lake waters of Murmansk region (data of 2008 year testing). The containing of elements represented in mg/l

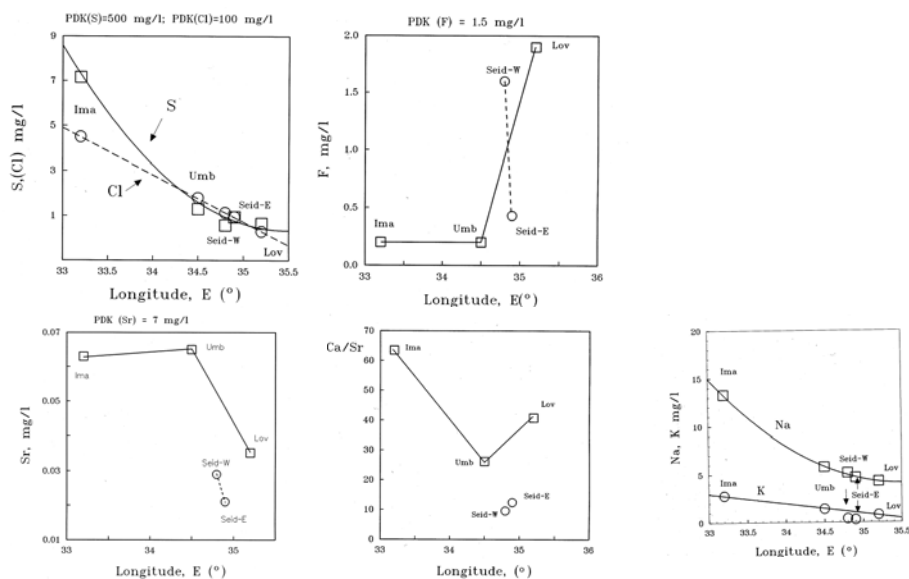
Parameter	Imandra lake, mountain Belaya	Umbozero lake, southern part	Lovozero lake, Yulinskaya salma	Seydozero lake, western part	Seydozero lake, eastern part	Baykal lake, 1000 m depth	Ladojskoe lake	Max. permiss. concent. in water, mg/l
pH	7.34	7.1	6.18	6.28	6.56	-	-	-
S	7.16	1.27	0.66	0.58	0.95	1.6	0.8	500
Cl	4.50	1.80	0.30	1.14	0.96	15.0	7.0	100
F	<0.25	<0.25	1.9(?)	1.60	0.43	-	-	1.5
Na	13.3	5.8	4.3	5.2	4.7	6.1*	8.6*	200
Mg	1.00	0.40	0.53	0.06	0.07	4.2	1.9	50
Al	0.087	0.025	0.01	0.02	0.21	-	-	0.2
P	0.004	0.002	<0.05	<0.05	<0.05	-	-	3.5
K	2.8	1.4	0.8	0.4	0.3	-	-	?
Ca	4.0	1.7	1.43	0.28	0.26	15.2	7.1	?
Fe	0.05	0.008	0.05	0.01	0.05	-	-	0.3
Sr	0.063	0.065	0.035	0.029	0.021	-	-	7
Zn	0.003	0.001	0.005	0.049	0.004	-	-	1
Cu	0.008	0.001	0.0015	0.002	0.001	-	-	?
Ni	0.015	0.001	-	-	-	-	-	0.02
Cr	0.0002	0.0002	0.002	0.001	0.004	-	-	0.05
Cd	0.00015	0.0001	0.00002	0.0002	0.00002	-	-	0.001
Co	0.0001	0.0002	-	-	-	-	-	0.1
Li	-	-	0.0005	0.0004	0.0003	-	-	0.03
Zr	-	-	0.00031	0.0001	0.00007	-	-	?
Nb	-	-	0.000013	0.000008	0.000004	-	-	0.01
Mo	-	-	0.001	0.003	0.002	-	-	0.25
Hg	-	-	<0.00003	<0.00003	<0.00003	-	-	0.0005
Tl	-	-	0.000001	0.000003	0.000001	-	-	0.0001
Pb	-	-	0.00051	0.00032	0.00069	-	-	0.1
Tl	-	-	0.000001	0.000003	0.000001	-	-	0.0001
U	-	-	0.000025	0.000014	0.000017	-	-	0.1
Na/K	4.75	4.14	5.37	13.0	15.7	-	-	-
Ca/Sr	63.5	26.2	40.8	9.65	12.4	-	-	-
(Na+K)/(Ca+Sr)	3.22	3.43	2.60	16.5	15.2	0.314	0.956	-

Mg)								
East longitude	33.16	34.5	35.2	34.8	34.9	-	-	-

Table 2. Results of analysis of water samples collected during a field trip 2010 year. The compositions of lake waters of Murmansk region (data of 2008 year testing). (Results for samples collected in 2009 year are presented within brackets)

	pH	Cl, mg/l	F, mg/l	Al, mg/l	SiO ₂ , mg/l	K, mg/l	Na, mg/l	Ca, mg/l	Mg, mg/l
Vostochniy stream	6.15	4.8	0.02	0.40	5.17	0.01	2.93	1.0	0.01
Stream Raslaka	7.70	6.7	0.06	1.50	10.58	0.61	4.0	1.0	0.013
Sergevan river headstream	7.63	11.6	3.60	2.41	10.57	1.25	26.11	1.0	0.02
Sergevan river inflow	6.75	4.2	2.20	0.94	5.16	1.55	21.12	2.5	0.56
Filter bed of Ilma mine	9.10 (6.89)	14.3 (2.9)	139.0 (6.7)	10.08	70.49	11.8 0	712.5	2.0	0.03
Stream from Vavnbed mountain	6.1	2.1	0.03	1.17	9.35	0.71	4.08	1.6	0.25
Nothern part of Lovozero lake	6.5	1.1	0.33	0.84	0.13	0.98	5.84	2.0	0.58
Nothern part of Umbozero lake	6.53 (6.26)	1.6 (6.0)	0.20 (2.9)	0.44	2.40	2.1	8.0	3.0	0.49
Stream fall flowing into Umbozero from day drift of Umbozerskiy mine	6.75 (6.87)	2.96 (6.7)	3.8 (4.3)	2.24	9.78	2.62	37.5	4.0	2.24
Water from day drift of Umbozerskiy mine	9.61	5.52	36.0	1.56	21.98	3.02	159.1	1.5	0.01

As is seen from results of investigation the composition of water of Lovozerskiy district (Umbozero, Lovozero and Seydozero) practically similar to composition of largest lake of Murmansk region – Imandra lake (Devjatkin, 2008). On the content of chlorine, sulfur, sodium, potassium, aluminium, copper, zink, this natural collectors correlate well with the longitude scheme of pollution (apparently concerned with transportation of elements by aerosol from the Northern basin of Atlantic: the content of this elements decrease from the west to the east (fig. 1).



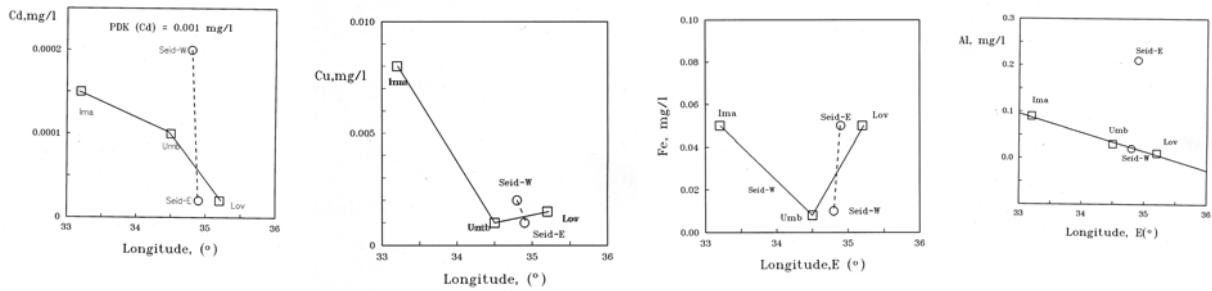


Fig. 1. The alteration of elements content in water of natural collectors of Murmansk region along longitude. The content of elements are presented on figures for the lakes: Ima – Imandra, Umb – Umbozero, Seid – Seidozero, Low – Lovozero

Seidozero lake by its composition of rare-earth elements correlate with rocks of Lovozerskiy alkaline massif. One can see dramatic increasing of fluorine content and decreasing of strontium/calcium ratio in Lovozerskiy district lakes some seasons. The fluorine content can exceed maximum permissible concentration for water in 3 or more times. The observed increasing of fluorine content in water of engineering collectors directly relating with mine working and in water of Seidozero, Umbozero, Lovozero water areas take place suddenly and apparently produce ecosystem changes. Thus ichthyologists relate environmental catastrophes with large fish death with such dramatic increasing of fluorine content in water of Seidozero lake (fig. 2).



Fig. 2. Environmental catastrophe on Seidozero lake (2006 year). Large fish death scientists relate with mycosis of fish which is caused by dramatic increasing of fluorine content in water