

Environment and human health

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Scientists and technologists have a special set of responsibilities which belong to them both as inheritors of a tradition and as professionals and members of disciplines devoted to the search for knowledge and to the need to protect the biosphere in the context of sustainable development.

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In accordance with the Plan of Meetings and Conferences of the Siberian Branch of the Russian Academy of Sciences, the Institute of Optical Monitoring (IOM) has held the II International Symposium on Monitoring and Rehabilitation of the Environment. The Symposium took place in Tomsk in July 19–21, 2000. More than one hundred scientists from Russia and foreign countries (Belarus, Uzbekistan, Kazakhstan, Kyrgyzstan, Latvia, Korea) participated in it. The Symposium was financially supported by the Russian Foundation for Basic Research (Grant No. 00–05–74031), Tomsk Administration, and bank Dvizhenie.

A total of 45 oral reports were presented in five sessions:

- Methods and physical-technical principles of environmental monitoring,
- Methods and tools for monitoring the air quality and industrial wastes,
- Methods and tools for monitoring water and soil, electromagnetic fields and radiation,
- Effect of climate, ecology, and ecosystem changes on human health,
- Advanced technologies of rehabilitation of the environment.

The papers presented at the Symposium generalized the results of researches and considered their various scientific and practical applications. The main issues discussed at the Symposium were *environment, human being, and health*.

Besides, suggestions and recommendations on solution of the discussed problems were considered. Young scientists took an active part in the Symposium. For most of them it was the first presentation of their research. The Organizing Committee and Competition Commission awarded ten young scientists special diplomas, prizes, and certificates.

M.V. Kabanov (IOM SB RAS) in his report presented the results obtained by him and his colleagues in the main fields of the activity that form the basis of the concept “monitoringB(methodology of monitoring, instrumental methods, field observations, geo-information technologies, physical and mathematical simulation).

With regard for the requirements to the list of the measured parameters and the space and time conditions of field observations, the Institute of Optical Monitoring works at modernization of the existent instrumental tools and development of new ones employing optical and acoustic radiation. As to the development of geo-information technologies, the Institute of Optical Monitoring is now in the beginning of this program. Nevertheless, some results on practical implementation of remote recording and readout of information are already obtained, as well as the results on information collection from stationary sensors, remote sensors with coordinate reference, and others.

A particular attention in the Institute is paid to the problems of analytical modeling and numerical simulation, whose solutions just determine the final stage of monitoring. One of the main achievements in this field is the development of analytical and fast computational models of radiative processes in the Earth’s atmosphere. These models allow a significant decrease in the volume of observations at monitoring of climate and ecological changes, even on the scale of a day. Development of the methods for optical monitoring of natural and anthropogenic gases was the theme of the presentation by **I.I. Ippolitov** and **M.V. Kabanov** (IOM). **Yu.M. Andreev**, **P.P. Geiko**, and **V.G. Voevodin** (IOM) presented the developed parametrical frequency converters of mid-IR laser radiation for systems of remote monitoring of the atmosphere. **A.P. Ivanov**, **A.I. Bril’**, and **V.P. Kabashnikov** (Institute of Physics, Belarus National Academy of Sciences, Minsk) reported the results of their research into the influence of industrial plants on the regional ecological state using as an example the Soligorsk industrial plant. The materials of mathematical simulation were confirmed by the experimental data. An ingenious solution to the problems in the development of measuring tools based on the use of nickelid-titanium alloys with the shape memory was proposed in the paper by **V.Ya. Erofeev** and **M.V. Kabanov** (IOM).

Forest is among most important parts of the biosphere and plays a great role in the human life. The role of forests in keeping the stability of the environment on both regional and global scales is also extremely large. **I.A. Bekh** (Tomsk Affiliate of the V.N. Sukachev Institute of Forest) presented the results on the dynamics of forests

in Western Siberia. Among numerous natural and anthropogenic factors affecting the state of forests, the key factors are swamping and forest fires in the north and human activity in the south. On the whole, the forest dynamics represents the past and current anthropogenic impact on forestlands and demutation and endoecogenetical processes proceeding in them. The long-term experience of forestry enterprises points to the possibility of purposeful regulation of the forest dynamics.

In the report by **Yu.M. Polichtchuk**, *A.E. Berezin, A.G. Dyukarev, et al.* (Institute of Petroleum Chemistry, SB RAS, Tomsk) the effect of oil and gas production on the state of forest and swamps of the West Siberia was evaluated. It was shown that oil production affects the environment in three ways: mechanical actions disturbing hydrological conditions (continuous and temporary roads for heavy carriers), geodynamical actions (change of the formation pressure because of the extraction of oil and gas in big volumes), and chemical pollution (oil spills, salt pollution, and pollution with products of burning of oil-well gas). The comparative analysis showed that chemical pollution, which can manifest itself at large distances from a source, is most dangerous for the environment. Specialized software operating in the GIS environment was developed to conduct computer experiments for estimating the effect of atmospheric pollution on landscape components. It follows from the obtained results that the proposed technique allows the ecological load to be estimated in space and time as a function of the level of pollution and the type of natural systems based on the oil and gas production volumes, quality indexes (for example, sulfur content), and the volume of burned oil-well gas.

The subject under discussion in the report by **V.V. Kozoderov**, *A.A. Shcherbakov, V.A. Golovko, et al.* (Institute of Computational Mathematics RAS, Moscow) was the development of a prognostic information model for description of manifestations and consequences of continental natural disasters based on satellite and ground-based observational data. It was proposed to develop a general theoretical model describing the evolution of the studied processes. Thus, a new statement of the problem on predictability of natural disasters (flood, drought, forest fire, etc.) could be formulated.

The construction of the Latvian State system for atmospheric monitoring based on optical gas analyzers was considered in the interesting and detailed presentation by **A. Leitass** (Latvian Department of Hydrology and Meteorology, Riga). The system is recognized by the Environmental Protection Agency, USA, and countries of the European Union, and it has a certificate of Russia. The equipment that is used in Latvia was tested in the corresponding European institutions and was officially recognized by specialists in environmental protection and monitoring.

Now it is very urgent to reveal how the polluted environment affects human health. Various aspects of this problem (relation between the quality of the drinking water and diseases, methods for estimating the influence of integral pollution, effect of ecosystem and social changes) were discussed in the papers presented by specialists in medicine.

The reports devoted to ecology-dependent diseases of thyroid gland attracted the greatest interest of the audience. Thus, **T.V. Andropova** and *T.A. Yagudina* (Siberian State Medical University, Tomsk) analyzed the main causes of iodine-deficient diseases, determined preventive measures, and demonstrated the problems of early diagnostics. In the report by **S.V. Dubskii**, *Z.D. Kitsmanyuk*, and *N.G. Dudarykova* (Oncology Center, Tomsk), the role of the radiation factor in formation of thyroid pathology, against the background of which malignant tumors are developed, was considered.

The problem of mental and bodily health of people who took part in liquidation of consequences of the emergency at the Chernobyl Nuclear Power Station is of high social significance. Some aspects of this problem were discussed in the report by **V.A. Rudnitskii** and *V.Ya. Semke* (Scientific Research Institute of Mental Health, SB RAMS, Tomsk). The dynamic study of mental, bodily, and immune pathologies in liquidators revealed some peculiarities in the course of disease, namely, the polymorphous character of clinical manifestation of mental disorders, pathology of the immune status, numerous accompanying bodily diseases, which are considered as psychosomatic because they are accompanied by stable psychovegetative syndromes. The problems of medical-ecological mapping were discussed in several papers. **E.L. Ovchinnikova**, *G.E. Gaponenko*, and *V.G. Stasenko* (Center of State Sanitary and Epidemiological Inspection, Omsk) proposed new methodical approaches to compilation of a medical-ecological atlas of an industrial city using ground-based experimental data on the state of pollution of the urban environment. In the report by **L.P. Volkotrub** (Siberian State Medical University, Tomsk) it is proposed to use space photographs of a territory.

In conclusion, it should be noted that the forum of specialists in different research fields allowed evaluation of the current state and wide exchange of ideas by discussing the advances in methodology and instrument making achieved both in Russia and in foreign countries. The Symposium called the attention of local ecological services to further development of works in the field monitoring and rehabilitation of the environment and recommended favoring extensive complex experiments combining the efforts of different organizations in Russia and CIS countries with invoking specialists from foreign countries.