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Final Report  
on the Results of Joint Russian-Japanese Works  
on the Research of the Amur River,  
Implemented by the IWEP in 2005-2006

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## 1. Introduction

In August 2005 a joint research expedition of Russian (leader Dr.Kim) and Japanese (leader Dr. Nagao) scientists was organized in the Lower Amur area from Khabarovsk to Nikolaevsk-on-Amur.

Taking into consideration the on-site situation the following sampling stations were selected to carry sampling of water, river bed sediments, and soils:

1. Amur River at Sikachi-Alyan village
2. Amur River mouth
3. Amur wetland at Malmysh village
4. Amur River at Malmysh village
5. Gorin River mouth
6. Amur River at Nizhnetambovskoe village
7. Amur River wetland at Sofiiskoe village
8. Amur River at Bogorodskoe village
9. Amgun River mouth
10. Amur River at Takhta village

All collected samples were delivered to the laboratories of the Institute of Water and Ecology Problems and the Institute of Tectonics and Geophysics FEB RAS for further analyses. Mass-spectrometry methods were used to analyze metal content in water, sediment and suspended matter samples.

Organic carbon was analyzed with organic substance oxidation with  $K_2 Cr_2 O_7 + H_2 SO_4$  at boiling and

Total organic nitrogen was analyzed with organic substance oxidation with  $H_2 SO_4$ .

At three stations on the Amur River (Sikachi-Alyan, Nizhnetambovskoe, Malmysh) and in the Amgun River mouth water discharge was determined with standard method based on water velocity and cross-section area measurements.

Analytical data are presented in the form of tables and sampling stations are shown on the Lower Amur map attached.

## 2. Hydrological Characteristics of the Amur River in 2005

In 2005 the Amur River water levels were comparatively not very high. After winter low water (-180 cm at the Khabarovsk water level measuring station) during spring flood water levels approached 370 cm in the first decade of June. Then summer low water followed. Summer rain flood in August had two peaks, which were not high (235 cm at the Khabarovsk water level measuring station). After that the Amur water level was steadily decreasing and reached its minimum before water freezing (180 cm).

Sampling of water, river bed sediments, soil and water discharge measurements were undertaken in August 2005.

Water discharge measurements were conducted at the village Sikachi-Alyan in the Amur main stream and at the Malmysh village in the sub-stream Kalistratovka. Within the Komsomolsk-Kiselevskoe narrowing water discharge measurements were performed at the Nizhnetambovskoe village. Water discharge was also measured in the Amgun River mouth (Table 1).

**Table 1. Measured Hydrological Characteristics**

#	Date	River, station	Q, cu m/sec	F, cu m	V m/sec
1	17.08.2005	Amur, Sikachi-Alyan	11000	11100	0,99
2	18.08.2005	Amur, Malmysh	12000	12200	0,98
3	19.08.2005	Amur, Nizhnetambovskoe	15500	14600	1,06
4	23.08.2005	Amgun, mouth	496	2240	0,22

Water discharge was measured when the Amur water level was decreasing and was characterized with low values. A certain increase of the river run-off near Nizhnetambovskoe can be explained by the increased water flow from the Rivers Gur and Gorin.

### 3. Analytical Data for Samples of Water, River Bed Sediments, Soil and Suspended Matter Collected in 2005

Table 2. Metal Content in Water (mg/cu dm)

#	Station	Al	Mn	Fe	Co	Ni	Cu	Cd
1	St-I, Right	413,384	4,099	506,562	0,091	1,136	6,460	-
2	St-I, Left	450,076	3,942	499,618	0,071	0,850	-	-
3	St-I, Center	693,503	5,113	690,481	0,123	1,266	10,173	-
4	St-I, Center bottom	593,468	3,867	571,309	0,099	1,225	10,477	-
5	St-A, Center surface	489,317	4,082	545,048	0,074	1,454	2,258	-
6	St-2, Anui	48,626	20,116	176,962	0,060	0,447	2,527	-
7	St-3-1 Lidoga Center surface	701,764	4,933	700,631	0,114	1,070	-	-
8	St-3-2 Lidga Center surface	83,323	115,947	483,213	0,177	0,893	1,601	-
9	St-1-B Center surface	490,585	4,646	559,973	0,074	0,904	-	-
10	St-2 Amur Center surface	490,431	4,695	558,871	0,082	1,014	10,390	-
11	St-4 Right	517,770	4,740	600,176	0,077	1,044	23,176	-
12	St-4 Left	438,640	9,080	530,143	0,069	0,814	2,943	-
13	St-4 Center bottom	418,886	5,342	511,102	0,062	1,041	11,629	-
14	St-4 Center surface	518,573	7,258	606,552	0,076	0,821	4,913	-
15	St-5-1	506,243	5,495	620,739	0,075	0,808	12,942	-
16	St-5-2	22,108	13,694	1709,390	0,021	0,293	12,671	-
17	St-5*	681,800	5,331	733,346	0,109	1,014	7,998	-
18	St-6 Right	516,026	7,173	649,233	0,085	0,872	19,633	-
19	St-6 Left	580,844	6,322	637,161	0,088	0,918	5,484	-
20	St-6 Center surface	576,001	5,355	638,541	0,088	0,900	8,689	-
21	St-6 Center bottom	584,145	5,146	628,452	0,093	1,032	13,002	-
22	St-7-1	533,662	8,725	642,711	0,095	0,906	21,925	-
23	St-7-2	263,259	10,597	1155,630	0,227	1,175	11,522	-
24	St-8 Right	480,111	12,120	568,137	0,126	0,962	22,561	-
25	St-8-Left	97,285	3,433	170,423	0,015	0,701	5,260	-
26	St-8 Center surface	493,845	5,493	565,671	0,080	0,920	11,803	-
27	St-8 Center Surface Nucrepore	-	0,648	-	-	0,881	6,992	-
28	St-9 Nucrepore	-	11,513	114,531	-	-	14,563	-
29	St-9 Nucrepore	0,175	2,994	-	-	0,708	15,982	-
30	St-q	13,203	12,961	309,687	-	-	0,122	-
31	St-L	169,753	226,637	2198,270	0,495	0,516	22,391	-
32	St-G	719,803	5,501	684,257	0,099	1,146	17,120	-

**Table 3. Organic Carbon Content in Water (mg/L)**

#	Station	mg/L
1	ST-1, Amur, Sikachi-Alyan, right	12.5
2	ST-1, Amur, Sikachi-Alyan, left	10.1
3	ST-1, Amur, Sikachi-Alyan, center-surface	9.8
4	ST-1, Amur, Sikachi-Alyan, center- bottom	9.0
5	ST-A, Amur	7.5
6	ST-2, Anui mouth, center-surface	5.3
7	ST-3-1, bay, Lidoga	9.8
8	ST-3-2, Amur, Lidoga	9.8
9	ST-1-B, Amur, Troitskoe	7.0
10	ST-4, Amur, Malmysh, right	8.5
11	ST-4, Amur, Malmysh, center- bottom	7.5
12	ST-4, Amur, Malmysh, left-surface	7.5
13	ST-4, Amur, Malmysh, center-surface	6.8
14	ST-5-1, substream Prokop	9.0
15	ST-5-2, Gorin River	9.5
16	ST-5, Amur, Nizhnie Khalby	8.3
17	ST-6, Amur, Nizhnaya Tambovka, right	9.8
18	ST-6, Amur, Nizhnaya Tambovka, center-surface	10.0
19	ST-6, Amur, Nizhnaya Tambovka, left	7.5
20	ST-6, Amur, Nizhnaya Tambovka, center- bottom	12.0
21	ST-7, Lake Dabana exit	8.5
22	ST-7, Lake Dabana	13.2
23	ST-8, Amur, Nizhnaya Gavan, surface	9.0
24	ST-8, Amur, Nizhnaya Gavan center-surface	9.0
25	ST-q, Amur, Tyr	8.3
26	ST-L, Kapkudan bay	11.3
27	ST-G, Amur, Khavanda	8.0

**Table 4 Trace Metal Content in Soils of the Amur River Flood Plain (mg/kg)**

#	Station	Depth in soil (cm)	Mn55	Co59	Ni60	Cu63	Cd114
1	St-3-2	0-3	704,267	5,559	11,656	17,565	0,059
2	St D	0-5 bank	280,067	4,686	7,106	-	0,050
3	St D	0-5 soil	491,443	5,924	9,234	1,874	0,119
4	St-A Gorin	bank	1492,320	16,522	19,196	17,876	0,235
5	St-B	0-3.5 soil	995,671	14,530	14,727	9,843	0,220
6	St-B	3.5-8.5	511,645	7,403	12,920	6,380	0,189
7	St-H	2-5	475,621	11,507	7,834	15,214	0,128
8	St-H	2-5	2131,470	16,548	13,258	115,030	2,832
9	St-7-1	0-5 bank	575,871	11,365	11,984	2,719	0,089
10	St-7-2	0-5	1304,480	16,256	18,539	16,662	0,217
11	St-7-2	5-10	301,026	11,950	16,908	16,927	0,219
12	St-7-2	10-15	144,443	5,924	8,953	6,566	0,048
13	St-7-2	15-20	159,455	9,890	10,018	6,156	0,056
14	St-K	0-5	460,212	6,390	8,460	2,109	0,063
15	St-L	0-5	1086,210	14,053	11,222	5,953	0,203
16	St-L-2	0-5	652,873	8,583	15,206	24,307	0,249

**Table 5. Organic Carbon Content in Soils of the Amur River Flood Plain (%)**

#	Station	Depth in soil (cm)	Content (%)
1	St. 3-2 Wetland	0-3 cm samples soil surface	3.19
2	St.D	0-5 cm bank	1.10
3	St. 5A Gorin	bank	0.27
4	St. 5B Gorin	0-3.5cm surface soil	5.26
5	St. 5B Gorin	3.3-8.5cm	4.52
6	St.H	2-5cm bank remove 0-2cm	2.68
7	St.H	2-5cm surface soil remove 0-2cm	3.60
8	St. 7-1 Amur	0-5cm bank	0.61
9	St. 7-2 Wetland	0-5cm peaty	4.24
10	St. 7-2 Wetland	5-10cm peaty	2.24
11	St. 7-2 Wetland	10-15 cm peaty	1.60
12	St. 7-2 Wetland	10-15 cm clay	1.00
13	St. K: Amgun	0-5cm surface soil muddy	0.53
14	St.L-1	0-5cm surface soil plant residue	5.57
15	St. L-2	0-5cm surface soil plant residue	18.20

**Table 6. Organic Carbon Content in the Amur River Bed Sediments (%)**

#	Station	Depth in core (cm)	content, %
1	St.2: Anui	0-2cm	2.01
2	St. 3-2 Wetland (center)	0-3 cm muddy	1.68
3	St.B: Stay point	0-5cm 0-1 cm muddy, 1 Sandy	0.79
4	St.4-3 (center)	0-3 cm muddy	2.05
5	St.4 (center)	3-6 cm muddy	1.98
6	St.4 (left)	2-4 cm	0.65
7	St.4	4-6cm	0.33
8	St.E: stay point	0-3 cm sandy	0.18
9	St. 5 Gorin (center)	0-3 cm rock&0-3cm	0.49
10	St. 5 Amur (left)	0-2cm sandy	0.65
11	St.F: stay point	0-3 cm sandy	0.49
12	St.7-1 Amur	0-3 cm sandy	0.67
13	St.7-2 Wetland	0-3 cm muddy	2.55
14	St.7-2 Wetland	3-6cm muddy	1.70
15	St.J: Susanino	0-3 cm muddy	1.89
16	St.K Amgun	0-3 cm muddy	1.02
17	St. K Amgun	3-6cm muddy	0.55
18	St.L Amgun	0-3 cm muddy	1.70
19	St.q (left)	0-2cm	0.98

**Table 7. Trace Metal Content in the Amur River Bed Sediments (mg/kg)**

#	Station	Depth in core (cm)	Mn	Co	Ni	Cu	Cd
1	St-2, Anui	0-2	1223,780	11,804	22,866	22,194	0,135
2	St-3-2, wetland	0-3	1084,100	11,305	18,734	13,195	0,159
3	St-B, stay point	0-5	917,816	7,954	13,113	11,620	0,092
4	St-4-3, center	0-3	1315,714	12,116	20,878	21,289	0,141
5	St-4-3, center	3-6	1242,322	11,047	18,152	15,531	0,139
6	St-4-5, left	0-2	553,578	7,688	11,778	27,872	0,093
7	St-4-5, left	2-4	608,320	8,436	13,478	10,376	0,087
8	St-4-5, left	4-6	268,646	5,468	8,004	12,016	0,051
9	St-E, stay point	0-3	192,698	3,518	4,728	11,550	0,009
10	St-5, Gorin center	0-2	579,791	11,112	13,458	9,133	0,095
11	St-F, stay point	0-3	546,422	8,091	15,052	16,463	0,053
12	St-7-1, Amur	0-3	508,205	6,534	8,879	0,292	0,065
13	St-7-2, wetland	0-3	1189,430	14,018	17,621	17,107	0,163
14	St-7-2, wetland	3-6	934,527	9,968	13,600	5,498	0,142
15	St-J, Susanino	0-3	789,932	8,777	13,895	8,694	0,103
16	St-K, Amgun	0-3	612,663	8,373	12,025	13,239	0,083
17	St-K, Amgun	3-6	107,001	2,200	2,619	-	0,024
18	St-L, Amgun	0-3	936,438	8,794	15,504	14,226	0,129

**Table 8. Total Nitrogen Content in the Amur River Bed Sediments**

#	Station	Depth in core (cm)	Content (%)
1	St-2, Anui	0-2	0.14
2	St-3-2, wetland	0-3	0.15
3	St-B, stay point	0-5	0.05
4	St-4-3, center	0-3	0.16
5	St-4-3, center	3-6	0.14
6	St-4-5, left	0-2	0.03
7	St-4-5, left	2-4	0.02
8	St-4-5, left	4-6	0.008
9	St-E, stay point	0-3	0.03
10	St-5, Gorin center	0-2	0.04
11	St-5, Amur left	0-2	0.03
12	St-F, stay point	0-3	0.03
13	St-7-1, Amur	0-3	0.18
14	St-7-2, wetland	0-3	0.14
15	St-7-2, wetland	3-6	0.11
16	St-J, Susanino	0-3	0.10
17	St-K, Amgun	0-3	0.03
18	St-K, Amgun	3-6	0.09
19	St-L, Amgun	0-3	0.06

**Table 9. Organic Carbon Content in Suspended Matter (mg/L)**

#	Station	Cotent (mg/L)
1	St. 1-1, right- surface	2.07
2	St. 1, left-surface	2.03
3	St. 1-3, center surface	3.36
4	St. 1, center bottom	3.57
5	St. A, center surface (050817)	2.48
6	St. 2 Anui River, center surface (050817)	0.83
7	St. 2 Amur River, center surface (050817)	1.98
8	St. 3-1 Lidoga, surface (050818)	1.36
9	St. 3-2 Lidoga, surface (050818)	2.61
10	St. 1 B, center surface (050819)	1.77
11	St. 4-1, right surface (05 0818)	2.17
12	St. 4-5, left surface (050818)	1.86
13	St. 4-3, center bottom (050818)	2.36
14	St. 4-3, center surface (050818)	1.86
15	St. 5 Gorin, surface	1.49
16	St. 5 Amur River, surface	2.19
17	St. 5', center surface	2.40
18	St. 6, right surface	2.05
19	St. 6, left surface	1.82
20	St. 6, center surface	1.98
21	St. 6, center-bottom	2.87
22	St. 7-1, surface	1.67
23	St. 7-2, surface	1.51
24	St. 8-3, center surface max	1.78
25	St.L, surface	1.82
26	St.G, surface	1.94
27	St.q, center surface	0.50

Table 10. Total Nitrogen Content in Suspended Matter

#	Station	Sample volume (ml)	Weight of sediment on the filter (g)	Content (%)
1	St. 1-1, right-	300	0,0255	0,49
2	St. 1, left	200	0,0283	0,34
3	St. 1, center surface	150	0,0247	0,56
4	St. 1, center bottom	150	0,0271	1,18
5	St. A, center surface	200	0,0271	0,51
6	St. 2 Anui River,	400	0,0092	0,75
7	St. 3-1 Lidoga, surface.	200	0,0195	0,42
8	St. 3-2 Lidoga, surface	200	0,0128	1,53
9	St. 1 B, center surface (050819)	200	0,0206	0,61
10	St. 2 Amur River, center surface	200	0,0202	0,62
11	St. 4, right	200	0,0198	0,35
12	St. 4, left	300	0,0183	0,61
13	St. 4 center bottom	200	0,0208	0,38
14	St. 4, center surface	200	0,0213	0,37
15	St. 5-1 Amur River, surface	300	0,0264	0,37
16	St. 5-2 Gorin, surface	300	0,0071	1,17
17	St. 5', center surface	200	0,0204	1,23
18	St. 6, right	200	0,0207	1,08
19	St. 6, left	200	0,0219	0,70
20	St. 6, center surface	200	0,0222	0,62
21	St. 6, center-bottom	200	0,0281	0,74
22	St. 7-1, center surface	200	0,0218	0,83
23	St. 7-2, surface	300	0,0128	2,95
24	St. 8-3, center surface	200	0,0205	0,61
25	St.9, center surface	300	0,0096	1,60
26	St.L, center surface	300	0,0090	0,15
	St.G, center surface	200	0,0194	0,64

Table 11. Trace Metal Content in Suspended Matter

Station	Volume (ml)	Al	Mn	Fe	Co	Ni	Cu	Cd
St-1-1, right surface	100	98516.7	1224.2	52914.4	12.12	93.12	246.58	0.72
St-1, left	100	95198.6	1148.8	52383.9	11.74	26.24	93.87	0.37
St-1, center surface	75	106675.5	1083.9	53006.7	12.31	29.55	179.21	0.50
St-1 center, bottom	100	90550.6	867.2	44548.9	9.22	32.46	41.01	0.27
St-A center surface	100	90154.6	1105.2	44963.3	10.92	27.98	169.15	0.78
St-2 center surface	100	69279.9	615.0	40339.4	16.12	31.31	1112.49	1.87
St-3-1 Lidoga center	100	113559.4	1133.1	58682.2	12.86	33.73	209.86	0.32
St-3-2 Lidoga surface	100	75637.2	6679.8	89046.6	14.67	18.98	273.66	1.01
St-1-B center surface	100	83845.7	1067.7	45542.9	9.96	44.19	55.83	0.18
St-2 Amur center surface	100	117350.4	1411.5	67432.4	14.26	44.81	221.62	0.51
St-4-1 left surface	100	87665.8	758.8	43863.4	8.88	42.58	65.69	0.27
St-4-3 center bottom	100	108528.1	1337.6	57442.5	13.04	35.62	182.20	0.56
St-4-3 center surface	100	122859.6	1471.6	56994.1	15.33	51.12	278.39	1.19
St-5 Amur surface	100	94276.6	1222.7	46330.8	16.33	21.16	201.40	0.35
St-5 Gorin surface	200	20971.7	5217.7	190412.1	17.40	218.01	890.62	5.73
St-5* center surface	100	166172.4	1440.3	85340.4	13.95	70.54	128.80	0.50
St-6, right surface	100	169869.9	1770.1	90774.3	15.34	37.34	76.95	0.63
St-6 left surface	100	164125.6	1417.2	92907.5	13.70	38.85	86.88	0.21
St-6 center surface	100	182153.6	1703.2	94663.1	15.69	40.29	117.22	0.54
St-6 center bottom	100	164600.5	1556.4	87078.2	14.34	40.73	98.27	0.73
St-7-1 surface	100	178516.7	1739.8	90486.1	15.43	40.65	139.07	1.10
St-7-2, right surface	100	85159.9	14796.6	145263.1	27.57	93.45	524.42	5.97
St-8-1 left surface	100	162872.6	1556.4	115566.3	14.85	45.60	46.42	0.70
St-8-5 center surface	100	174483.9	1364.4	96689.0	13.61	39.82	61.27	0.67
St-8-3 center surface	100	168728.5	1458.9	103812.6	14.04	40.09	110.42	0.43
St-9 center surface	120	55354.8	14526.7	214127.8	28.48	259.59	702.20	11.95
St-10 center surface	100	180301.0	1082.8	97344.5	14.97	123.87	55.56	2.78
St-L surface	100	61028.4	2360.4	143167.1	10.60	9.60	436.10	1.85
St-G surface	100	191520.2	1752.6	104981.0	17.74	152.71	20.86	1.26

Table 12. Al and Fe Content in Soils

Station	Depth in core (cm)	Al	Fe
St-3-2	0-3	8588,39	52372,40
StD	0-5 bank	7108,01	39132,50
StD	0-5 soil	13166,40	60704,40
St-A Gorin	bank	20884,90	67861,00
St-B	0-3,5 soil	12256,10	50946,20
St-B	3,5-8,5	13250,90	55600,60
St-H	2-5	15905,10	67146,60
St-H	2-5	21799,30	67658,60
St-7-1	0-5 bank	13073,70	53693,40
St-7-2	0-5	27020,00	59124,30
St-7-2	5-10	22632,30	55161,70
St-7-2	10-15	19289,50	51259,10
St-7-2	15-20	13005,00	51896,90
St-K	0-5	9039,74	59388,70
St-L	0-5	18510,90	63427,40
St-L-2	0-5	16975,80	60310,70

Table 13. Al and Fe Content in River Bed Sediments

Station	Depth in core (cm)	Al	Fe
St-2		25955,10	65386,00
St-3-2		22217,30	40373,70
St-B		14465,30	40270,40
St-4-3	0-3	23494,30	60873,10
St-4-3	3-6	19139,20	45043,00
St-4-5	0-2	9208,70	29418,30
St-4-5	2-4	12887,00	42216,00
SM-5	4-6	7621,26	39705,40
St-E		10477,50	43934,50
St-5		5868,39	32562,40
St-E		11185,80	42172,60
St-7-1	0-3	7977,87	38477,60
St-7-2	0-3	21666,20	58142,40
St-7-2	3-6	27153,90	59817,60
St-I		17206,70	60612,70
St-K	0-3	18412,30	64792,00
St-K	3-6	2420,68	34427,00
St-L		12977,30	43890,80

