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CHRONICLE

The Third International Conference "Emission and Sinks of Greenhouse Gases in Northern Eurasia"

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On June 4 to 8, 2007, the Third International Conference "Emission and Sinks of Greenhouse Gases in Northern Eurasia" was held at the Scientific Center of Biological Studies on the premises of the Institute of Physicochemical and Biological Problems of Soil Science of the Russian Academy of Sciences (IPBPSS RAS, Pushchino, Moscow oblast). Nowadays, changes in the climate due to the increase in the concentration of greenhouse gases in the atmosphere are considered as the most threatening ecological catastrophe. The soil cover is considered as the most powerful source of CO_2 and other greenhouse gases. In 2005, the Kioto Protocol was ratified by the Government of the Russian Federation, and the problems of greenhouse gas emission and stocks acquired important scientific and political aspects. Special attention in the solution of these problems is paid to the search of efficient ways to lower the emissions of greenhouse gases and their long-term sequestration. The main aim of this conference was to sum up the results of studying the greenhouse gas emission and stocks in the territory of Northern Eurasia for the time passed since the first and the second conferences (2000 and 2003) devoted to the same issue. These conferences at the Pushchino Scientific Center became traditional with the same participants and subjects of the section sessions.

The conference was held under the patronage of the Russian Academy of Sciences and the Ministry of Education and Science of the Russian Federation. Its traditional organizers were the Institute of Physicochemical and Biological Problems of Soil Science of the Russian Academy of Sciences (IPBPSS RAS, Pushchino), the Vinogradskii Institute of Microbiology of the Russian Academy of Sciences (Moscow), the Dokuchaev Society of Soil Scientists, and the Scientific Council on Problems of Soil Science of the Russian Academy of Sciences.

Eighty scientists took part in the work of the conference from various regions of Russia (Moscow and Moscow oblast, St. Petersburg, Vladimir, Voronezh, Petrozavodsk, Syktyvkar, Tomsk, Krasnoyarsk, Irkutsk, and so on) and from Ukraine, Poland, Germany, Holland, Italy, and Japan. During the conference, there were 53 oral presentations (63 claimed) and 15 posters (25). Among the speakers were Academicians of the Russian Academy of Sciences A.S. Isaev and E.S. Vomperskii. Young scientists, postgraduates, and students also actively participated in the work of the conference. By the beginning of the conference, the proceedings *Emission and Sinks of Greenhouse Gases in Northern Eurasia* (84 p.) were published.

The conference was opened by deputy chairman of the organizing committee V.M. Semenov (IPBPSS RAS, Pushchino). He outlined the great importance of the conferences held and analyzed the history of their arrangement at the IPBPSS RAS. He said that, after the ratification of the Kioto Protocol, Russia accepted responsibility for the production of greenhouse gases over its territory. This fact results in the more careful quantitative assessment of greenhouse gas emission and stocks on both regional and global scales.

Three review reports were presented at the plenary session. They were devoted to various aspects of studying the biogenic carbon cycle—one of the basic ones on the earth. S.E. Vomperskii (Institute of Forestry, RAS, Moscow oblast) performed a comprehensive analysis of modern approaches that are used for the assessment of the carbon budget in bog ecosystems. V.G. Sukhovol'skii in his report "Analysis of Natural Data and Modeling of the Phytomass Distribution by Fractions" (Center of Ecology and Productivity of Forests (EPFC), RAS, Moscow) proposed a model for the accurate calculation of tree root and stand biomasses based on the above-

ground phytomass, as well as for the estimation of the phytomass distribution according to the data on the wood stock. The model elaborated will allow using the data on forest taxation for the calculation of the carbon pool deposited in stands. A.S. Komarov (IPBPSS RAS, Pushchino) dwelled upon the application and analysis of different mathematical models for the assessment of the carbon pool and its dynamics in forest soils. Special attention was paid to the discussion of different mathematical approaches and assumptions that are used in the model calculations.

The reports were grouped into 7 sections, which worked one after another allowing the participants to listen to all of them. *At the session of Section 1* (the "Carbon Budget and Its Components in Terrestrial Ecosystems") 12 oral reports were presented. They were devoted to studies of the carbon budget in different ecosystems of northern Eurasia and the contribution of different constituents to the total carbon flux from soils.

The work of this section was opened by the review report by D.G. Zamolodchikov (CEPF RAS, Moscow) the "Carbon Budget of Forests of Russia: Scientific and Political Aspects," where the contribution of different forest ecosystems to the total carbon sink in the territory of Russia was assessed. This report has raised not only scientific problems but also showed the political importance of the carbon budget estimates. The work by B.N. Moiseev (International Center on Forests, Research Institute of Silviculture and Mechanization of Forestry, Moscow) supplemented the previous report: it represented direct calculations of the carbon budget in forests of Russia based on the inventory data of the forest fund. V.A. Grabar (Institute of Global Climate and Ecology, Federal Service of Hydrometeorology and Environmental Monitoring (Rosgidromet), RAS, Moscow) in the report "Assessment of the Carbon Budget in the Biomass Removed during Timber Cutting" and N.F. Kaplina and V.F. Lebkov (Institute of Forestry, RAS, Moscow oblast) in the report "Reserves and Annual Removal of Carbon from the Crown Part of the Stand Biomass" calculated the carbon fluxes upon the intense utilization of forest stands. Applied aspects were considered in the work of V.A. Zheldak (Research Institute of Silviculture and Mechanization of Forestry, Moscow), who proposed systems of forest regeneration that promote carbon deposition to a greater extent.

Some reports of the first section were devoted to the analysis of the carbon budget in particular forest ecosystems, particularly, in larch forests of the cryolithozone in Central Siberia (V.I. Zyryanov et al.; Sukachev Institute of Forestry, RAS, Krasnoyarsk) and in native spruce forests of the North (K.S. Bobkova; Institute of Biology, Komi Scientific Center, RAS, Syktyvkar). I.D. Grodnitskaya et al. (Sukachev Institute of Forestry, RAS, Krasnoyarsk) represented a detailed analysis of carbon transformation in forest bog soils of Western Siberia on the basis of microbiological investigations. A.G. Molchanov (Institute of Forest Science, RAS, Moscow oblast) assessed the respiration of tree organs under different moisture conditions using an oak stand as an example. He found that the amount of available moisture might be the main factor that determines the direction of carbon dioxide fluxes in phytocenoses. V.N. Zaitsev (Institute of Fundamental Problems of Biology, RAS, Pushchino, Moscow oblast) showed that fluctuating light controlled both oppositely directed CO_2 and O_2 fluxes and parameters of functioning of metabolic donor–acceptor processes in the system aboveground plant parts–root plant parts.

In the course of the work of Section 1, an internet session with participants that could not present their reports in Pushchino was organized for the first time. Due to the enthusiasm of the organizers and the use of achievements in communication, G.V. Aleksandrov (National Institute for Environmental Studies, Tsukuba, Ibaraki, Japan) and L. Belleli Marchesini (Department of Forest Science and the Environment, University of Tuscia, Viterbo, Italy) presented their reports and even took part in discussions. The first Internet report was devoted to modeling of carbon stocks in forest stands as related to their age. The second reporter characterized the specific features of carbon accumulation in former croplands of Khakassia. The internet session showed that the use of advances in communication can increase the number of participants from different regions at future conferences.

In Section 2 "Dynamics and Fluxes of Carbon Dioxide in Soils and Cenoses of Various Regions," nine oral reports were presented; they may be subdivided into three groups. The works of the first group were based on monitoring measurements of carbon dioxide fluxes in different natural objects. In the report "Budget of Greenhouse Gases in Northeastern Tundras of Siberia" by M.K. van der Molen et al. (Vrije University, Amsterdam, the Netherlands), the results of 4-year-long observations of the CO_2 budget in Yakutian tundras using the method of microdynamic pulsations were presented. A conclusion was drawn about the fluxes of atmospheric CO_2 and greenhouse gases to the ecosystems studied taking into account the methane emission recalculated for the potential warming. A similar conclusion was reached for bogs in northwestern Poland in the work by M. Urbanek (Agricultural University of Poznan, Poland) entitled "Seasonal Variations of the CO_2 Exchange in Waterlogged Ecosystems Using the example of the Rzhechin Bog in Northwestern Poland." The method of microdynamic pulsations was also used in this study. The object was included into the widely known scientific network of the CarboEurope Project. The works presented by Russian researchers were carried out using the traditional chamber method. The main attention was paid to the influence of hydrological and meteorological factors on soil respiration in the report by E.A. Golovatskaya and E.A. Dyukarev (Institute for Monitoring of Climatic and Ecological Systems, RAS, Tomsk) entitled "The

Influence of Weather and Hydrothermal Conditions on the Daily and Seasonal Dynamics of CO_2 Emission from the Surface of Peat Bog Ecosystems in Southern Western Siberia." A detailed analysis of the effects of long-term changes in weather conditions on soil respiration was made in the report by V.O. Lopes de Gerenyu et al. (IPBPSS RAS, Pushchino) entitled "Annual Variability of Soil Respiration in Forest, Meadow, and Agroecosystems of the Temperate Zone of Russia." One of the interesting conclusions of this work was the fact that the agrocenosis is an ecosystem exposed to changes related to weather conditions to the greatest extent (the mean variation of the CO_2 flow is the highest there and reaches 33.5%). When the reports of this series were discussed, an insistent need was noted to renew the instrumental base of research organizations (for the use of microdynamic pulsations, in particular).

Another group of reports was devoted to the studies of carbon exchange in soils using the isotope methods. I.V. Evdokimov (IPBPSS RAS, Pushchino) in his methodical report "Determination of the Contribution of Microbial and Root Respiration to the Total CO_2 Emission from the Soil Surface Using Laboratory, Vegetation, and Field Experiments" revealed the advantage of continual labeling of plants in a $^{13}CO_2$ atmosphere over impulse labeling and pointed to limitations for using the method of substrate-induced respiration. Ya. Kuzyakov and K. Schnekenberger (University of Bayreuth, Bayreuth, Germany) in the report "Dynamics and Isotope Composition of Soil CO_2 after Replacement of Vegetation C_3 by Vegetation C_4" represented the results of studying the isotope CO_2 composition in soil initially formed under C_3 vegetation. In the last 10 years, it was used for growing *Sorghum sinense*, a plant with photosynthesis of the C_4 type. The data obtained indicated a very significant contribution of rhizosphere respiration to the CO_2 production.

Reports of the third group were devoted to studies of the long-term exchange processes between the soil and atmosphere. Ya.G. Ryskov and V.A. Demkin (IPBPSS RAS, "Calcareous Soils of Russia as a Stock for Atmospheric CO_2") focused attention on the functioning of the carbonate system in chernozems and chestnut soils. The authors concluded that, for the last 5 thousand years, soil pedogenic carbonates have sequestered CO_2 from the atmosphere and have been a stock of atmospheric carbon. T.S. Demkina et al. (IPBPSS RAS, Pushchino) presented the report "Production of CO_2 by Present-Day and Buried Soils of the Steppe Zone in Native and Moistened States." The authors showed that, upon moistening, the native soils emitted CO_2 more intensely than the buried ones. In the authors' opinion, humidization of the climate may increase the CO_2 production by steppe soils by two orders of magnitude. L.S. Pesochina (IPBPSS RAS, Pushchino) in the report "Regularities of the Dynamics of the Carbon Pool in Chernozems of the Azov Sea Basin in the Late Holocene" showed (on the basis of an age series of paleosols) that the climatic changes did not greatly affect the total capacity of the carbon pool in the chernozems of this region but influenced the proportion between the organic and carbonate carbon contents. The reports of this group provoked a boisterous discussion concerning the problems related to the interpretation of the information obtained and the feasibility of continuation of the studies in this direction.

The work of Section 3, which was entitled "Organic Matter of Soils as a Reservoir and the Main Source of Carbon-Containing Greenhouse Gases," was begun with the report by V.M. Semenov et al. (IPBPSS RAS, Pushchino) considering different aspects of carbon sequestration by soils. The importance of measuring the carbon-sequestrating capacity of soil—the ability of soil to stabilize carbon and hold it in its organic matter (**OM**)—was shown. A.A. Larionova et al. (IPBPSS RAS, Pushchino) represented new data on the rate of OM renewal in a gray forest soil and leached chernozem. The studies conducted revealed that the time of the OM renewal in the gray forest soil calculated using ^{13}C averaged 50 years, whereas the OM turnover in the chernozem took much more time. The exclusive role of the stable soil OM pool in the sequestration of atmospheric carbon was noted. The possibility to reconstruct the OM dynamics in coniferous–broad-leaved forests using the systems of land use earlier applied in central Russia and the models of the carbon and nitrogen biological cycles (EFIMOD) were demonstrated in the report by M.V. Bobrovskii et al. (IPBPSS RAS, Pushchino). This author showed that slash-and-burn agriculture led to a loss of soil fertility, and the stable state of the OM pool was supported by the three-field rotation system with application of fertilizers. The work by S.M. Lukin (Research Institute of Peat and Organic Fertilizers (VNIIPTIOU), Russian Academy of Agricultural Sciences, Vladimir) summarized the results of long-term studies on the OM cycle and budget in loamy–sandy soddy-podzolic soils of agrocenoses. Every year from 1.0 to 3.2 t of C/ha are mineralized in relation to the structure of the rotation and doses of fertilizers. With the application of organic fertilizers, the C-CO_2 emission from the soil exceeded the CO_2 input by crops by 579–701 kg/ha. The optimal state of these items of the carbon budget was reached upon the application of organomineral fertilizers. The effect of biological preparations on the transformation of plant residues in the soil was shown in the report by I.V. Rusakova et al. (VNIIPTIOU, Russian Academy of Agricultural Sciences, Vladimir). The presence of carbon available for microorganisms and of biologically active substances in the preparations promoted the more efficient decomposition of plant residues, which increased the OM content without changes in the CO_2 production.

Section 4, which was entitled "Methane Generation and Methane Emission from Soils," included only 4 reports. The report by E.M. Rivkina (IPBPSS RAS, Pushchino) "Biogeochemistry of Methane in Permafrost," which was based on a great amount of experi-

mental material, showed that methane-forming microorganisms not only maintain their viability in permafrost sediments but also are able to accomplish metabolic reactions at temperatures below zero. The studies performed allowed concluding that the methane formation in permafrost is an important factor affecting the total budget of inactivated methane. Three reports were devoted to the quantification of methane fluxes and particularities of the methane formation in agrocenoses on gray forest soils in southern Moscow oblast (T.V. Kuznetsova et al; IPBPSS RAS, Pushchino), on drained bogs upon peat production and agricultural use (A.A. Sirin and M.V. Chistotin; Institute of Forest Science, RAS, Moscow oblast), and in soils of Tomsk oblast (N.A. Shnyrev and M.V. Glagolev; Faculty of Soil Science, Moscow State University).

Section 5, which was entitled "Nitrous Oxide Emission from Soils and the Processes Responsible for It," included 5 reports. M. Minke et al. (Institute for Landscape Matter Dynamics, Muncheberg, Germany) analyzed the specific features of greenhouse gases (CO_2, CH_4, and N_2O) in regularly moistened and flooded peat bogs widespread in the northeastern regions of Europe. The scope of the nitrous oxide emission in the peat bogs was found to increase under their excessive moistening. N.P. Buchkina et al. (Agrophysical Research Institute, RAAS, St. Petersburg) reported on the scale of N_2O emission from soddy-podzolic soils in the northwestern region of Russia under the application of different fertilizer systems. The novelty of this work lies in the fact that the data were first obtained in the field using the method of closed chambers. The highest $N–N_2O$ losses were recorded from the manure-fertilized soil under a vetch–oat mixture during the rains. In the droughty years, the N_2O fluxes from the soils, including the fertilized ones, decreased greatly. In another report, N.P. Buchkina presented the data obtained by S.V. Pavlik et al. (Agrophysical Research Institute, RAAS, St. Petersburg), who showed that the greatest N_2O losses were characteristic of the well-cultivated and forest soils with a content of the light OM fraction from 16 to 25% of the total C org amount. The compacted cultivated soils released more N_2O than the poorly cultivated ones did.

A detailed review of the microbiogical processes responsible for the production of greenhouse gases in automorphic and hydromorphic soils was given by A.L. Stepanov (Faculty of Soil Science, Moscow State University). He showed the possibility of methane oxidation under anaerobic conditions with the participation of nitrates as final electron acceptors, changeover of monooxygenase responsible for methane oxidation by methanotrophic bacteria to ammonium oxidation in the presence of ammonium nitrogen forms, and methane oxidation by nitrifying bacteria. In the cultivated peat soil, the contribution of methanotrophs to ammonium oxidation amounted to 24%, and that of nitrifiers to methane oxidation to 9%. Practical methods of limiting the N_2O and CO_2 emissions from plowed soils were proposed by R.S. Truskavetskii et al. (National Scientific Center, Institute of Soil Science and Agrochemistry, Ukrainian Academy of Agricultural Sciences, Kharkov). These methods included deep placement of fertilizers and local application of ammonium with organomineral fertilizers.

At the session of Section 6, which was entitled "Microbiological Aspects of the Emission and Stock of Greenhouse Gases," there were 6 oral presentations on different aspects of the production and absorption of greenhouse gases by microorganisms in various soil types in the territory of northern Eurasia. N.D. Anan'eva et al. presented "Carbon of the Microbial Biomass of Plowed and Native Soils in Different Bioclimatic Zones of European Russia" (IPBPSS RAS, Pushchino). The main ecological factors responsible for the contribution of the microbial biomass to CO_2 emission from various soils were revealed. The differentiated assessment of the fungal and bacterial biomass contributing to the formation of the CO_2 flux from the soils to the atmosphere was performed using inhibitor analysis. S.Yu. Zorina et al. (Siberian Institute of Plant Physiology and Biochemistry, RAS, Irkutsk) reported on the "Comparative Assessment of the Organic Matter Status and Activity of the Microbial Complex in Siberian Agrozems Polluted with Fluoride Emissions of Aluminum Plants." Using the example of two soils with different humus contents, it was shown that the resistance of the soil microbial complex to pollution was determined both by the quality and composition of the OM and the equilibrium between the processes of mineralization and immobilization of carbon and nitrogen in the soils. E.V. Blagodatskaya et al. (IPBPSS RAS, Pushchino, Moscow oblast) gave the report entitled "CO_2 Emission from Soil and Changes in the Growth Strategies of Soil Microorganisms after the Application of Trace and Great Amounts of Glucose" devoted to problems of the response of microbial complexes to different amounts of readily available OM applied to soils. The authors showed that the high C and N excess led to a decrease in the specific growth rates of soil microorganisms and was accompanied by a negative primer effect. An important conclusion was drawn that, under a limit of C, soil microorganisms were able to change their growth strategies.

The work of A.M. Semenov et al. (Faculty of Biology, Moscow State University) the "Dynamics of the Microbial Biomass and Emission of Greenhouse Gases in the Rhizosphere Soil" allowed revealing the close correlation between the abundance of the rhizosphere microorganisms and the intensity of production of greenhouse gases. The wavy dynamics of the emission from the rhizosphere soil were first shown to be characteristic of carbon dioxide and, to a lesser degree, of nitrous oxide. The results of these investigations were considered in detail in the report by A.V. Zelenev et al. (Faculty of Biology, Moscow State University) entitled "Dynamics of Microorganisms' Abundance in and Greenhouse Gas Fluxes from Soils of Different Agri-

cultural use," where a correlation analysis was performed and quantification of the greenhouse flux was carried out. The pulsating character of the greenhouse gases emission was found to be related to the abundance of bacteria in the rhizosphere soil. Close relationships between the microbial population and the flow of some greenhouse gases (CO_2 and N_2O) from the soil to the atmosphere were found. In the report by I.N. Bogomolova et al. (Voronezh State University) entitled the "Priming Effect in Gray Forest Soil under the Application of Different Substrates," a new methodological approach for the assessment of the microbial biomass reserves in soils was presented. This approach is related to the response of microorganisms to the application of easily available OM in high concentrations.

A result of the work of the microbiological section was the comprehension of the necessity to control the production and absorption of greenhouse gases in soils. It is important to clarify the reasons for the separation of these processes, which leads to the disturbance of the soil cover as a global biochemical membrane, as well as to extend and clarify the ideas on the combined microbial transformation of nitrous oxide, methane, and carbon dioxide in different types of soils.

Section 7, which was entitled the "Methodology of Studying and Modeling of Nitrogen and Carbon Cycles," represented 9 oral reports on different approaches of measuring and modeling of the carbon and nitrogen cycles in terrestrial ecosystems. L.L. Golubyatnikov (Institute of Physics of the Atmosphere (IPhA), RAS, Moscow) in the report "Assessment of Native Ecosystems of European Russia as Carbon Sources and Stocks" described a simple model for the assessment of the carbon budget as the difference between the carbon of the annual primary biological production and that of the carbon released in the course of OM decomposition. The territory of European Russia was shown to represent carbon stocks on a global scale. Forest ecosystems of the temperate zone greatly accumulate carbon, whereas, in tundra ecosystems, the values of the carbon absorption and its emission to the atmosphere under OM decomposition differ insignificantly. Two model approaches for the estimation of the effect of different scenarios of forestry activities on the carbon budget in three forest ecosystems from different climatic zones of Finland were represented in the report by A.V. Mikhailov et al. (IPBPSS RAS, Pushchino; "Comparison of Two Model Approaches to the Assessment of the Effects of Forestry Measures on the Carbon Stock"). The use of traditional forestry measures produced close results when using these models. However, some differences between the results appeared due to the more detailed descriptions of the main processes in the EFIMOD-ROMUL system. A.V. Ol'chev et al. (Institute of Ecology and Evolution, Russian Academy of Sciences, Moscow) presented the report "The Use of a Three-Dimensional Model for the Description of the Radiation Regime of Tree Seedlings on a Small Clear-Cut Area." A local three-dimensional model of the radiation, water, and gas exchange in the forest canopy was proposed and verified. The model was used for the assessment of effects of small clear-cut areas on the radiation and temperature regimes of soils and for the calculation of the transpiration and production of tree regrowth. In the report by Glagolev et al. (Faculty of Soil Science, Moscow State University) entitled "A Mathematical Model of Methane Emission: The Experience of its Use in Different Geographical Zones," a new version of the model for methane production with the use of new relationships between the optimal and maximal temperatures of methane genesis and the latitude of the site was presented. Such an approach allowed obtaining results maximally approximate to the real ones without the calibration of the model for the site. The author showed that the calculated and observed values frequently coincided to a greater extent than those obtained with calibration for particular sites. The supplementing of the earlier developed model with a block of thermophysical soil properties and the methane cycle, which took into account the response of methane emission by bog ecosystems to climatic changes, was discussed by A.V. Eliseev et al. (IPhA, RAS, Moscow; "The Response of Methane Emission by Bog Ecosystems to Changes in the Climate and Its Effect on These Changes According to Calculations Using the Climatic Model of Intermediate Complexity of the IPhA RAS"). The numerical experiments of the model well reproduced the greenhouse gas emissions in the twentieth century. In the twenty-first century, global warming will decrease the permafrost area by 4 million km^2 and increase the methane emission from waterlogged territories. S.A. Blagodatskiy et al. (IPBPSS RAS, Pushchino) presented the report "Forecast of Nitrous Oxide Emission by Soils Using the MICNIT Model." These authors showed the possibility of developing a model for the carbon and nitrogen cycles in soils based on modern concepts of microbiological processes in soils with a detailed description of the processes responsible for N_2O emission. The data obtained using the model demonstrates good coincidence with the experimental results. The report by I.N. Kurganova and V.O. Lopes de Gerenyu (IPBPSS RAS, Pushchino) "Empirical Models of CO_2 and N_2O Emissions from Soils of Different Genesis and Land Use" was devoted to the elaboration of the empirical regression (exponential and linear) temperature dependences between the carbon and nitrogen emissions from soils of different genesis and land use. The regression coefficients obtained in the linear models greatly varied depending on the type of soil and vegetation. The interannual variation of the temperature coefficient Q_{10} determined on the basis of 9-year-long observations amounted to 28–37%. The empirical models should be used carefully for the prediction of the intensity of CO_2 and NO_2 emissions from soils. A.V. Zinchenko et al. (Division of the Central Geophysical Observatory, St. Petersburg; "A Method for Monitoring of Greenhouse Gas Emission in a Water-

logged Territory Based on Measurements in the Atmosphere") represented results of measuring CO_2 and CH_4 emissions at particular sites and proposed a method based on the measurement of increasing concentrations of these gases at night. This method was successfully applied in the northern part of the West Siberian Lowland. V.E. Ostroumov (IPBPSS RAS, Pushchino; "Modeling of CO_2 Diffusion in Soil with Frost Cracks") showed that the increase in the CO_2 emission in winter was explained by its transfer within frost cracks. A model for the effective gas diffusion in frozen soils at the walls of frost cracks may be used for the quantitative description of its transfer.

All the reports on modeling prompted active discussions. The reporters demonstrated their great experience in the elaboration of new methodology for the measurement of gas emissions and their modeling at local, regional, and global levels.

On the second day of the conference, a round table discussion entitled the Problem of Carbon Sequestration in Soils was organized. A wide spectrum of theoretical and applied issues related to the participation of OM in the production of greenhouse gases and carbon fixation in soils was actively discussed by V.M. Semenov, I.N. Kurganova, A.A. Larionova, S.A. Blagodatskii, I.V. Evdokimov, A.M. Semenov, D.G. Zamolodchikov, Ya.V. Kuzyakov, N.P. Buchkina, S.M. Lukin, A.A. Romanovskaya, and other participants.

The following problems were discussed. What relations between soil sequestration and the dynamics of greenhouse gases are there in the soil–atmosphere system? What mechanisms and factors control the carbon fixation in soils and what is the rate of these processes? Which of the terrestrial ecosystems have the highest sequestering potential and what practice of land use is the most acceptable for the long-term carbon fixation in soils? What methods for studying carbon sequestration in soils are the most reliable, sensitive, accurate, and simple? What is the cost of carbon sequestration under different ways of land use and controlling of soil regimes and plant production? How realizable in Russia is the problem of carbon sequestration by soils? Can we consider the transfer of plow soils into fallows as a carbon sequestration practice?

The participants in the discussion agreed that soil carbon sequestration should be considered as the "transformation of atmospheric carbon to OM of terrestrial ecosystems and its long-term preservation in the soil OM pool with a minimal risk of its return to the atmosphere." Considering soil carbon sequestration as an effective and promising process for decreasing the CO_2 concentration in the atmosphere, the necessity of investigating mineralization processes—studies of OM stabilization in soils and the factors that control it—were outlined. A more accurate assessment of the carbon-sequestering potential of former plowed soils (laylands) is also needed. Another important innovation was the different form of the poster presentation. Before the traditional discussion of the posters, the authors presented the main results of their works within two minutes in the institute hall. The form of the poster presentation was approved by the majority of the participants, since it could serve to stimulate the active participation of the posters' authors.

At the final session of the conference, an overview of the work of the sections was presented and a conclusion was drawn that, for the 4 years that passed since the Second Conference, the studies of greenhouse gases have been expanded to consider their geographical and thematic aspects. The number of studies with the participation of foreign scientists (one-fifth of the reports presented) has increased. This circumstance may improve the methodology of the investigations and raise the level of the work. The problem of greenhouse gases is of international importance, and contact between different specialists (plant physiologists, microbiologists, soil scientists, foresters, botanists, climatologists, specialists on bogs, and so on) is required. The sessions were well attended, and the discussions were active and constructive. One of the resolutions of the conference was a proposal for the organization of a new workshop entitled Soils and Climatic Changes within the Dokuchaev Soil Science Society. The arrangement of this group will allow organizing more frequent (2–3 times a year) workshops on particular subjects within such global scientific problems as the problems of greenhouse gases and global changing of the climate.

At the end of the conference, the participants visited areas of ecological monitoring of CO_2 emission from the soils of forest and meadow cenoses, as well as the Bison Nursery, the Museum of Nature at the Prioksko-Terrace Biosphere Reserve, and the Memorial Museum of A.P. Chekhov in Melikhovo (Moscow oblast).