

Progress Report IV

Contractor

Name of Institute providing the report: **State Oceanographic Institute Russian Federal Service for Hydrometeorology and Monitoring of the Environment (SOI)**

Address: 6, Kropotkinsky line, Moscow, 119034, Russia

Coordinator of the Contract from SOI: deputy director of SOI, Dr. A.A. Postnov

Person in charge of the progress report II: prof. Anton V. Syroeshkin

Identification of the project

Name of the project: **Field Study and Survey Project to Determine the Levels of Major Contaminants in the Surface Sediment of Volga Delta-Field Study (FS-CSSVD)**

Ref.: **RER/03/G31 (00034997) Caspian Environment Programme - CEP/SAP Project**

Location: **Moscow, Russia**

Start-up Date: 19/07/2005

Completion Date: 30/12/2005

Budget and finance

Total Project Cost: 55800 USD

Amount received under this Contract: 44640 USD

Amount received from other sources of funding: 0 USD

Amount Requested under this Contract: 11160 USD

Activities

The task of the period was:

Analytical studies of samples from field. 30 probes are for the laser particles analyzes and for the – determination of total organic carbon. 5 probes are for full chemical analysis according to the Contract (metals, aliphatic and polyaromatic hydrocarbons, chlorinated pesticides and PCB).

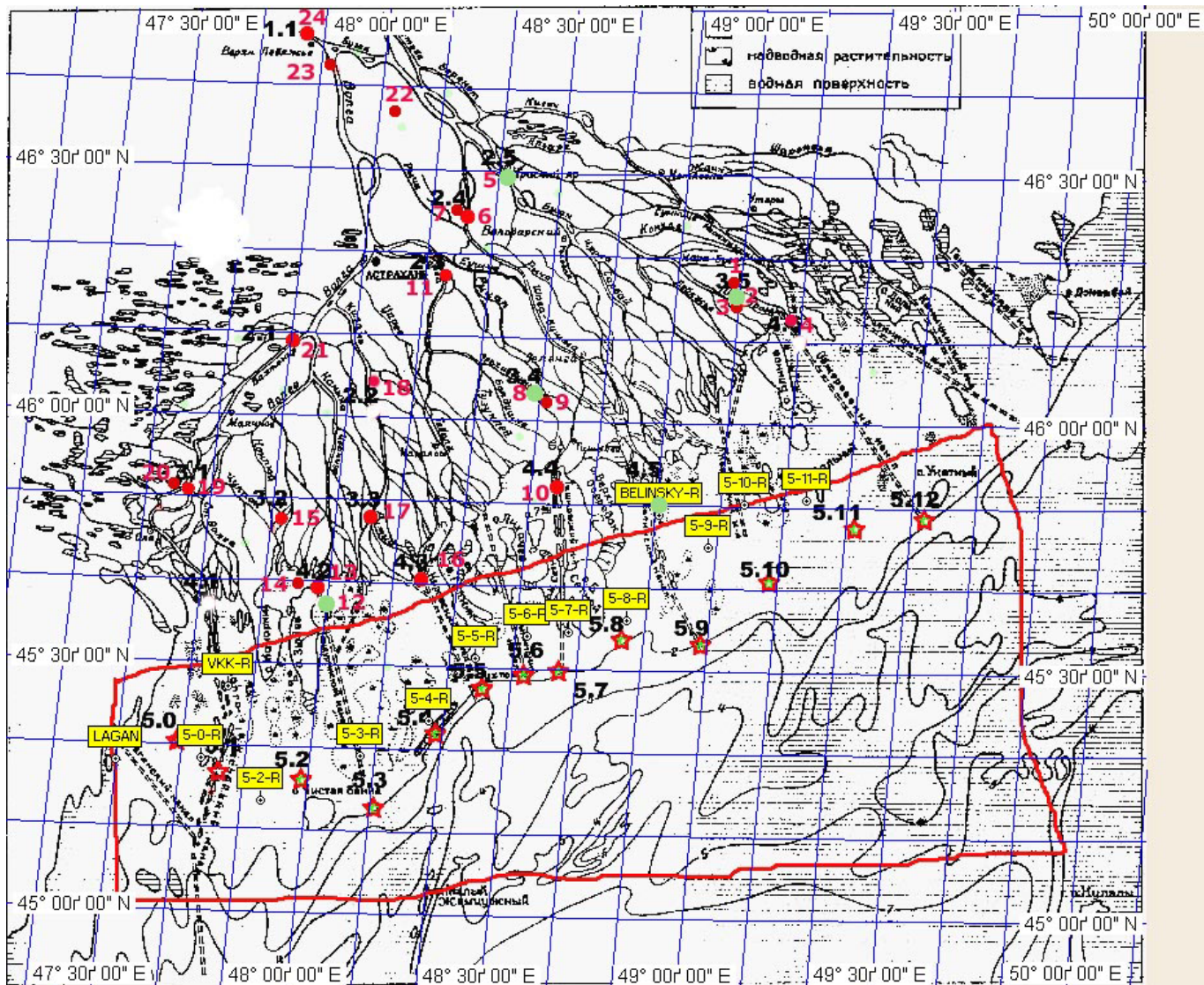
Results:

The field works on selection of tests of bottom sediments were carried out by two groups:

1. Delta group.
2. Sea group.

The items of selection of tests basically corresponded to the basic scheme developed in the report on the first stage of works. During field works the reconnaissance of the appropriate water objects with

the purpose of specification of places of selection of tests was carried out. There is the map with the planned and real sampling stations on the scheme 1.



Scheme 1. The places of planned and real sampling stations of sediments Delta team. Red circles and red figures label the real sampling stations of delta team. Black figures label the earlier planned station in the delta.
Marine team. The figures in yellow frames and its circles with points label the real sampling stations. Red starlets label the earlier planned station.
The green circles label the 5 sampling stations from which the samples of sediments were fully analyzed.

Delta team

The group has executed selection of tests of bottom sediments in items located in delta of Volga and near to its sea edge on shallow mouth off-shore.

During recognized inspection of water objects in the areas of preliminary planned sampling stations the places with fine (silt-like) sediments were revealed taking into consideration its ability for a car or a small boat. Such places are as a rule near shores of water drain. During low-water's conditions the depth of the places are near 1 m with the exception of the places on low-water estuary's seashore (the depths are near 1.5-2 m). The places of the sampling in delta attach to the concrete areas of water objects and are identified with the place-names. The places of selection of tests on shallow mouth off-shore are identified on geographical coordinates. 24 points on different type objects were selected after specification of places of selection of tests of bottom sediments by results of reconnaissance of water objects (scheme 1, table 1):

- 1) The Ostovaja anabranh (at the left coast) - Kordon №3 of Objorovo site of reservation - 27.08.2005, 12-00;
- 2) The Objorovo anabranh (at the right coast) - Kordon №1 of Objorovo site of reservation - 27.08.2005, 16-30;
- 3) drain flood bed at Kordon №1 of Objorovo site of reservation - 27.08.2005, 17-00;
- 4) The Objorovskiy channel (at the left coast) - against a place of the ending of right surface eage of the channel (lat – 46° 7.9 ' lon - 49° 36.1 ') - 28.08.2005, 13-00;
- 5) The Buzan arm (at the right coast) - in 1 km lower than s. Krasniy Yar - 29.08.2005, 12-00;
- 6) The Belyi Ilmen arm (at the right coast) - in 1 km lower than s. Belyi Ilmen - 29.08.2005, 14-30;
- 7) the residual reservoir in right drain flood bed of Belyi Ilmen arm - in 100 m higher than the bridge near s. Belyi Ilmen - 29.08.2005, 16-00;
- 8) The Trekhizbenka anabranh (at the right coast) - in 200 m higher than Kordon №2 of Trekhizbenka site of reservation - 30.08.2005, 13-00;
- 9) drain flood bed at Kordon №2 of Trekhizbenka site of reservation - 30.08.2005, 14-00;
- 10) the zone of sediment sitting on shallow mouth off-shore to west from Tishkovo channel (lat - 45° 51.7 ' lon - 48° 37.6 ') - 31.08.2005, 12-30;
- 11) The Bolda arm (at the right coast) - to the east with s. Nachalovo - 01.09.2005, 14-30;
- 12) The Gandurinskiy channel (at the right coast) - against a place of the ending of left surface eage of the channel (lat - 45° 36.2 ' lon --48° 4.7 ') - 02.09.2005, 14-00;
- 13) The Babushkinskiy channel - shallow bar in a zone of intensive sediment sitting (lat - 45° 39.1 ' lon - 48° 2.1 ') - 02.09.2005, 16-00;

- 14) shallow mouth off-shore to the west from Babushkinskiy channel (lat - 45 ° 39.2 ' lon - 47 ° 59.8 ')
- 02.09.2005, 17 -00;
- 15) The Bistraja anabranh (at the right coast) - Kordon №3 of Damchik sites of reservation (s. Damchik) - 03.09.2005, 11-00;
- 16) The Kirovskiy channel - exit in Kamenskaya Yama (lat - 45 ° 40.0 ' lon - 48 ° 23.5 ') - 04.09.2005, 14-00;
- 17) The Kizan arm (at the left coast) - in 200 m higher than a source of Nikitinskiy Bank - 04.09.2005, 17-00;
- 18) The Kizan arm (at the left coast) - at the southern end of. S. Kamizak - 04.08.2005, 19-00;
- 19) The Bakhtemir arm (at the right coast) - s. Feodorovka - 05.08.2005, 12-30;
- 20) The Three Yerika anabranh (at the right coast) - in 100 m lower than the bridge near s. Feodorovka -05.08.2005, 14-00;
- 21) The Bakhtemir arm (at the right coast) - s. Krasny Barrikady - 05.08.2005, 16-30;
- 22) The Yesaul anabranh (at the left coast) - s. Talnikoviy - 06.09.2005, 11-30;
- 23) The Volga arm (at the right coast) - in 200 m higher than a Water dividing dam - 07.09.2005, 12-00;
- 24) The Volga arm (at the right coast) - in 500 m higher than s. Verkhnelebyaje - 07.09.2005, 14-00.

Table 1. The description of the places of the sampling stations in Volga delta during SOI expedition (24.08.2005-08.09.2005)

No of the station according the scheme 1	No of the sample	The place-name of the water object	Date	Time	The coordinates of the sampling point		Depth, m	Comments
					latitude	longitude		
1	1	The Ostovaja anabranh	27.08.05	12 ⁰⁰	46°20.0'	48°58.6'	0,5	at the left coast
2	2	The Objorovo anabranh	27.08.05	16 ³⁰	46°18.2'	48°58.9'	0,5	at the right coast
3	2a	The drain flood bed of Objorovo anabranh	28.08.05	17 ⁰⁰	46°18.1'	48°58.9'	0	on the right coast of the Objorovo anabranh
4	3	The Objorovskiy channel	28.08.05	13 ⁰⁰	46°15.0'	49°8.0'	0,5	at the left coast
5	4	The Buzan arm	29.08.05	12 ⁰⁰	46°30.4'	48°21.4'	0,5	at the right coast
6	6	The Belyi Ilmen arm	29.08.05	14 ³⁰	46°25.3'	48°15.6'	0,5	at the right coast
7	5	The residual reservoir in right drain flood bed of Belyi Ilmen arm	29.08.05	16 ⁰⁰	46°26.5'	48°14.6'	0,5	on the right coast of the Belyi Ilmen arm
8	7	The Trekhizbenka anabranh	30.08.05	13 ⁰⁰	46°3.8'	48°30.8'	0,5	at the right coast
9	9	drain flood bed of the Trekhizbenka anabranh	30.08.05	14 ⁰⁰	46°3.5'	48°30.9'	2,2	at Kordon No 2
10	8	the shallow mouth off-shore to west from Tishkovo channel	31.08.05	12 ³⁰	45°54.3'	48°34.5'	0,7	
11	10	The Bolda arm	01.09.05	14 ³⁰	46°21.0'	48°13.0'	0,5	at the right coast
12	14	The Gandurinskiy channel	02.09	14 ⁰⁰	45°37.7'	48°1.0'	1,5	at the right edge
13	15	The Babushkinskiy channel	02.09.05	16 ⁰⁰	45°40.8'	47°58.5'	0,5	at the left coast
14	16	shallow mouth off-shore (marine border of the delta)	02.09.05	17 ⁰⁰	45°40.9'	47°56.2'	1,4	
15	17	The Bistraya anabranh	03.09.05	11 ⁰⁰	45°47.5'	47°53.4'	1,5	at the right coast
16	11	The Kirovskiy channel	04.09.05	14 ⁰⁰	45°41.4'	48°16.6'	2,0	in Kamenskaya Yama
17	12	Nikitinskiy Bank	04.09.05	17 ⁰⁰	45°49.8'	48°6.9'	0,5	at the left coast
18	13	The Kizan arm	04.09.05	19 ⁰⁰	46°5.9'	48°4.0'	0,5	at the left coast
19	18	The Bakhtemir arm	05.09.05	12 ³⁰	45°51.8'	47°38.2'	0,5	at the right coast
20	23	The Three Yerika anabranh	05.09.05	14 ⁰⁰	45°52.2'	47°35.5'	0,5	at the right coast
21	19	The Bakhtemir arm	05.09.05	16 ³⁰	46°12.3'	47°53.4'	0,5	at the right coast
22	22	The Yesaul anabranh	06.09.05	11 ³⁰	46°38.6'	48°3.2'	0,5	at the right coast
23	20	The Volga arm	07.09.05	12 ⁰⁰	46°42.5'	47°51.1'	0,5	at the right coast
24	21	The Volga river at the top of the deltay	07.09.05	14 ⁰⁰	46°45.5'	47°48.1'	0,5	at the right coast

Marine team

The expeditions way was on the Volga delta shallow off-shore zone (table 2 and scheme 1).

Table 2. The list of real sampling stations

№	Date	Time	Coordinates		Depth (m)
			Lat	Lon	
VKK	28.08.05	13 ⁰⁰ -13 ²⁰	45°27.010'	47°46.174'	2,0
5.0-*(R)	28.08.05	15 ⁴⁵ -16 ¹⁰	45°18.423'	47°43.201'	1,4
5.2.-R	28.08.05	20 ⁰⁵ -20 ³⁰	45°13.396'	47°53.159'	2,1
5.3-R	29.08.05	09 ¹⁵ -09 ⁴⁰	45°19.012'	48°07.831'	2,0
5.4-R	29.08.05	11 ⁵⁰ -12 ¹⁵	45°23.512'	48°17.854'	1,4
5.5-R	29.08.05	15 ¹⁵ -15 ²⁵	45°31.198'	48°24.108'	1,3
5.6-R	29.08.05	17 ⁰⁵ -17 ²⁵	45°34.042'	48°31.777'	1,65
5.7-R	29.08.05	18 ³⁰ -18 ⁵⁰	45°34.571'	48°38.225'	1,5
5.8-R	30.08.05	06 ²⁰ -06 ⁴⁰	45°36.092'	48°47.020'	2,2
Belinsky-R	30.08.05	10 ³⁰ -10 ⁵⁴	45°48.880'	48°50.558'	2,3
5.9-R	30.08.05	13 ¹⁵ -13 ³⁵	45°45.111'	48°58.760'	2,1
5.10-R	30.08.05	15 ⁰⁰ -15 ¹⁵	45°50.346'	49°03.784'	2,3
5.11-R	30.08.05	16 ⁵⁰ -17 ¹⁰	45°50.863'	49°13.515'	2,2
Lagan-R	31.08.05	15 ⁵⁰ -16 ¹⁰	45°17.815'	47°30.021'	2,25

Methods of samples' analysis

The analysis of all probes

1. Granulometric analysis was provide with two methods. The first one is sieving analysis with geology sieves with size of cells 2 mm and 0,25 mm. The second one is the low anlgle laser light scattering (LALLS).

The storage of the arrived in the laboratory samples of frozen sediments was at -20°C . Before the start of analysis the sediments were dried to constant mass at $35-45^{\circ}\text{C}$ (no more). Then the samples were carefully reduced to fragments and sifted from geological sieve (with size of cell 0,25 mm). The samples, sift through $250\text{-}\mu\text{m}$ sieve were carried out of analysis by particle sizer. Repeatability of measurement for mass size spectra was analyzed three-times (each mass of sample was approximately 0,2 g). The samples were preliminary prepared by described method (figure 1 A) So, granulometric composition of the alevrit and pelit fractions were analysed. The mail characteristic of the aquatoria at the monitoring of the pollutions in the samples of bottom sediments is maintenance of the toxic compounds in the alevrit and pelit fractions

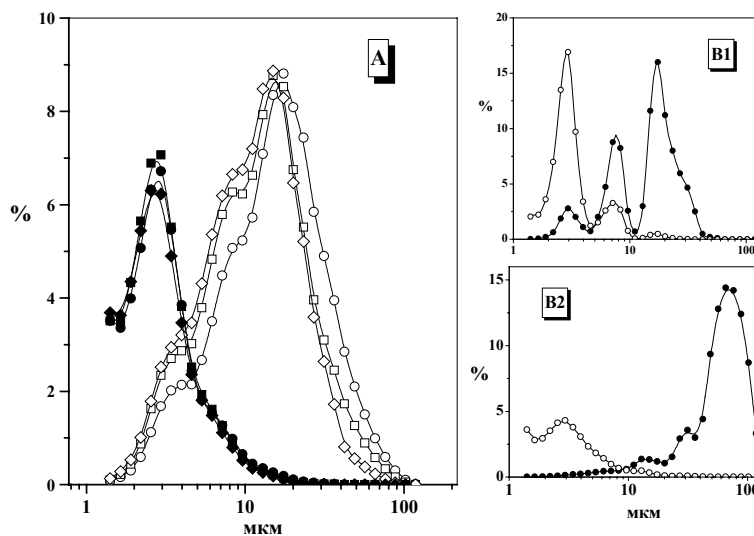


Figure 1. Typing of the samples of bottom sediments and suspended matter by granulometria based on laser diffraction.. A – example of the repeatability of the measuring. B1 – examples of the size specter of *размерного спектра* sandy silt. B2 – example of the size specter of silty sand.

Size spectra of suspensions of bottom sediments in distill water were constructed by laser diffraction using low angle laser light scattering («particle sizer») «Malvern 3600 Ec». The dependence $v_i=f(r_i)$, (where v_i is mass part of group size r_i .) was used for analysis of distribution of particular matter. (www.malvern.co.uk, GOST R 8. 606-2004, GOST ISO 14644-1-2002, certificate

about approval of type of the means of measuring GB. E. 27. 002. A #11341). Suspension of the sediments was prepared in the cell of particle sizer «Malvern 3600 Ec». Principle of the work is: low-powerful He-Ne laser radiates of monochromic light ($\lambda_{\max}= 633 \text{ nm}$), which goes through experimental cell. The diffraction picture focus on multi-element photoelectric detector with helpful of Furry's lens. The detector connects with computer, which analyses of all complex of data, beginning from integrating of set of diffraction pictures. The diffraction pictures reflect moment size spectra. In the experimental sample all particles goes through light zone due to continuous mixing. The two type of dependence were used for analysis of dispersion phase: $n_i=f(r_i)$ and $v_i=f(r_i)$, where n_i and v_i are size and mass part of size group r_i . Sensitivity of the method depends on area of section and average from 300 particles in the sample (at length approximately 0,5 mm and average width approximately 70 μm) to 10^4 particles in the sample (average linear size less the 1 μm). The average relative error for detection of maximum of size spectra was no more then 10% (confidence probability is 0,95).

2. Samples preparation of sediments for chemical analysis.

The storage of the arrived in the laboratory samples of frozen sediments was at -20°C . Before the start of analysis the sediments were dried to constant mass at $35-45^{\circ}\text{C}$ (no more). Then the samples were carefully reduced to fragments and sifted from geological sieve with size of cell 0,25 mm (steel sieve for analysis of organic substance, inert polypropylene sieve “Bioblock” company for element analysis). All chemical analysis were carried out for five parallel samples (if there is not other data in the text)

3. Definition of the total organic carbon in the samples.

Total organic carbon (%) in the samples of bottom sediments was defined by method of automatic titration of pH. Aliquot of the bottom sediments were burned in tubular furnace, then in the stream of especially pure O_2 . Formed CO_2 leaved with O_2 stream in the electrochemical cell and have been absorbed by solution of KCL , $\text{SrCl}_2 \times 6\text{H}_2\text{O}$ and H_3PO_4 in distilled water. The catalyst at the burning was Co_3O_4 . Saccharose 42,24% was as the standard. Total organic carbon (%) in the samples of bottom sediments was defined by AH-7229 analyzer. The analysis has been carried out at 500°C .

If siderite was in the samples, the analysis has been carried out after removing of the siderite. Removing of the siderite was by 10% HCl . Temperature of the siderite decomposition was 450°C . There was no impurity of the siderite in the samples. Other carbons don't stir of analysis. The average relative error for detection was no more then 15% (confidence probability is 0,95).

***Complete chemical analysis of concentration of heavy metals and organic contamination
in 5 samples:***

1. Element assay

Preparation of the of bottom sediments for microelement concentrations determination 0,1 g dried bottom sediments were incubated with mix of acids (HCl, HNO₃, HF - 6 ml) during 1 day in teflon bombs. Mineralization of the samples was carried out under pressure in microwave MDS2000 in the condition: 2 min. 20 sec. - at 80% power, 5 min. - at 100% power. Three parallel samples were analyzed in each experiment. [Coquery M., Villeneuve J.P. Final report on the Split Sampling Exercises and Quality Assurance Activities. EU Project Number ENVRUS9602. - Amsterdam: ICWS. - 2001. - 51 c.]

The microelement concentrations were determined using spectrometer «SpectrAA-800» with electrotermic atomization and Zeeman effect according to manufacturer's ("Varian" Inc) and international calibration standards. One-element lamps with hollow cathode ("Varian" Inc) were used as radiation source. Current in a lamp for Ni, Cu, Hg, Cd was 4.0 mA, for Al, As – 10 mA; for Mn, Zn – 5.0 mA; for Cr, V, Pb – 7.0 mA, for Co, Sn – 7 mA. Width of the monochromator split was 0.5 nm (for measurement of Al, Ni, Cu, Zn, Hg), 0.2 nm (for measurement of Cr, Fe, Mn, V, Co, Sn) and 1.0 nm (for measurement Cd, Pb, As). Correction mode of baseline and hot injection (80°C) were used. The following wavelengths and modifiers were used: for Al - $\lambda=256.8$ nm, Mg(NO₃)₂; Ni - $\lambda=232.0$ nm, Mg(NO₃)₂; Cr - $\lambda=429,0$ nm, Mg(NO₃)₂; Mn - $\lambda=403,1$ nm, Mg(NO₃)₂; Fe - $\lambda=386,0$ nm, Mg(NO₃)₂; Cu - $\lambda=327.4$ nm, Pd(NO₃)₂; Zn - $\lambda=307.6$ nm, Mg(NO₃)₂. As - $\lambda=193.7$ nm, Pd(NO₃)₂+Mg(NO₃)₂; Sn - $\lambda=286.3$ nm, Mg(NO₃)₂ + NH₄H₂PO₄; V - $\lambda=318.5$ nm; Co - $\lambda=242.5$ nm, Pd(NO₃)₂; Cd - $\lambda=228.8$ nm, Pd(NO₃)₂+Mg(NO₃)₂+NH₄H₂PO₄; Pb - $\lambda=283.3$ nm, Pd(NO₃)₂+Mg(NO₃)₂+NH₄H₂PO₄.

Hg has been analyzed separately: aliquot 0.5 r add to 4 ml HNO₃ and 2 ml H₂SO₄. Mix was incubated during 1 hour and heated at 90°C during 3 hours. Then mix was cooled and added 1 ml 10% solution of K₂Cr₂O₇. Concentration of Hg was measured by method of cool steam - CVAAS (atomic-absorption spectrometer «SpectrAA-800»).

Relative standard deviation was no more than 20% with probability level 0.95 Average relative deviations were calculated based on 5 repeated measurements.

Composition of the reference sample for element analysis has been shown in table 3.

Table 3. Concentration of elements in the reference sample of sediment IAEA-405 (IAEA, service of analytical control of quality)

Element	Concentration, $\mu\text{g/g}$ (dry weight)	95 % probability level, $\mu\text{g/g}$ (dry weight)
As	23.6	22.9 - 24.3
Cd	0.73	0.68 - 0.78
Co	13.7	13.0 - 14.4
Cr	84	80 - 88
Cu	47.7	46.5 - 48.9
Fe	37400	36700 - 38100
Hg	0.81	0.77 - 0.85
Li	72	65 - 79
Mg	12300	11400 - 13200
Mn	495	484 - 506
Ni	32.5	31.1 - 33.9
Pb	74.8	72.6 - 77.0
Sb	1.81	1.62 - 2.00
Se	0.44	0.32 - 0.56
Sn	7.6	6.3 - 8.9
V	95	90 - 100
Zn	279	272 - 286
Me-Hg	0.00549	0.00496 - 0.00602
Al	77900	72700 - 83100
Br	85	60 - 110
Cs	12.5	10.4 - 14.6
Eu	1.25	0.89 - 1.61
Hf	5.80	4.93 - 6.67
K	24900	17700 - 32100
La	40.4	33.1 - 47.7
Lu	0.468	0.283 - 0.653
Sc	13.52	11.53 - 15.51
Sm	6.86	6.50 - 7.22
Sr	118	104 - 132
Tb	0.93	0.50 - 1.36
Th	14.3	12.2 - 16.4
U	3.01	1.86 - 4.16
Yb	3.04	2.19 - 3.89

5. Definition of total aliphatic and total aromatic in the samples of the sediments carried out according to document RD 52.10.556-95 (Definition of pollution in samples of marine bottom sediments and pound compounds Manual editor Oradovskii S. G- M.: “Gidrometeoisdat”. – 1979. - 40 p. and M., “Gidrometeoisdat”, 1982 and Manual No 43, “Gidrometeoisdat”, – 1996. - 50 p.) using IR-spectroscopy and UV-spectrofluorometry with little modification. Relative standard deviation was no more than 20% with probability level 0.95 Average relative deviations were calculated based on 3-5 repeated measurements. The relative standart deviation was no more then 20% (confidence probability is 0,95).

A sample about 20 – 35 g of natural moisture is introduced into rotary tube, add 15 ml of acetone, mix well and centrifuge at speed of 1500 rpm during 5 min. until an absolute stratification of solid and liquid phases. An acetone layer is decanted in a flask. The procedure is repeated once more. Then add

to the sample 15 ml of methylene chloride and a procedure of homogenization, rotation and decant is repeated three times. Combined extract is dried with sodium sulphate, then is evaporated until dry in natural condition. Treated sediment sample is dried and weighted.

15 ml of carbon tetrachloride is added to dried extract, then it is passed through the chromatographic column filled with Al_2O_3 . The content of nonpolar hydrocarbons is determined by absorption intensity in IR-area in the range $2700-3100\text{ cm}^{-1}$ on IR-spectrophotometer SP-1100 Pye Unicam {max absorption – 2926 cm^{-1} }.

To measure in UV-area treated extract is dried and solved in hexane. The fluorescence measurement is made on the spectrofluorometer FP-550 Jasco at $\lambda_{ex}=310\text{ nm}$ and $\lambda_{em}=360\text{ nm}$. Crude oil '*Ekofisk*' (or *Simard's mixture*) is used as standard. The limit of determination: IR – 5 $\mu\text{g/g}$, UV – 0,5 $\mu\text{g/g}$.

6. Determination of concentrations of individual saturated oil hydrocarbons.

Contents of total aliphatic in samples of the sediments were defined by Capillary gas-liquid chromatography [Gordadze G. N. Analysis of organic substitution for rock, oil and condensats// Geologic of oil and gas. – 1994. - #9. – P. 49]. The sample for IR- spectrofluorometer was evaporate in 1000 times. 1 μl of sampe was used for chromatography. Quartz ion-exchange column ULTRA-1 inoculate with methylsilicon phase was used. Length of column was 25 m, diameter was 0,25 mM. Thermostat was programmed from 80 to 300°C , speed of heating was $4^{\circ}\text{C}/\text{min}$. H_2 was used as gas-carrier, flaming ionizationtector. Pressure on enter of column was 0,8 atmosphere.

Example of determination of relative maintenance for n-alcans, pristan, fitan, phthalate ether has been shown on the figure 2. Examples of chromatograms have been shown on the figure 3. The preparation of the damp oil and individual substances from n-alcans were used as the standard samples. The relative standart deviation was no more then 20% (confidence probability is 0,95). The limit of the detection using this methodic was 0,002 $\mu\text{g/g}$ dry sediments for compound C_n .

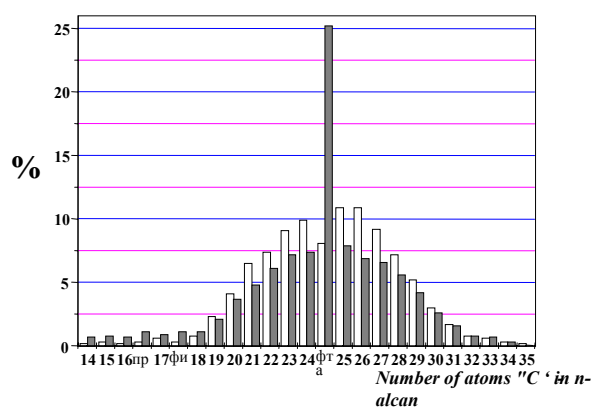


Figure 2. Example of determination of relative maintenance for n-alcans, pristan, fitan, phthalate ether

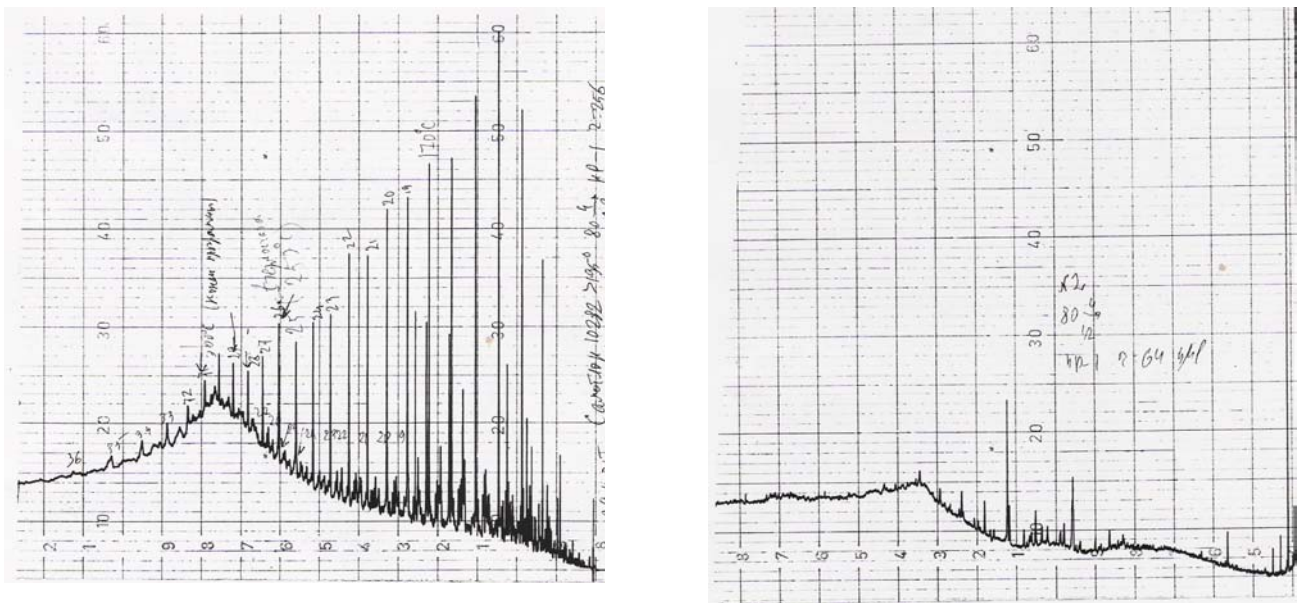


Figure 3. Examples of chromatograms for samples of oil and sample No12 (table 1) .

7. Determination of concentration of different fraction of polyaromatic carbons, chlororganic pesticides and polychlorbiphinils.

Aliquots of the samples of bottom sediments (150 g) were picked out for definition of the total aromatic. 50 ml CH_2Cl_2 was added to each sample, mixed and incubated in ultrasonic disintegrator during 20-30 min. The procedure was repeated twice, using 30 ml CH_2Cl_2 . Two solutions were combined and evaporated at room temperature to volume 500 μl .

Composition of solutions were research by chromato-mass-spectrometers (CMS) using gas-chromatograph (model 6890, « Hewlett Packard» (USA) with mass-selection detector (model 5973, « Hewlett Packard» (USA) in condition of ionization of electronic pulse.

Devison of the compounds were carried out in helium stream, with 40 cm/sec in the column HP-5MS («Hewlett Packard» (USA) diameter was 0.25 mm, thickness of the layer of fixed phase 0.25 μm , length was 30 m. Temperature of the injector was 250 $^{\circ}\text{C}$. Conditions of injector «Splitless», was without division of the stream. Volume of the samples was μl . Temperature on the column: isotherm 40 $^{\circ}\text{C}$ during 1 min, then programming hitting with speed 25 $^{\circ}\text{C}/\text{min}$ to 320 $^{\circ}\text{C}$ with follow-on incubation during 10 min. Temperature of the source was 150 $^{\circ}\text{C}$, temperature of the interface was 250 $^{\circ}\text{C}$.

Mass-spectra for the each compound were registered in diapason 29-800 a. u. m (Da). Analysis of the compositions was carried out by comparing obtained mass-spectra and data from library (NIST 98 and Wiley) and with mass-spectra of the standard samples. Concentrations of polyaromatic carbons, chlororganic pesticides and polychlorbiphinils in reference samples have been shown in table 4 and 5

(corresponding to). Example of chromatogram and sample expansion using library of mass-spectra NIST 98 and Wiley has been shown on figure 4.

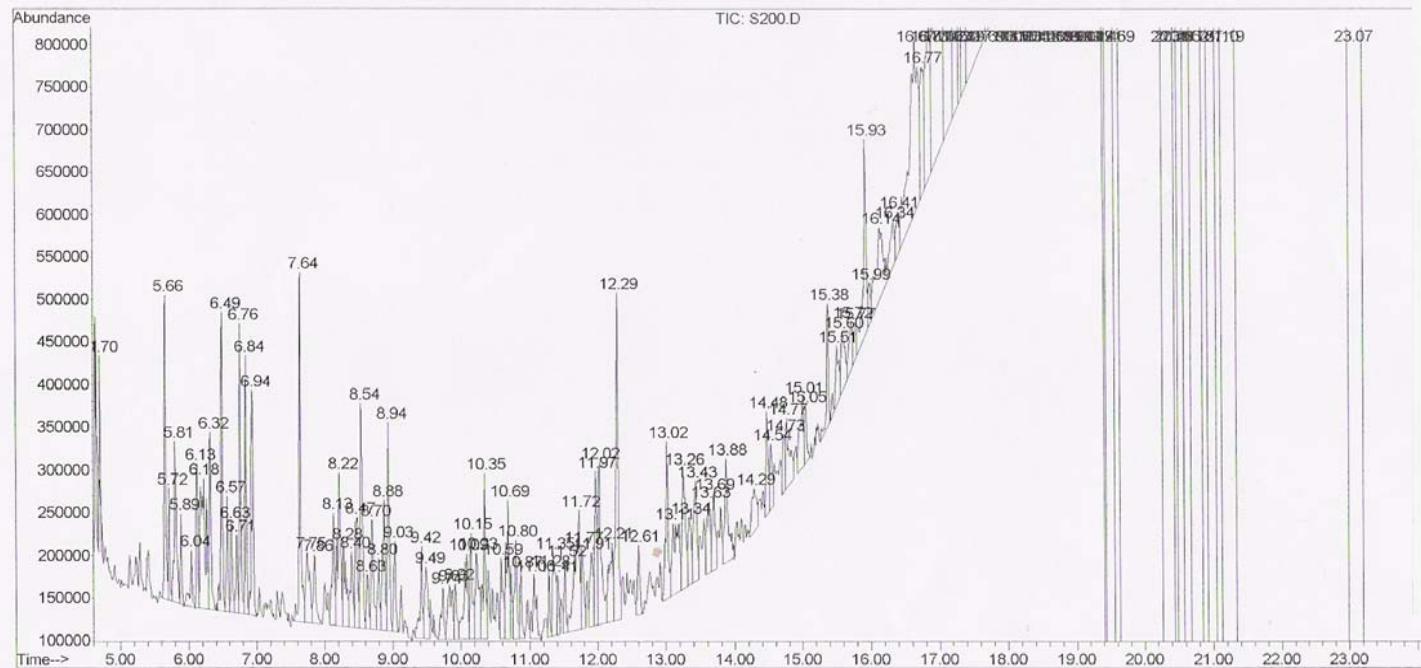
Table 4. Concentration of oil hydrocarbons in reference sample of the sediments BS-1/OC (IAEA, MEL).

Analyte	Units	Concentration	Standard Deviation
Total Aliphatics	µg/g	110	± 5.0
Resolved Aliphatics	µg/g	10	+ 0.53
Unresolved Aliphatics	µg/g	99	± 4.3
n- C ₁₇	ng/g	120	± 4.5
Pristane	ng/g	120	± 4.5
n-C ₁₈	ng/g	58	± 1.8
Phytane	ng/g	110	± 4.5
Σ Alkanes (C ₁₄ -C ₃₄)	µg/g	3.6	± 0.19
Total Aromatics	µg/g	18	± 0.84
Resolved Aromatics	µg/g	3.2	+ 0.15
Unresolved Aromatics	µg/g	13	+ 0.84
Naphthalene	ng/g	30	± 1.5
1-Methylnaphthalene	ng/g	29	+ 1.9
2-Methylnaphthalene	ng/g	38	+ 2.4
2, 6-Dimethylnaphthalene	ng/g	19	± 0.84
Biphenyl	ng/g	7.3	± 1.2
Acenaphthylene	ng/g	2.5	± 0.33
Acenaphthene	ng/g	2.3	± 0.089
Fluorene	ng/g	8.5	+ 0.69
Phenanthrene	ng/g	40	+ 1.2
Anthracene	ng/g	3.2	+ 0.53
2-Methylphenanthrene	ng/g	17	± 0.71
1-Methylphenanthrene	ng/g	24	± 1.4
Fluoranthene	ng/g	51	± 2.2
Pyrene	ng/g	60	± 3.0
1-Methylpyrene	ng/g	4.3	± 0.2
Benz[a]anthracene	ng/g	13	± 0.55
Chrysene	ng/g	45	± 1.9
Benzo[b]fluoranthene	ng/g	44	± 2.4
Benzo[k]fluoranthene	ng/g	32	± 3.9
Benzo[e]pyrene	ng/g	37	+ 1.9
Benzo[a]pyrene	ng/g	31	+ 1.9
Perylene	ng/g	69	+ 4.2
Indeno[1,2,3- <i>cd</i>]pyrene	ng/g	43	± 2.1
Dibenz[<i>a,h</i>]anthracene	ng/g	12	+ 0.45
Benzo[<i>ghi</i>]perylene	ng/g	39	± 1.1
Dibenzo Thiophene	ng/g	5.1	± 0.25
1-Methyldibenzo Thiophene	ng/g	2.1	± 0.11
4-Methyldibenzo Thiophene	ng/g	6.3	± 0.43
UVF, Chrysene equivalent	ug/g	23	+ 2.5
UVF, ROPME Oil equivalent	ug/g	200	+ 21

Table 5. Concentration of chlororganic pesticides and polychlorbiphinils in reference samples of the sediments BS-1/OC (IAEA, MEL).

Analyte	Units	Concentration	Standard Deviation
HCB	pg/g	820	± 13
Lindane	pg/g	130	± 5.5
α HCH	pg/g	260	± 18
β HCH	pg/g	370	± 18
pp' DDE (4,4')	pg/g	2 700	± 55
pp' DDD (4,4'')	pg/g	18 000	± 1100
pp' DDT (4,4')	pg/g	5 000	± 320
DDMU	pg/g	1400	± 100
op DDE (2,4')	pg/g	150	± 19
op DDD (2,4')	pg/g	2 100	± 110
op DDT (2,4')	pg/g	180	± 25
Heptachlor	pg/g	4.2	± 0.45
Aldrin	pg/g	< 2	
Dieldrin	pg/g	19	± 1.2
Endrin	pg/g	< 5	
Aroclor 1254	pg/g	7 800	± 45
Aroclor 1260	pg/g	3 900	± 110
PCBNo 18	pg/g	290	± 15
PCBNo 28	pg/g	200	± 11
PCBNo 31	pg/g	180	± 7.1
PCB No 44	pg/g	320	± 24
PCBNo 49	pg/g	300	± 40
PCBNo 52	pg/g	500	+ 8.9
PCBNo 87	pg/g	250	± 7.1
PCB No 101	pg/g	620	+ 8.9
PCB No 105	pg/g	140	± 15
PCB No 118	pg/g	350	± 7.1
PCB No 128	pg/g	86	± 9.4
PCB No 138	pg/g	650	± 17
PCB No 149	pg/g	480	± 15
PCB No 153	pg/g	650	+ 17
PCB No 170	pg/g	230	± 11
PCB No 174	pg/g	180	± 7.1
PCB No 177	pg/g	100	± 3.1
PCB No 180	pg/g	450	+ 16
PCB No 183	pg/g	100	+ 4.5
PCB No 187	pg/g	250	± 16
PCB No 194	pg/g	84	± 4.1
PCB No 201	pg/g	22	± 0.84

File : F:\D\DATA\OL\5SOIL\S200.D
 Operator :
 Acquired : 16 Dec 2005 13:14 using AcqMethod PAH
 Instrument : GC/MS Ins
 Sample Name: sample 1
 Misc Info : EI(+) 2 mkl splitless DB-1 30 m
 Vial Number: 18



Приложение № 1. Расшировка основных компонентов пробы воздуха № Велюнь-Р с использованием спектральных библиотек NIST98 и Wiley275.

Information from Data File

File : F:\DATA\OL\5SOIL\S200.D
 Operator :
 Date Acquired: 16 Dec 2005 13:14
 Method File: PAH
 Sample Name: sample 1
 Misc Info: EI(+) 2 mkl splitless DB-1 30 m
 Vial Number: 18

Search Libraries: C:\DATABASE\NIST98 Minimum Quality: 80
 C:\DATABASE\WILEY275.L Minimum Quality: 0

Unknown Spectrum: Auto
 Integration Events: Chromatogram Integration: Auto

File RT Area LibraryID Ref CASQ Qual

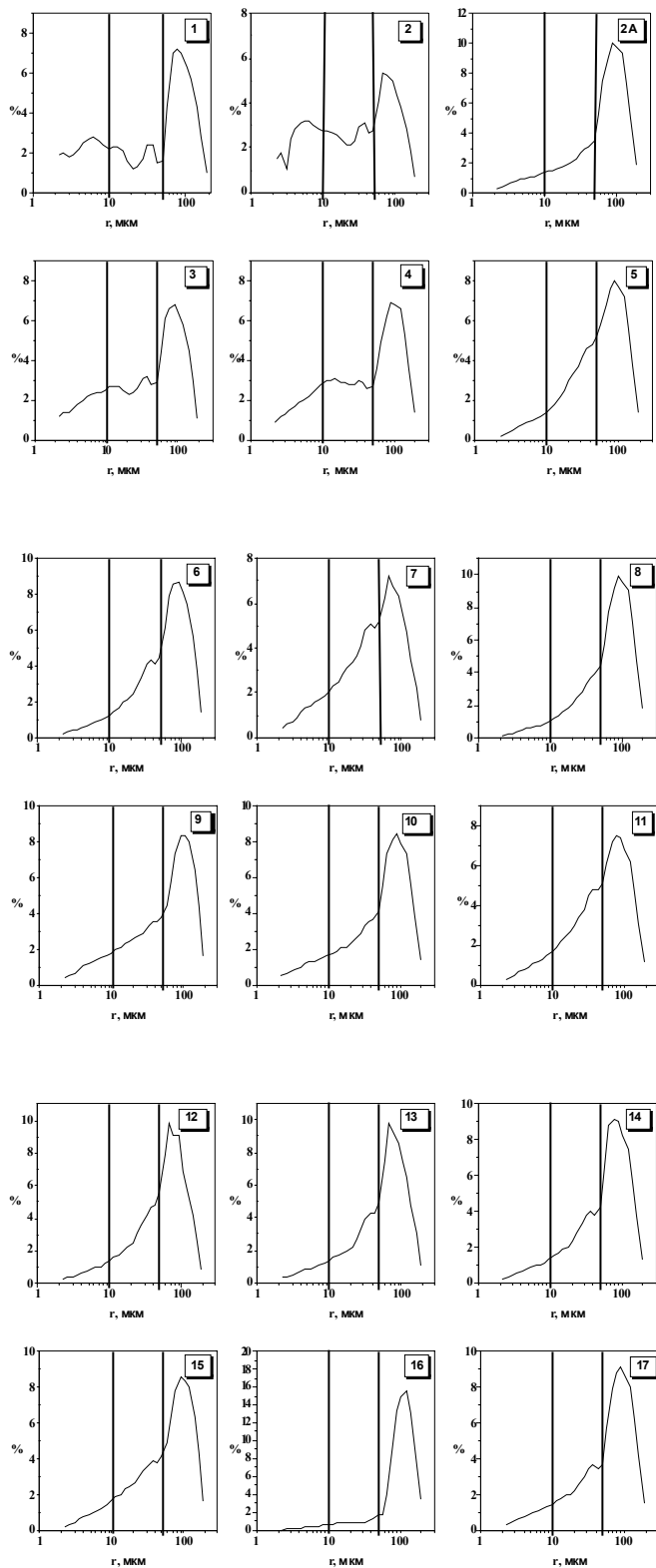
File	RT	Area	LibraryID	Ref	CASQ	Qual
1	4.70	100	C:\DATABASE\WILEY275.L	Methane, dihydro- (CAS) 65	2583 000075-09-2 50	
				Phenyl, 2-amino-4-hydro- (CAS) 95	3621 000098-07-0 36	
				Chloroacetic acid, bromoethoxy- (Wiley) 134036	027755-03-4 17	
2	5.86	100	C:\DATABASE\NIST98.L			
				Chlorobenzene	112318 000112-40-3 87	
				Chlorobenzene	112319 000112-40-3 84	
3	6.71	100	C:\DATABASE\NIST98.L			
				Methylene Chloride	111041 000075-09-2 76	
				Methylene Chloride	111042 000075-09-2 76	
				Methylene Chloride	111039 000075-09-2 76	
4	6.81	100	C:\DATABASE\NIST98.L			
				Methylene Chloride	111041 000075-09-2 81	
				Methylene Chloride	111039 000075-09-2 74	
				Methylene Chloride	111041 000075-09-2 74	
5	6.89	100	C:\DATABASE\NIST98.L			
				Methylene Chloride	111041 000075-09-2 80	
				Methylene Chloride	111041 000075-09-2 81	
				Methylene Chloride	111039 000075-09-2 81	
6	6.04	100	C:\DATABASE\NIST98.L			
				Methylene Chloride	111039 000075-09-2 72	
				Methylene Chloride	111041 000075-09-2 42	
				Chloroform	111042 000068-71-0 36	
7	6.13	100	C:\DATABASE\WILEY275.L			
				METHYLENE CHLORIDE	2584 000075-09-2 64	
				Methane, dihydro- (CAS) 65	2583 000075-09-2 64	
				Methane, dihydro- (CAS) 65	2578 000075-09-2 58	
8	6.13	100	C:\DATABASE\NIST98.L			
				Methylene Chloride	111041 000075-09-2 76	
				Methylene Chloride	111041 000075-09-2 64	
				Methylene Chloride	111039 000075-09-2 64	
9	6.25	100	C:\DATABASE\WILEY275.L			
				Methane, dihydro- (CAS) 65	2583 000075-09-2 58	
				Chloroacetic acid, 2-bromo-1,1-dichloro-5-oxo- (CAS) 10461	000000-00-3 25	
				Dichloro, 2-methyl- (CAS) 65	3499 013151-35-4 22	
10	6.49	100	C:\DATABASE\WILEY275.L			
				perchlorane	9030 000034-02-0 83	
				perchlorane	9030 000034-02-0 80	
				Dichloro, 2-methyl- (CAS) 65	3499 013151-35-4 22	
11	6.86	100	C:\DATABASE\NIST98.L			
				Methylene Chloride	111039 000075-09-2 84	
				Methylene Chloride	111041 000075-09-2 58	
				Methylene Chloride	111037 000075-09-2 47	

Figure. 4 Example of chromatogram and sample expansion using library of mass-spectra NIST 98 and Wiley

Results of granulometric and chemical analysis

1) Size spectra of sediments

There are size spectra of sediments from 0.002 mm to 0.25 mm on the fig. 5.



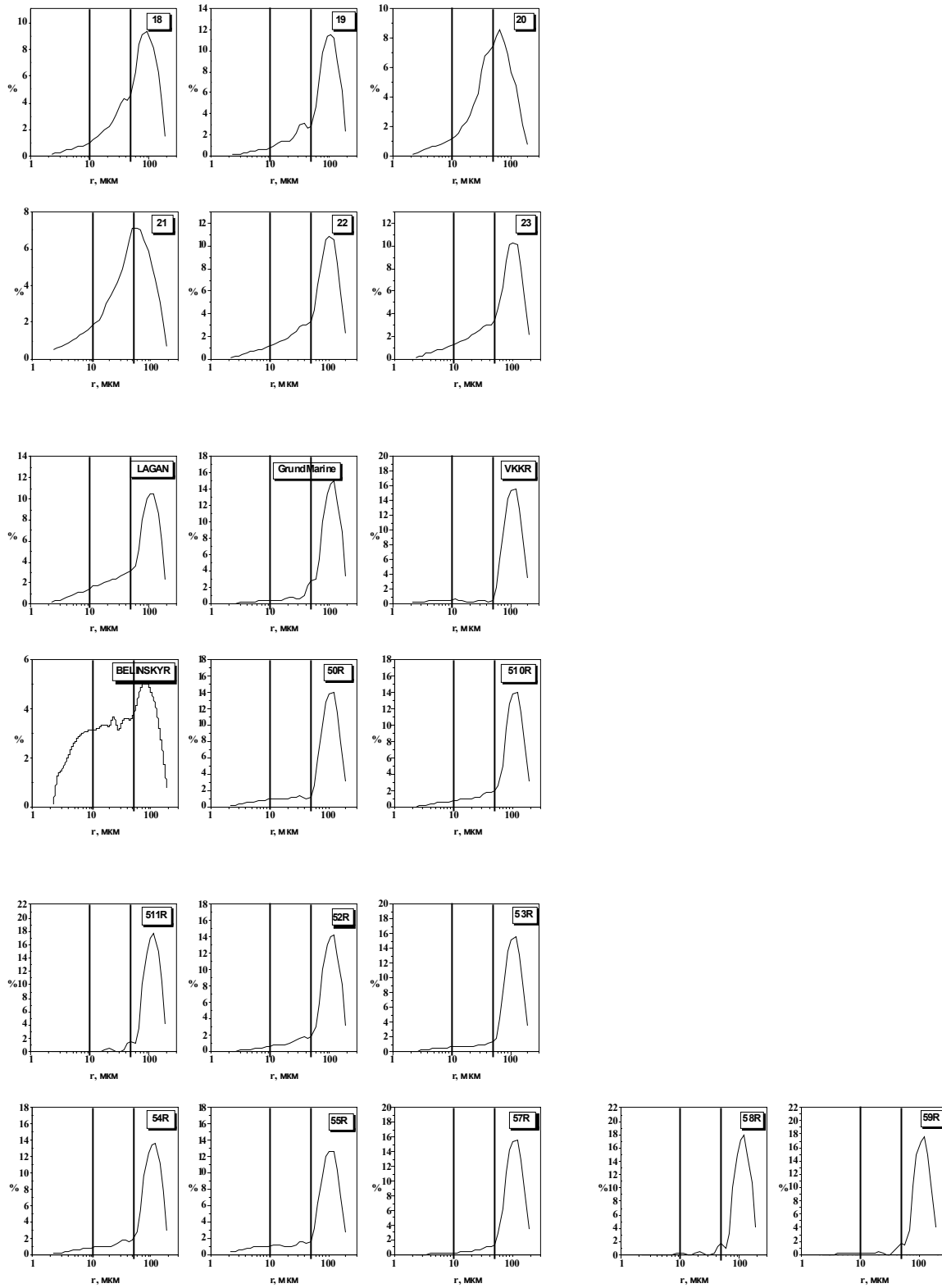


Fig. 5. Mass size spectra of particulate matter of Volga delta's sediment. Number of sample is indicated in the right upper part of the figure (see tables 1 and 2).

Table 6. Reduced Grain Size distribution data for the samples

No Of the station (according to sheme 1)	No Of the sample (according to table 1 and 2)	2 mm - 200 μm , % (g per g)	200 μm – 63 μm , % (g per g)	< 63 μm , % (g per g)
1	1	1.3	33.3	65.4
2	2	0.8	23.1	76.1
3	2a	2.3	49.7	47.9
4	3	1.4	32.9	65.7
5	4	1.1	30.6	68.3
6	6	2.0	41.9	56.1
7	5	2.1	39.3	58.6
8	7	0.9	29.0	70.1
9	9	2.7	41.8	55.5
10	8	2.6	48.9	48.5
11	10	3.0	39.8	57.2
12	14	2.2	35.4	62.4
13	15	2.4	42.6	55.0
14	16	4.2	75.2	20.6
15	17	1.9	44.6	53.5
16	11	0.9	36.0	63.1
17	12	0.9	36.8	62.3
18	13	1.3	39.3	59.4
19	18	1.5	45.8	52.7
20	23	2.8	52.2	45.0
21	19	3.3	58.3	38.4
22	22	2.7	55.7	42.6
23	20	1.2	30.2	68.6
24	21	2.1	30.5	67.4
VKK	VKK	4.2	77.6	18.1
5.0-*(R)	5.0-*(R)	5.2	68.0	26.8
5.2.-R	5.2.-R	4.6	70.1	25.3
5.3-R	5.3-R	4.2	76.1	19.7
5.4-R	5.4-R	2.7	68.5	28.8
5.5-R	5.5-R	2.7	64.9	32.4
5.6-R	5.6-R	3.8	74.3	21.9
5.7-R	5.7-R	4.3	77.6	18.1
5.8-R	5.8-R	5.5	84.6	9.9
Belinsky-R	Belinsky-R	0.7	24.3	75.0
5.9-R	5.9-R	3.5	86.2	10.3
5.10-R	5.10-R	4.8	68.7	26.5
5.11-R	5.11-R	4.3	84.7	10.9
Lagan-R	Lagan-R	2.5	53.3	44.2

2) Concentrations of total organic carbon (%) in the samples of sediments in delta Volga River 08-09. 2005 y.

Table 7. Concentrations of total organic carbon (%) in the samples

No Of the station (according to sheme 1)	No Of the sample (according to table 1 and 2)	C org., %
1	1	0.67
2	2	0.54
3	2a	3.72
4	3	1.07
5	4	0.91
6	5	3.84
7	6	0.47
8	7	1.6
9	8	1.39
10	9	2.7
11	10	0.38
12	11	1.17
13	12	0.51
14	13	0.71
15	14	0.84
16	15	0.92
17	16	0.47
18	17	0.88
19	18	0.76
20	19	0.42
21	20	0.84
22	21	0.59
23	22	2.77
24	23	2.5
VKK	VKK	0.17
5.0-*(R)	5.0-x	0.31
5.2.-R	5.2-R	0.26
5.3-R	5.3-R	0.24
5.4-R	5.4-R	0.42
5.5-R	5.5-R	0.26
5.6-R	5.6-R	0.47
5.7-R	5.7-R	0.34
5.8-R	5.8-R	0.16
Belinsky-R	Belinsky-R	1.8
5.9-R	5.9-R	0.09
5.10-R	5.10-R	0.31
5.11-R	5.11-R	0.11
Lagan-R	Lagan-R	0.5

3) *The selection of the samples for the further chemical analysis*

The stations with the most high-dispersion (the greatest part of the pelit fractions) in the sediments have been chosen. There are three stations # 2, 7 and Belinsky R in this group (cxem 1, figure 5, table 6). There are two more station # 4 and 14 which have been chosen extra both the samples with most high-dispersion (table 6) and regarding in its entirety of geographic coverage: in order to be represent the top of the delta Volga River, zone of the greatest accumulation of atmospheric precipitations, sea border of delta (table 8).

Table 8. List of the samples from the 5 selected stations (see also scheme 1) for further chemical analysis

No of station. Place of the station	No of samples
Belinsky channel	Belinsky-R
2 – The Objorovskiy channel. Right bank	2
8 – Trekhizbenka drain. Right bank	7
5 – Buzan arm (at the right coast) - in 1 km lower than s. Krasniy Yar	4
12 – Gandurinskiy channel (at the right coast).	14

4) *The concentration of heavy metals and other elements in the samples of sediments in delta Volga River 08-09. 2005 y.*

Table 9. The results of determination of the elements' concentration in the samples of sediment, µg/g (dried weight)

Element	No of the sample				
	4	2	14	7	Belinsky-R
Hg	0.025	0.044	0.036	0.068	0.078
Sn	1.05	1.63	1.47	1.86	1.81
As	4.1	4.6	5.0	2.7	5.7
Cr	52	67	211	94	75
Mn	225	304	427	302	306
Zn	41	52	97	90	61
V	47	60	85	77	62
Li	64	97	176	140	69
Co	9.4	11.4	15.4	16.6	13.4
Cd	0.13	0.16	0.31	0.37	0.23
Ag	0.17	0.19	0.31	0.26	0.34
Pb	5.4	7.3	12.2	9.7	7.7
Ni	37	46	156	70	53
Cu	10.0	13.1	31.6	20.9	18.3
Fe	11200	14400	22500	23000	16200
Al	26700	32600	69600	45900	33600
Ba	448	551	819	548	449
Ca	10253	12220	16378	12422	17501

5) *The concentrations of organic pollutants in the samples of sediments in delta Volga River 08-09. 2005.*

The most of the organic pollutants were not found in the samples of sediments. This fact is in a good agreement with data of SOI, VNIgeosystems and RC “Arctic Monitoring” about investigations of the *upper* (1 cm) layer of bottom sediments in Volga delta during 2000-2004 years.

Table 10. The concentrations of saturated oil hydrocarbons in the five samples from delta Volga ($\mu\text{g per g}$ (dried weight) – for total aliphatic oil hydrocarbons, ng per g (dried weight) – for individual *n*-alkans). The detection’s limit for individual *n*-alkans is 2 ng per g (dried weight) ($\rho=95\%$). «n.d.» - not detectable (the concentration is less than the detection’s limit). There were not peaks in the zones of elution of *n*-alkans and izoprenans on the chromatogram (see e.g. fig. 3, right picture). There were non-identify peaks of nonpolar compounds (most likely biogenic origin) in the area of elution of the *n*-C₁₆ - *n*-C₂₂ (287⁰C - 371⁰C) and *n*-C₃₉ - *n*-C₃₆ (447⁰C-504⁰C).

Определяемый параметр	Номер пробы				
	4	2	14	7	Belinsky-R
Total aliphatic	30	6	22	62	12
Resolved aliphatics oil hydrocarbons	0	0	0	0	0
Unresolved aliphatics oil hydrocarbons	30	6	22	62	12
Σ n-C14-C34	n.d.	n.d.	n.d.	n.d.	n.d.
n-C12	n.d.	n.d.	n.d.	n.d.	n.d.
n-C13	n.d.	n.d.	n.d.	n.d.	n.d.
n-C14	n.d.	n.d.	n.d.	n.d.	n.d.
n-C15	n.d.	n.d.	n.d.	n.d.	n.d.
n-C16	n.d.	n.d.	n.d.	n.d.	n.d.
n-C17	n.d.	n.d.	n.d.	n.d.	n.d.
n-C18	n.d.	n.d.	n.d.	n.d.	n.d.
n-C19	n.d.	n.d.	n.d.	n.d.	n.d.
n-C20	n.d.	n.d.	n.d.	n.d.	n.d.
n-C21	n.d.	n.d.	n.d.	n.d.	n.d.
n-C22	n.d.	n.d.	n.d.	n.d.	n.d.
n-C23	n.d.	n.d.	n.d.	n.d.	n.d.
n-C24	n.d.	n.d.	n.d.	n.d.	n.d.
n-C25	n.d.	n.d.	n.d.	n.d.	n.d.
n-C26	n.d.	n.d.	n.d.	n.d.	n.d.
n-C27	n.d.	n.d.	n.d.	n.d.	n.d.
n-C28	n.d.	n.d.	n.d.	n.d.	n.d.
n-C29	n.d.	n.d.	n.d.	n.d.	n.d.
n-C30	n.d.	n.d.	n.d.	n.d.	n.d.
n-C31	n.d.	n.d.	n.d.	n.d.	n.d.
n-C32	n.d.	n.d.	n.d.	n.d.	n.d.
n-C33	n.d.	n.d.	n.d.	n.d.	n.d.
n-C34	n.d.	n.d.	n.d.	n.d.	n.d.
n-C35	n.d.	n.d.	n.d.	n.d.	n.d.
n-C36	n.d.	n.d.	n.d.	n.d.	n.d.
Pristane	n.d.	n.d.	n.d.	n.d.	n.d.
Phytane	n.d.	n.d.	n.d.	n.d.	n.d.
Squalane	n.d.	n.d.	n.d.	n.d.	n.d.

Table 10. The concentrations of polyaromatic oil hydrocarbons in the five samples from delta Volga ($\mu\text{g per g}$ (dried weight) – for total oil hydrocarbons, ng per g (dried weight) – for separated fraction). The detection's limit for separated fraction is 0.2-0.4 ng per g (dried weight) ($\rho=95\%$).

«n.d.» - not detectable (the concentration is less than the detection's limit).

<u>Determined parameter</u>	No of the sample				
	4	2	14	7	Belinsky-R
Total aromatic	0.1	2.4	0.5	20.0	1.1
Naphthalene	n.d.	n.d.	n.d.	n.d.	n.d.
Cl-naphthalenes	n.d.	n.d.	n.d.	n.d.	n.d.
C2-naphthalenes	n.d.	n.d.	n.d.	n.d.	n.d.
C3-naphthalenes	n.d.	n.d.	n.d.	n.d.	n.d.
Acenaphthylene	n.d.	n.d.	n.d.	n.d.	n.d.
Acenaphthene	n.d.	n.d.	n.d.	n.d.	n.d.
Fluorene	n.d.	n.d.	n.d.	n.d.	n.d.
Cl-fluorenes	n.d.	n.d.	n.d.	n.d.	n.d.
Dibenzothiophene	n.d.	n.d.	n.d.	n.d.	n.d.
Phenanthrene	n.d.	n.d.	n.d.	n.d.	n.d.
Anthracene	n.d.	n.d.	n.d.	n.d.	n.d.
Cl-dibenzothiophenes	n.d.	n.d.	n.d.	n.d.	n.d.
C2-dibenzothiophenes	n.d.	n.d.	n.d.	n.d.	n.d.
C3-dibenzothiophenes	n.d.	n.d.	n.d.	n.d.	n.d.
C4-dibenzothiophenes	n.d.	n.d.	n.d.	n.d.	n.d.
Cl-phenanthrenes	n.d.	n.d.	n.d.	n.d.	n.d.
C2-phenanthrenes	n.d.	n.d.	n.d.	n.d.	n.d.
C3-phenanthrenes	n.d.	n.d.	n.d.	n.d.	n.d.
Retene	n.d.	n.d.	n.d.	n.d.	n.d.
C4-phenanthrenes	n.d.	n.d.	n.d.	n.d.	n.d.
Fluoranthene	n.d.	n.d.	n.d.	n.d.	n.d.
Pyrene	n.d.	0.86	n.d.	6.0	0.38
Cl-pyrenes	n.d.	n.d.	n.d.	n.d.	n.d.
Benzo (c) phenanthrene	n.d.	n.d.	n.d.	n.d.	n.d.
Benzo (a) anthracene	n.d.	n.d.	n.d.	4.38	n.d.
Chrysene	n.d.	1.4	n.d.	6.1	n.d.
Cl-chrysenes	n.d.	n.d.	n.d.	n.d.	n.d.
C2-chrysenes	n.d.	n.d.	n.d.	n.d.	n.d.
Benzo (b) fluoranthene	n.d.	n.d.	n.d.	n.d.	n.d.
Benzo (k) fluoranthene	n.d.	n.d.	n.d.	10.9	n.d.
Benzo (a) fluoranthene	n.d.	n.d.	n.d.	H.O.	n.d.
Benzo (e) pyrene	n.d.	n.d.	n.d.	H.O.	n.d.
Benzo (a) pyrene	n.d.	n.d.	n.d.	6.5	n.d.
Perylene	n.d.	n.d.	n.d.	H.O.	n.d.
Indeno [1,2,3-c,d] pyrene	n.d.	n.d.	n.d.	6.2	n.d.
Benzo [g,h,i] perylene	n.d.	n.d.	n.d.	24.0	n.d.
Dibenz [a,h] anthracene	n.d.	n.d.	n.d.	6.3	n.d.

Table 12. The concentrations of chlorinated pesticides in the five samples from Volga delta (pg per g (dried weight)). The detection's limit is 20-40 pg per g (dried weight) ($\rho=90\%$) excepted heptachlor, aldrin, dieldrin, endrin (2-4 pg per g (dried weight), $\rho=90\%$).

«n.d.» - not detectable (the concentration is less than the detection's limit).

Determined parameter	No of the sample				
	4	2	14	7	Belnsky-R
HCB	H.O.	H.O.	H.O.	H.O.	H.O.
a HCH	H.O.	H.O.	H.O.	H.O.	H.O.
b HCH	H.O.	H.O.	H.O.	H.O.	H.O.
Lindane	H.O.	H.O.	H.O.	H.O.	H.O.
5 HCH	H.O.	H.O.	H.O.	H.O.	H.O.
pp' DDE	H.O.	H.O.	H.O.	H.O.	H.O.
pp' DDD	H.O.	H.O.	H.O.	H.O.	H.O.
pp' DDT	H.O.	H.O.	H.O.	H.O.	H.O.
DDMU	H.O.	H.O.	H.O.	H.O.	H.O.
op DDE	H.O.	H.O.	H.O.	H.O.	H.O.
op DDD	H.O.	H.O.	H.O.	H.O.	H.O.
op DDT	H.O.	H.O.	H.O.	H.O.	H.O.
Cis Chlordane	H.O.	H.O.	H.O.	H.O.	H.O.
Trans Chlordane	H.O.	H.O.	H.O.	H.O.	H.O.
Trans Nonachlor	H.O.	H.O.	H.O.	H.O.	H.O.
Heptachlor	H.O.	H.O.	H.O.	H.O.	H.O.
Aldrin	H.O.	H.O.	H.O.	H.O.	H.O.
Dieldrin	H.O.	H.O.	H.O.	H.O.	H.O.
Endrin	H.O.	H.O.	H.O.	H.O.	H.O.
Heptachlor epoxide	H.O.	H.O.	H.O.	H.O.	H.O.
Methoxychlor	H.O.	H.O.	H.O.	H.O.	H.O.
Alpha Endosulfan	H.O.	H.O.	H.O.	H.O.	H.O.
Beta Endosulfan	H.O.	H.O.	H.O.	H.O.	H.O.
Endosulfan sulfate	H.O.	H.O.	H.O.	H.O.	H.O.
Aroclor 1254	H.O.	H.O.	H.O.	H.O.	H.O.
Aroclor 1260	H.O.	H.O.	H.O.	H.O.	H.O.

Table 12. The concentrations of polychlorbiphenils (PCBs) in the five samples from Volga delta (pg per g (dried weight)). The detection's limit is 10-40 pg per g (dried weight) (ρ=90%).

«n.d.» - not detectable (the concentration is less than the detection's limit).

Определяемый параметр	Номер пробы				
	4	2	14	7	Belinsky-R
PCBs	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 8	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 18	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 28	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 31	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 44	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 49	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 52	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 66/95	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 87	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 97	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 101	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 105	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 110/7	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 118	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 126	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 128	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 138	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 149	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 153	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 156	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 169	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 170	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 174	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 177	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 180	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 183	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 187	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 189	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 194	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 195	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 201	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 206	H.O.	H.O.	H.O.	H.O.	H.O.
PCB 209	H.O.	H.O.	H.O.	H.O.	H.O.

Date: 30.12.2005

Proposed by:

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