

PROGRAM OF INVESTIGATION OF POLLUTION IN WATER AND AIR BASIN OF THE VOLGA DURING THE XI SYMPOSIUM ON MOLECULAR SPECTROSCOPY OF HIGH RESOLUTION

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The XI Symposium—School on Molecular Spectroscopy of High Resolution (HighRus-93) had been held from June, 28 to July, 7, 1993, onboard the ship "Il'ya Repin" cruising en route Moscow—Nizhny Novgorod—Moscow. Among participants of the Symposium there were 110 specialists from Russia and the republics of the former USSR as well as 22 west scientists.

In parallel with lectures, reports, and discussions, the Symposium program included a complex ecological expedition, the purposes of which were

- to test and demonstrate pilot specimens of new instrumentation designed to measure water and air pollutants by optical methods;

- to conduct intercalibrating measurements with concurrent use of traditional physicochemical analytical methods and new optical and spectroscopic ones for detection of water and air pollutants along the ship path;

- to conduct a series of complex measurements of the Volga water polluted by organic matter, oil products, and heavy metals;

- to determine the promising designs being candidates for standard instrumentation for ecological monitoring of inland waters.

The program of the expeditionary investigations had been prepared and organized by the Organizing Committee of the XI Symposium on Molecular Spectroscopy of High Resolution and by Working Group on Spectroscopy of Atmosphere under Commission on Radiation of the Russian Academy of Sciences.

Specialists from ten research organizations were the members of the ecological expedition. They have presented 13 measuring complexes and instruments. The list of meters and organizations is presented in Table I.

Three prototypes of meters, such as a shipborne scanning laser locator for detection of pollutants of industrial origin on water surface, a long-path gas analyzer of air on base of continuously tunable IR laser source, and an absorption laser analyzer of carbon oxides in air based on a diode laser, were tested under shipborne conditions and used in routine measurements as well as the rest 10 instruments.

Table II presents a time-table of the ship "Il'ya Repin" run. Time of arrivals to geographic points and the distances from each one to the initial point of the route (the Northern River Port in Moscow) are shown according to ship's sailing directions and time. The last column of

Table II presents numbers of the meters (according to Table I) used in measurements in the given point. More detailed description of operation mode of each meter is in the corresponding articles of the issue.

In the measurements performed in Yaroslavl, Kostroma, Nizhny Novgorod, Tver, and at mooring in Ples (the farthest point from the industrial centers) practically all the meters on hand were used. Three groups of method were used in the measurements to obtain results on water and air polluting. The first group is represented by traditional physicochemical methods when taking samples of water and air is followed by their analysis aboard or under stationary laboratory conditions after the passage termination (positions 1, 3, 5, and 9 in Table I). The second one includes the fast optical and laser methods of local analysis (positions 2, 3, 4, 6, and 10), and the last group is presented by the laser techniques for remote sounding (positions 8 and 11).

The given special issue consists of articles on results of testing the pilot specimens of new instrumentation as well as measurement results on water and air pollution obtained during the expedition. Besides, there are the articles both on methodological problems of measurement and on calibration of meters of local and remote type, as well as the theoretical ones.

It should be noted, that some quantitative results on environmental pollution had been obtained by certified methods and instruments and are of practical significance.

A feature of the used instrumentation is that no its adaptation to board conditions was required. All instruments operates from standard ship's mains and were placed in standard state-rooms. Measurements were conducted both at moorings and during the ship running. They had shown the specimens of new instrumentation to be promising in operative ecological monitoring of inland waters and as a base of designing the instrumental complexes of wide application in order to be located aboard standard passenger ships.

The scientific editor of the special issue thanks all members of the expedition, ship's captain and company as well as Mrs. N.S. Pugachev, G.S. Khrapov, and G.F. Gokhman for assistance in the measurement program execution. Though intended primarily for the researches, the issue will hopefully be found useful by practical specialists.

TABLE I.

N	Name of instrumentation complexes and meters	Organization
1	Instrumentation for approximate analysis of organic pollutants in water	The Scientific Production Union "Taifun", Obninsk
2	Analyzer of organic carbon soluted in natural water	The Institute of Oceanology of RAS, Moscow and the Moscow State University
3	Instrumentation for analysis of mercury and other heavy metals content in water	The Tomsk Polytechnical University, the Design and the Technology Institute "Optika" of SB of RAS, Tomsk
4	Apparatus for detecting the living microorganisms in water	The Institute of General Physics of RAS, Moscow
5	Instrumentation for analysis of organic pollutants in water	The Institute of Oil Chemistry of SB of RAS, Tomsk
6	Compact laser spectrophotometer for diagnostics of soluted organic matter and oil products in water	The Moscow State University,
7	Shipborne scanning laser locator for detection of pollutants of industrial origin on water surface	V.I. Vernadskii Institute of Geochemistry and Analytical Chemistry of RAS, Moscow
8	Laser spectrofluorimeter for remote detection and analysis of oil films on water surface	The Institute of Atmospheric Optics of SB of RAS, Tomsk
9	Instrumentation for analysis of formaldehyde and phenol content in air	The Scientific Production Union "Taifun", Moscow
10	Mercury gas analyzer	The Design and Technology Institute "Optika" of SB of RAS, Tomsk
11	Compact aerosol lidar on base of pulse semi-conductor laser	The Institute of Space Investigation, Moscow
12	Long-path gas analyzer of air based on continuously tunable IR laser source	V.I. Vernadskii Institute of Geochemistry and Analytical Chemistry of RAS, Moscow and the Moscow State University
13	Absorptional laser analyzer of carbon oxides in air based on diode laser	The Institute of General Physics of RAS, Moscow

TABLE II. "Il'ya Repin" ship time-table (June 28 – July 7, 1993) and instruments.

Date	Time	Distance from Moscow, km	Point, comment	Instrumentation and apparatus (according to numbers in Table I) used in measurements
28.06	18.00	0	Northern River Port, departure from Moscow	1, 4
29.06	8.00	125	Dubna	1, 4
	12.00	210	Kalyasin	1, 4, 11
	15.25–19.00	270	Mooring in Uglich	1, 3, 4, 10
30.06	0.30	378	Departure from Rybinsk lock	4, 11
	5.30–6.45	475	Mooring in Yaroslavl	1
	7.30–9.15	482	Mooring in Yaroslavl roadstead	1, 3, 4
	13.10–19.00	555	Mooring in Kostroma	1, 2, 3, 4, 5, 6, 9, 10
	23.55	663	Kineshma	1, 9
01.07	3.00	730	Yurievetz	1
	7.35–8.45	806	Mooring at roadstead	2, 6
	12.45–14.00		Roadstead in Nizhny Novgorod	2, 3, 5, 6
	14.20–24.00	861	Mooring in Nizhny Novgorod	1, 9, 10, 11
02.07	0.00–19.00	861	Mooring in Nizhny Novgorod	1, 2, 3, 5, 6, 9, 10, 11
	23.45	805	Lock No. 13 in Zavolzhie	2, 6
03.07	9.45–21.00	614	Mooring in Ples	2, 3, 5, 6, 8, 10, 11
	24.00	555	Kostroma	8
04.07	7.15–17.30	475	Mooring in Yaroslavl	2, 5, 6, 8, 9, 10
	20.00	428	Podosenovo	2, 6
	23.15–24.00	378	Rybinsk lock	5, 8
05.07	9.30–18.00	193	Mooring in Novookatovo	1, 2, 6, 10
06.07	7.30–18.00	233	Mooring in Tver	1, 2, 3, 5, 6, 9, 10, 11
07.07	10.00–17.00	34	Mooring in Khvoyni bor	11