The State Hydrological and Hydrochemical Monitoring in the Russian Part of Amur River Basin

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Abstract

The Amur River - one of the largest rivers of the world. Its uniqueness consists and that the river basin is located in several climatic zones. River sources are in dry continental Asia, an average and bottom current – in a zone of a Far East monsoonal climate where many rains in the summer drop out, and summer high waters are formed. The Amur River is also the most extended boundary river of Russia. The river basin is located within three states, on territory of Russia it is necessary about half of its area. We consider these features of the river at planning of an observant network. Regular hydrological observation has begun in the end of 19 centuries, hydrochemical observation – in the middle of 20 centuries. Today the stationary network of Federal Hydrometeorology and Environmental Monitoring Service works on uniform state standards which meet the international requirements, and includes points with different programs. The quantity of observation posts makes about 80 % from the necessary. For situation improvement new automatic complexes take root. Results of supervision are processed in Federal Hydrometeorology and Environmental Monitoring Service organizations, the existential analysis of the received data is carried out, then materials are transferred in the state fund of the data. Besides, observation is a basis for forecasts, including dangerous hydrological phenomena, displacement of zones of pollution. Joint Russian-Chinese researches of quality of water which since 2006 are spent according to the intergovernmental Agreement became an important part of monitoring of pollution of Amur water.

Keywords: the Amur Basin, the state observant network, hydrology, hydrochemistry.

Water Resources and Hydrology and Some Socio-economical and Environmental Aspects in the Kherlen River Basin

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Abstract

The Kherlen river basin is one of origin of the Amur river and as well as one of biggest river system in Mongolia with basin area of 116455 km^2 which is about 7.4 percent of Mongolian territory.

Kherlen river originates from southern slope of Great Khentei mountain range at altitude of 1750 m and flows toward south and east finally discharges into Dalay Lake in China. The Mongolian part of Kherlen River Basin is located in various types of natural zone and belts ranging from high mountain taiga to forest steppe and dry steppe. Climate in the Kherlen river basin is under direct influence of cold winter of Siberia and average annual air temperature varies from -2.8^0C in the upper basin to 1.5^0C in lower basin. In the Kherlen river basin, average of 227-287 mm rainfall falls a year.

Main hydrological and water resources data is collected at 4 mentioned hydrological stations. Longest period of coverage is 1947-2009 at Kherlen-Choibalsan station.

According to flow regime classification the Kherlen river belongs to rivers with rainfall and spring flood regime. About 15 percent of annual runoff forms during the spring flood while 53 percent during the rainfall flood period and remaining 32 percent of annual is considered to be as groundwater contribution. Long term annual mean runoff along the Kherlen river varies 19.3-23.5 m^3/sec.

According to water quality classification, the Kherlen belongs to calcium-hydro carbonate type of water and whole reach of the Kherlen river is characterized as “clean” water. In terms of basin water balance, annually about 240 mm in lower basin while up to 250 mm upper basin of the Kherlen river and 170-230 mm of them evaporates back and only 3-30 percent of precipitation contributes to the surface runoff. Annualy 0.60 km^3 (at Choibalsan) of surface runoff forms in the Kherlen river basin within the Mongolian territory which is about 1.7% of total surface runoff of Mongolia.

In terms of administrative units, the Kherlen river flows through 4 provinces as Tov, Khentii, Sukhbaatar and Dornod including 23 soums of each provinces. Total population in the Kherlen river basin is 109600 which is 4.1 percent of the whole coutry’s population. Key of sectors of economy in the Kherlen river are livestock, agricultural and mining. Total livestock in the Kherlen river basin is 1.42 million which is 3.4 percent of the whole coutry’s livestock.

The protected areas in eastern Mongolia are recognized internationally important areas to be preserved by its unique formation, natural complex, pristine nature and contained rare and endangered animals, plants, historical and cultural heritages.

Results of greenhouse gas scenario-A1B show that runoff of rivers in the Pacific ocean basin expected to increase by 5, 8 and 9 mm in (2020, 2050 and 2080). At same time, evaporation will increase by 310, 451, 482 mm in the region thus river basins will be much dry in near future due to climate change.

Keywords: Amur and Kherlen river basin, flow regime, surface water resources, livestock and mining and protected areas

Recent Climate Change in the Amur Basin and Its Feasible Effect on Riverine Iron Behavior

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Abstract

The climate change and the permafrost degradation data within the Amur Basin during last two decades of XX are considered in order to explain the “iron flood” in the Amur and its trib in 1990s. The soil temperature data obtained by Russian State Weather Monitoring System for some observation sites during last two decades of XX were analyzed as well as integrated trends on near-surface air temperature and precipitation rate by some climatologists over the Amur Basin. In 1980s and 1990s, it was found a kind of tied covariance in soil temperature oscillations at mutually remote meteostations from Transbaikalian through the Khanka Lake valley. There is a bird’s-eye gradual tendency of increase of annual air temperatures and annual precipitation totals in the end of 1980s and beginning of 1990s, and prominent decrease in annual precipitation in the most end of XX. Obviously, abrupt growth of number of the irrigation wells in main agricultural enterprises of Heilongjiang Province, CPR along 1995-1999 was not crucial for iron behavior in the Amur and, far less, in its northern tributaries.

Presumably, during the past half of 1990s, a large amount of dissolved iron-humic compounds have been contemporarily released by peat and peaty soils melting away into the rivers, perhaps, throughout the northern part of the Amur basin.

Pollution of the Amur River during an Ice Cover: Primary Factors of Ecological Risk

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Abstract

The problem of the Amur River pollution remains relevant for many years. The phenol contamination has discussed since 1996. Water pollution with chlorphenol and chlorinated pesticides was confirmed from 2005 to 2007. Toxic volatile organic compounds including methylated derivatives of benzene regularly had been found in various components of the Amur River ecosystem. Experiments have shown that derivatives of benzene can be produced due to microbial transformation petroleum products. Previously it was shown that ice can accumulate persistent organic matter and toxic trace metal ions. Chemical composition of upper and lower ice layers reflects on an ecological situation of river ecosystem in the beginning and in the end of freeze-up. Investigations were carried out in the area of Khabarovsk City Water Intake in the winter of 2010-2011. Ice samples were taken in mainstream of the Amur River and in its major channels (Amurskaya, Pemzenskaya). Ice melts were studied with the use of ICP-MS and gas chromatographic methods. High concentrations of volatile derivatives of benzene were registered along the right bank of the Amur River mainstream. Presence of methylated organic matter is a prerequisite for the formation of more toxic methylated mercury form. The maximal content of methylene chloride was found in the lower ice layer in front of Central Quay of the Khabarovsk City (0,33 mg/l of ice melt). The higher mercury concentration was detected in the same ice layer (0,468 µg/l). Increased toxic agents concentrations were registered in upper ice layers in the middle of the Amurskaya channel (0,036 µg/l). Mercury was found in single ice sample in the Pemzenskaya channel (lower layer at left bank – 0,026 µg/l). The toxic agents accumulated in the ice can come into the Amur estuary and coastal waters of the Okhotsk and the Japanese Seas during the Amur River ice break-up.

Ecological Co-Management of Water and Nutrients in Natural and Cultivated Wetlands of Sanjiang Plain

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Abstract

The sustainability of both natural and cultivated wetlands of Sanjiang Plain faces challenges, among which, water shortage and nutritional imbalance are serious. The hydrological and elemental cycling has been much changed in the natural wetlands in the process of wetland reclamation causing water shortage and imbalances of mineral nutrients, while the overuse of groundwater for rice cultivation greatly lowers the groundwater level, and the low efficiency of agricultural application of nitrogen-based fertilizers causes pollution to both the groundwater environment and receiving water bodies. Available mechanisms are relatively passive on protecting the remaining natural wetlands, and more proactive approaches are needed to co-manage both natural and cultivated wetlands of Sanjiang Plain to ensure their long-term sustainability. Firstly, the overuse of groundwater for rice cultivation has to be stopped to protect the groundwater environment of Sanjiang Plain as a whole. In doing so, a large scale water irrigation system should be well developed under the coordination of the central government to significantly expand the capacity of the present irrigation/drainage system to divert more surface water from rivers for rice cultivation. Secondly, agricultural runoff may be diverted to the natural wetlands when possible to provide nitrogen-based mineral nutrients to promote the growth of natural wetland plants. Such ecological co-management of water and nutrients in both natural and cultivated wetlands is essentially needed in order to simultaneously achieve sound protection of the remaining natural wetlands and sustainable rice cultivation in Sanjiang Plain.

Keywords: rice cultivation; groundwater shortage; nutritional imbalance; water diversion; agricultural runoff

Mechanism of Dissolved Iron Production and Transport in the Amur River Basin; What is Clarified and What is Still Unresolved?

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Abstract

We have executed combined monitoring and modeling studies of mechanisms of dissolved iron production and transport in the Amur River basin during the period from 2005 to 2009 through an international collaborative project 'Amur-Okhotsk project' funded by Research Institute for Humanity and Nature. Our studies revealed that wetlands of which total area is only about 7% are producing highly concentrated dissolved iron, while dissolved iron productivity of forest occupying more than half of the basin is low. Thus, major source of dissolved iron is suggested to be wetland. Annual dissolved iron load from the Amur River was estimated at 1.1×10^{11} g. Conversion of wetlands to agricultural lands have great effect on decreasing dissolved iron productivity has been clarified. Negative impact of forest fires on dissolved iron productivity of forests was also detected. Long term monitoring data of total iron concentration at the mouth of one watershed in the China side clearly shows decreasing trend according to wetland decrease accompanying with increase of agricultural lands. On the contrary to this, dissolved iron concentration of the main course of the Amur River does not show decreasing tendency. Moreover, as an unexpected finding, we found that drastic increase of dissolved iron was recorded in the late 1990s'. Though we proposed possible hypothesis explaining this drastic increase, these hypothesis were not fully verified within the project period. Modeling study indicated that combined effects of unusual flooding and intensive irrigation using groundwater which contain rich dissolved iron would be effective mechanisms. However, many unresolved points still remained. Thus, periodical monitoring of dissolved iron concentration of the basin is necessary condition to provide more complete understanding of dissolved iron production mechanisms.

Pivotal Roles of Sea Ice on Biogeochemical Processes in the Sea of Okhotsk

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Abstract

In the Sea of Okhotsk, large amounts of sea ice are produced along the Siberian coast in every winter, and the sea ice are transported and extents to the wide area. In addition, the Sea of Okhotsk has high primary production in the time of the ice retreat. However, influences of the sea ice on the spring productivity and biogeochemistry have not been clearly understood, especially in the chemical aspect. To elucidate the roles of the sea ice on dynamics of macro- and micro-nutrients in the Sea of Okhotsk, direct observation for biogeochemical parameter, which covered all season including winter, were conducted. Iron (Fe) data in the water column and in the sea ice which were collected during sea ice retreat season indicate that the melting ice provided substantial Fe to the surface of the water column. On the other hand, nutrients-rich seawater was existed beneath the ice-influenced surface water, and massive phytoplankton bloom occurred in the boundary between the Fe-rich surface water and the nutrients-rich seawater. These results clearly indicate that the additional Fe input from melting sea ice could be biologically important. Additionally, incubation studies which were conducted in the southern part of the Sea of Okhotsk clearly indicate that Fe became limiting factor for phytoplankton production in termination phase of the spring bloom around the Kuril Island. Variability in sea ice dynamics are likely to result in a varying supply of Fe to the southern part of Sea of Okhotsk in early spring, and to contribute to changes in the timing of termination and community composition of the spring phytoplankton bloom, especially around the Kuril Islands. Shift in climate patterns in recent decades might have affected not only the sea ice extent but also biological production through the sea ice biogeochemistry in the Sea of Okhotsk.

Monitoring of Ice Conditions in the Sea of Okhotsk as a Factor for Preventing Ecological Risks Connected with Oil and Gas Projects

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Abstract

Okhotsk Sea is highly productive marine ecosystem and is of crucial economic importance, both for Russia and Japan. Human activities leading to ecological imbalance, abnormal appearance of natural and industrial situations: natural disasters, accidents and disasters. In addition, daily humanity faces many severe natural phenomena that are affecting the product of human activities, increase the risk factors that lead to environmental catastrophes. Active development of offshore oil and gas, has increased the construction of terminals and berthing facilities, and in areas of their location - the intensity of shipping. In temperate climate, berthing and oil offshore structures and vessels is a significant risk of their exposure to the moving ice masses. With their year-round operation is a major problem for security. The aim of this work carried out in the Sakhalin State University on the sustainable development agenda, is the study of regularities spatial and temporal variability of ice conditions in the Sea of Okhotsk and the need for improved methods to assess fluctuations and trends in the parameters of the state of natural systems in order to improve the accuracy of estimation and forecasting of ice conditions and, accordingly, reduce the risk of execution of marine operations. Knowledge of ice conditions in the upcoming ice season is an important factor for coastal fishing. In this paper we consider some methodological issues for evaluating the variability of hydro-meteorological parameters in terms of their influence on the formation of extreme ice conditions.

Monitoring of Ecological Conditions of the Far East Seas

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Abstract

Distributions of radioactive elements in the coastal zones The Sea of Japan and The Sea of Okhotsk are discussed. Monitoring has been executed on research vessels FERHRI. The estimation of radioactive pollution of water, air, sediments in 2011 by results of sea monitoring are given.

Keywords: air, monitoring, sediments, water

Coordinated Efforts among Ocean Science Expertise to Explore and Solve Marine Pollutions Caused by M9 Earthquake

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Abstract

The Tsunami was produced by the Magnitude-9 earthquake off Japan on March 11 and caused devastation on land in particular the Fukushima-I nuclear power plants. Radionuclide falling out from the atmosphere mainly in March spread widely over Japan and the Northwest Pacific. A direct flow out of the power plants in early April poured radionuclide into the coastal region and subsequently the Kuroshio Extension. The ocean floor close to Japan coast has received bottom sediments contaminated with Cs-137. Not only radioactive contaminant but also coastal flooding impacts and other non-radioactive pollutants have given damages on the marine ecosystem. The Oceanographic Society of Japan has established Working Group on M9 Earthquake and coordinated expertise in oceanic sciences and the related disciplines (fisheries science, atmospheric science, limnology, nuclear engineering, radiology).

Numerous oceanographic cruise collected water, sediment and biological samples from Japan coast to the date line, including the US-lead cruise. The samples have been analyzed with a standardized protocol by the analysis teams in Japan and foreign colleagues. Simulation was carried out by formulating a systematic inter-comparison of ocean models (MIP). The information collected through these coordinated efforts has been opened quickly to public with appropriate explanations so that thoughtful citizens may be able to understand the fact. Responsibility is realized for passing information to the international community as well.

A more detailed report is given on the simulation. The models were developed to reproduce ocean current patterns and water structures, under atmospheric forcing and river flows. The coastal models were applied to reproduce freshwater- and wind-driven currents and connected to the mesoscale features in the offshore side. The models were first verified against current meter data collected before 2000. The polluted water spread along the coast southward on the average with variations due to the wind forcing and was taken away within the mesoscale eddies. Low-level pollution spread along the Kuroshio Extension and will be carried by the general circulation for a few years. Even though the current patterns were reproduced consistently among the models, the radionuclide contents showed significant differences in the coastal region a few hundred kilometers southward. An additional attempt is getting under way for simulating the component in sediments.

Results of the Monitoring Data of Radioactive Materials in the Coastal Waters around Hokkaido

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Abstract

It was reported that the primary releases of radioactive nuclides from the crippled Fukushima Daiichi Nuclear Power Plant have been iodine and caesium, however, strontium and plutonium have also been found. These elements have been released into the air via steam, and into the water leaking into groundwater or the ocean. Central Research Institute of Electric Power Industry has checked that 3,500 TBq of Cs-137 have been released into the Pacific Ocean after the 2011 Tohoku earthquake and tsunami until the end of May. Moreover about 10,000 TBq were added to the ocean from the air. There is a hypothesis that these materials will be stocked and circulated in the pacific ocean more than 30 years.

Ocean current off the Fukushima Daiichi Nuclear Power Plant, where the Oyashio cold current from the north and the Kuroshio warm current from the south meet, are thought to be moved to the central part of the Pacific Ocean from the coast. The result of the observation of drift bottle from Fukushima coast indicated that the drift bottle did not get to Hokkaido's coast. As a result, radioactive materials are not transferred so easily into Hokkaido's coast by the ocean current.

Radioactivity, iodine-131 and caesium-134/137, have been monitored on the air quality, water quality and sea life every two weeks in Hokkaido. In this report, we will report on the sea water quality and sea creatures in Hokkaido. Three sea areas, 9 swimming areas and 19 sea creatures involved sea grasses and a whale, are targets.

Latest results revealed from some samples by Hokkaido government about the above showed extremely under the emergency predictive values of Cs-137, Cs-134 and I-131, respectively. Consequently, all targets are still quite safe. These monitorings will be continued until safety is assured.

Distribution, Behavior and Countermeasure Issues of Radioactive Contamination in Soils

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Abstract

On March 11, 2011, a massive earthquake of magnitude of 9.0 occurred off the Pacific coast of northeast Japan. The Tsunami generated by this earthquake caused great damage to wide coastal areas in Tohoku Region including Fukushima prefecture where Fukushima 1 Nuclear Power Plant is located. On March 14, 2011, a hydrogen explosion occurred at No.3 reactor and a similar explosion occurred at No.1 reactor. Due to the explosions and some other troubles, tremendous radioactive materials including ^{131}I, ^{134}Cs, ^{137}Cs were released into the atmosphere, and consequently induced a wide area of soil pollution contaminated by these radioactive materials due to rainfall. In this paper, I discuss about distribution, behavior and countermeasure issues of radioactive contamination in soils.

Distribution and Behavior

The estimated area of agricultural land, where the concentrations of radioactive materials in soils are over 5000 Bq/kg-15cm, is about 26,000 ha (Ministry of Agriculture, Forestry and Fisheries, 2011). Also, the total volume of the contaminated soil in areas where air dose r**ate** of radioactive rays is more than 5 mSv/year is estimated to be 20,833,000 –28,385,000 m^3 (Ministry of Environment. 2011). By contrast, the large amount of ^{134}Cs and ^{137}Cs likely remains in the surface layer of the soils. Our field study at Koriyama city conducted on July 24, 2011 indicated that 80%-90% of ^{134}Cs and ^{137}Cs were observed in the soil above the depth of 1 cm due to their strong adsorption to soil. We also simulated the transport of ^{134}Cs and ^{137}Cs in soil using the convective and dispersion equation over next 50 years and evaluated the large amount of ^{137}Cs will remain in depth of 100 cm from land surface next 50 years.

Issues on how to manage

Our research team assessed several methods for managing and treating the radioactive contaminated soils (e.g., institutional control, soil replacement and soil washing) in terms of performance, reliability, direct countermeasure cost, land-use regulation, indirect cost and remediation time. We also indicated 3 serious and practical issues to accelerate countermeasures for the management of the radioactive contaminated soils. First, there has been no standard for the remediation level required; MoE will establish the standard by January 2012. Second, the places to keep the radioactive contaminated soils have not been determined. The third issue is re-contamination from surrounding environments (e.g., forest) and sources after the remediation.

Effects of Radioactive Contamination on Fisheries Resources and Wildlife

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Abstract

I discuss aspects of wildlife near Fukushima I NPP and seafoods. Radioactive contaminations of I-131, Cs-137, Cs- 134 are mainly concerned. Meltdown occurred in reactors 1,2 and 3 of Fukushima Daiichi NPP. In addition, fuel fired in unit 4. Major source of atmosphere contamination is hydrogen explosion of unit 3 on March 14. Major source of seawater contamination is emission by a hole into the pit near reactor 2 that was blocked by water glass on April 6 morning.

Recent concerns of wildlife management in Japan are not extinction, but “over-abundance” of deer, monkeys and boars, all of which inhabits near Fukushima-Daiichi NPP. Human excluded zone (20km zone) is a “heaven” of wildlife despite of radioactive contamination Wildlife may threat damage on agriculture outside of the 20km zone. Human activities including agriculture outside planned evacuation zone is limited. We cannot catch them in the 20km zone.

Radioactive contamination of seafood may not be very serious for the biodiversity of marine ecosystems. threats. Fisheries activities and consumptions of seafood significantly decreased after the Fukushima-Daiichi NPP accident. Major source of radioactive contamination is I-131, Cs-134 and Cs-137, whose physical half-life periods are 8 days, 2 year and 30 years, respectively. I-131 is concerned by internal exposure at thyroid. The exposure in the first month after the accident is probably significant for neighbors. Seaweeds produced near Fukushima may be highly contaminated, but seaweed is effective to remove I-131 from thyroid. We need further monitoring of seaweed contamination.

Biological half-life period of Cs is about 50 days. The contamination level of seafood significantly decreased one month after the accident. Some ground fish are still contaminated higher than the interim standard (>500 Bq Cs-134 & 137/kg). If food with higher contamination than standard is excluded from the market, the average radioactive exposure from vegetable and seafood is significantly small (0.37mSv in 2011). Even if contaminated foods are not excluded, the average exposure is 1.07 mSv. Sr-90 has a long physical half-life period and accumulated into bones, although it was not released from the Fukushima Daiichi NPP accident. It is therefore not serious if we do not eat bones of top predators. Plutonium contamination level is very low and negligible. In conclusion, the contamination level of vegetables and seafood is not very serious if the sampled inspection of radioactive contamination level is effective.

The New Project "Environmental Criteria and Restrictions in the Programs for Sustainable Nature Management in the Amur River Basin": Main Tasks and Expected Results

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Abstract

The present Project started at July, 2010. The following tasks will be conducted for the project implementation: 1. complex assessment of the Russian part of the basin; 2. analysis of environmental problems in the Amur basin; 3. landscape mapping; 4. development of the ecological-economical balance model in the programs of sustained nature management; 5. development of environmental criteria and indexes of sustained nature management on the basis of analysis of landscape structure, implementation of functional zoning of the Russian part of the Amur basin with singling out of priority, possible and forbidden types of nature management. Tasks 1, 2, and part of tasks 3, 4 were resolved to date. The main results are the next. Socio-economic description and assessment of the basic types of nature management in various parts of the territory, including traditional nature use by indigenous people was made. The mineral and forest resources included an assessment of their condition, use and impact on the environment were analysed in detailed. Environmental problems of the nature use, environmental hazards and risks, modern biodiversity state and nature protection were examined. Landscape map of Russian part of Amur basin was created. Carried out cause-consequence analysis of the environmental problems and hazards is also an important part of the Project. Obtained results can serve as the information basis for long-time monitoring of global changes of environment experiencing the influence of natural and anthropogenic factors and for provide a strategy of sustainable development.

Keywords: Amur basin, environmental problems, landscape mapping, land use.

Environmental Problems in the Russian Part of the Amur River Basin: Tendencies of Last Decade and Future Prospects

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Abstract

Natural environment of the Amur River Basin was significantly transformed during the last 150 years due to various economic activities. Analysis of environmental problems in the Russian part of the Basin was one of the first year's tasks of the project "Environmental Criteria and Restrictions in the Programs for Sustainable Nature Management in the Amur River Basin" carrying out since 2010 by the Pacific Geographical Institute FEB RAS and the Institute of Water and Environmental Problems FEB RAS under the financial support of International Science and Technology Center. Examination of the contemporary ecological situation was based on the data from various literary sources and official statistics of the administrative units of the provincial level (Primorskii, Khabarovskii and Zabaikalskii Krais, Amurskaya and Evreiskaya Avtonomnaya Oblasts). The studies were mainly focused on such environmental problems as air and water pollution, wastes generation and reclamation, alteration and transformation of natural landscapes, land use changes, and their dynamics over the last decade. Researches of the indicated environmental issues were directed to the claryfying of their spatial distribution within the both administrative Krais and Oblasts and the Russian part of the Amur Basin, as well as to identifying a cause-effect relationships between environmental problems and various kinds of economic activities (agriculture, forest industry and forestry, residential and industrial land use). Forecasts of possible changes of environmental conditions and natural landscapes during the next 10-15 years were made on the base of projected directions of economic development in the Amur Basin scheduled in the official state and regional Programmes and Strategies of socio-economic development of the Russian Far East and the Baikal Region.

Keywords: Amur River Basin, statistics, environmental problems, air and water pollution, land use changes, wastes generation, natural landscape transformation, economic activity.

The Study of Land Use Change in Sanjiang Plain of China

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Abstract

Regarded Sanjiang Plain as the research object based on multi—temporal remote sensing data, dynamic process of the land use was analyzed using 1995 and 2000 year's land use maps. The transition probability matrix about the land use type between 1995 and 2000 was calculated. Under the help of the Markov Process, the land use transition probability matrix was built to predict the land use situation in year 2005,At first, the remote sensing interpretation data of 2005 was used to validate the Markov Process, showing that the Markov Process is efficient and suitable for prediction in the area. Except for wetland(0.26％),other land—use types difference between prediction and interpretation value is less than 0.20％.Then, the land use pattern in 2010 and 2015 was predicted using the Markov Process. The results find that if the current land use policy is kept in the next 10 years, the areas of farm land and grassland will markedly increase, and the areas of wetland and forest land will obviously decrease. The share of farmland and grassland increase from 56.21％ and 3.71％ in 2005 to 63.88％ and 3.88％ in 2015;the share of forest land and wetland decrease from 28.05％ and 7.46％ in 2005 to 25.53％ and 5.39％in 2015.According to the results of the prediction, the land use pattern can be adjusted, which may serve as a scientific basis for regional ecological environment protection and land resource rational utilization.

Keywords: Land use change; The Markov Process; Sanjiang Plain of China

The Urgent Tasks for Northeast Asian Countries Confronting with the Challenges of Non-traditional Security--Information Sharing in View of the Ecological Security & Environmental Protection

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Abstract

In recent years, compared with the relatively controllable traditional security field, the non-traditional security factors have grown both in importance and risks within the Northeastern Asia region as well as the whole world, which brings many negative effects to the cooperation between different nations and regions, especially those concerning environmental protection, ecological safety, food safety, the spread of nuclear energy. Negative news caused by the lack of transparency, openness and sharing of information is now common occurrence. In order to respond to those risks mentioned above effectively and overcome the impact of non-traditional security, Northeastern Asian countries should apply information disclosure and sharing cooperation as powerful means and important tasks at the moment. Using information disclosure, sharing and cooperation as the main line, this paper starts with the severe situation of non-traditional security and aims at discussing the effective mechanism and methods which promote cooperation.

Forest Development and Utilization of the Russian Far East

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Abstract

The forest area in the Russian Far East accounts for about one-third of the total forest area of Russia, and its timber stockpile amounts to one-fourth of the total amount of Russia. Forestry (mainly timber harvesting and wood processing industries) has become one of the key industries in the Russian Far East, and has played an essential role in the development of the regional economy. After the Soviet breakup forestry in the Far East fell into crisis, and has yet fully to recover. Forestry in this region has mostly striven to expand export markets due to the decrease in demand from the Far East itself. Forestry in the Far East had tended to recover along with the increase in the timber export; however, the policy to raise export tariff on logs enforced in 2007 has had a strong influence on Russian forestry, specifically on that of the Far East. The objective of this paper is to examine the wood trade and international cooperation related to the Far East by analyzing the forest resources of the Russian Far East and reviewing policies pertaining to the expansion of forestry.

The Role of New Investment Projects in Nature Management in the Amur River Basin

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Abstract

Realization of any investment project (building of a new enterprise, a transport object, modernization of existing enterprises, etc.) is always connected with nature management. These are both an additional use of natural resources (a territory, water, building materials, wood, etc.) and environmental contamination. Data on over 100 investment projects planned for realization in various programs of long-term development are generalized for the Russian part of the Amur River basin. The most of the projects are those related to extraction of natural resources (ores of black and nonferrous metals, coal, wood and building raw materials), transport, and construction and power sector. Estimations of resource-consumption growth and the influence on environment at various variants of realization of investment projects were done. Estimation maps were compiled.

Recent Features of Economic Cooperation in Northeast Asia

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Abstract

Looking back a few years ago, economic sub-region of Northeast Asia has been changed dramatically. China made a strategy which aims to turn Province Jilin into economic sub-region of Northeast Asia, and Russia is implementing a Special program of the development for The Far East and Zabaikal region. Mongolia consigns coal development to Japan, China, Russia and America, and extends its railway to the northwest to connect Chinese northeast region's railway. China constructed carriage rail from Autonomy state Enben to Rasen-city, and Russia completed to revamp railway from station Khasan to station Rajin and first train run in October. North Korea made an agreement with Russia to construct natural gas pipeline from Russia to South Korea via Korean peninsula. While these construction developing, we are required conservation, a system of international supervision, criteria for regal judgment, regulation, law, an academic exchange and a development of education. To develop and build The International Meeting of Amur-Okhotsk Consortium which can achieve our requirement into track 2nd is urgent need.

Cooperation between the Stakeholders as a Factor for Sustainable Development of the Amur-Okhotsk Ecosystem

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Abstract

Article contains systemic notion about sustainable development processes, which on the one hand reflect main components of society sustainable development processes and on the other hand show quintessence of sustainable development. This quintessence consists in coordinating stakeholders' aims in realization of sustainable development. Simulation game "At the lake" is adequate model of stakeholders' aims coordination problem. Conflict between aims of the individual (or of the group) and aims of the society is modeled and repeated in this game. Settlement of this conflict is possible both for benefit of individuals and for benefit of society. There are a great number of examples for this situation in the real life and particularly in the Amur-Okhotsk ecosystem. Partnership is presented as a most effective method of coordinating stakeholders' aims. Just because of effective coordination of stakeholders it is possible to reach complex objects of sustainable development. This assertion lies in the basis of partnership approach. This approach creates new possibilities for the social development as a result of better understanding of activity terms and sectors' possibilities as well as searches new ways to use these possibilities for purposes of sustainable development. Sustainable development realization activity of certain stakeholders in Amur-Okhotsk ecosystem is analyzed.

Keywords: systemic notion about sustainable development processes, stakeholders, simulation game, partnership.

The Sakhalin Project and Hokkaido Fishery

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Abstract

The fishery production volume in Hokkaido is a quarter of total production in Japan, and one fifth in total sales in Japan in fishery. Currently, Japanese Fishermen are promoting the fishery resource management. Therefore, especially in Hokkaido, fishermen are interested in the environmental matters. The fishery organizations in Hokkaido operates its own environmental research center and the center conducts the environmental analysis for the fishery associations in Hokkaido. From day to day, the inspections of construction sites to prevent muddy water are conducted and the analysis of effluents is conducted to check the harmful substances.

Recently, developing the oil is in progress around Sakhalin Island in the north of Hokkaido. Sakhalin-2 and Sakhalin-1 project are well-known. Souya strait between Sakhalin and Hokkaido are very narrow. In this narrow strait, the huge oil tankers and the LNG carriers are passing. Against oil spill incidents and large vessels accidents, the equipments and rescue vessels are insufficient in Hokkaido area. Against these accidents, the fishery organizations have asked to establish the measures to the government. On the other hand, aiming for the information sharing to preventing accidents, the direct negotiations with Sakhalin Energy Investment Company have been made. And letter exchanges was done for that purpose. In addition, to JBIC and NEXI, we have asked the leadership as the official lender to Sakhalin Energy in Japan on the basis of letter exchange with JBIC and NEXI. Futhermore, we have asked the government to the measures to promote the safe navigation of huge tankers and carriers to prevent accidents such as collisions or oil spill. Recently, for the information sharing and the measures against oil spill incidents, the representatives of fishery organizations visited to Sakhalin and had the meeting with Sakhalin Energy or Sakhalin Government or the Consulate General of Japan. Nowadays, fishery organizations are contacting to Exxson Neftgas as the operator of Sakhalin-1 project.

The Amur River Basin: A Region at Risk? Environmental and Political Consequences of Chemical Spills in the Songhua River

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Abstract

The November 13, 2005 chemical spill in the Songhua (Sungari) River highlights some of the risks facing the Amur River Basin. The health of the Songhua River, one of the largest tributaries of the Amur, affects the habitats of endangered plant and animal species as well the drinking water of millions of people. The paper recaps the 2005 spill and subsequent accidents in the Songhua River. Chinese provincial level and national responses are examined, within the context of Chinese legislation on emergency response. The paper then evaluates the impact of chemicals spills in the river on Sino-Russian environmental cooperation. The paper discusses the need for transparency in environmental reporting for appropriate emergency response and trust in cross-border relations. Finally the paper underscores the importance of environmental protection for safeguarding the unique habitats and drinking water in the Amur River basin and urges further Track II efforts such as the Amur/Okhotsk Consortium to achieve more ecologically sound and transparent water management practices.

Regional Environmental Cooperation and Agreements on the Conservation of Shared Natural Resources in Other Regions

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Abstract

The Amur-Okhotsk Project (2005-2009) has recently found that the primary production in the Sea of Okhotsk has been dependent on the dissolved iron transport from the Amur River basin. It is also reported that water pollution in the Amur River basin might cause severe damage to the ecological condition in the Sea of Okhotsk as well as the downstream areas as it is the case with the Songhua River accident (2005). Therefore, in order to conserve the marine resources in the Sea of Okhotsk, it is also necessary to protect the environment in the Amur River basin. It needs international cooperation among relevant countries because the Amur-Okhotsk ecosystem is shared by China, Mongolia, Russia and Japan. While an attempt to establish a cooperative framework for the conservation of this ecosystem has just recently started, it is not clear what this should look like. In order to further explore the possible framework, we should study existing frameworks of international environmental cooperation developed in other regions. Concerning the marine environmental protection, we studied the activities of Helsinki Commission (HELCOM) on the Protection of the Marine Environment of the Baltic Sea as a desirable model. Considering that the Amur-Okhotsk ecosystem actually has the characteristic of the upstream-downstream relationship, however, it is also helpful to examine cooperative frameworks for the international river basin management such as the pollution reduction case of the Rhine River basin. This presentation will review the experiences of these cases as exemplary ones of transnational environmental cooperation, especially focusing on data sharing, information exchange and incongruence in preference between states.

Keywords: data sharing, incongruence, information exchange, international cooperation, HELCOM, Rhine

How I Have Developed a Close Collaboration with Far Eastern Hydrometeorology and Environmental Monitoring since My First Visit to Khabarovsk in 1999

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Abstract

I have fallen in love with beautiful Okhotsk sea ice since my first visit to an Okhotsk Sea cost of Hokkaido in winter in 1980s. It was in my student days. A professor taught us that low-salinity surface layer in the Okhotsk Sea suppresses deep convection and promotes freezing. He also said that low-salinity layer is mainly due to the inflow of the fresh water from the Amur River. In the late 1990's, a student, whose name is Masayo Ogi, and I started to verify this processes using Amur River discharge data. Our time series analysis based on sea-ice and river-discharge data suggested that interannual variations in the ice extent are negatively correlated with the amount of discharge. This means that the amount of the river discharge was below normal, the ice covers abnormally large areas in. This is opposite relation to the suggestion by the professor. But the problem is that the river-discharge data after 1991 was not opened in public. 1991 is the downfall of Soviet Union. To strengthen our finding, the river data after 1991 is necessary. But, Japanese could not see the data after 1991. We had almost given up trying to see the river data. But, a casual meeting with a Russian physical oceanographer made everything changed. His name is Michael A. Danchenkov in FERHRI. Both he and I were casually in the Okhotsk Sea boarding in Russian research vessel, Khromov, in 1998 for about a month. During the long cruise, we deepened our friendship, and I introduced him about our finding. One year later, in 1999, I visited Vladivostok to discuss with him about our finding. Then I tripped to Khabarovsk with him. The story of the development of a close collaboration with Far Eastern Hydrometeorology and Environmental Monitoring started at this time. The detailed are presented in the Meeting of Amur-Okhotsk Consortium 2011.

Collaborative Data Analysis between FERHRI and ILTS on the Okhotsk Sea Data

Humio MITSUDERA
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Abstract

Hydrographic data in the Sea of Okhotsk collected by Far Eastern Hydrometeorological Research Institute (FERHRI) is being analyzed collaboratively between FERHRI and Institute of Low Temperature Science (ILTS). FERHRI database has data volume three to five times larger than those of the previous datasets such as WOD due to inclusion of unpublished Russian observation data. Number of data near the coastal region has increased dramatically. After the erroneous data being removed from the database through pertinent quality control methods, the gridded climatology on isopycnal surfaces are produced by the objective analysis. Since only Russian scientists are allowed to access raw data of the FERHRI hydrographic database, data processing that should be done with the raw data (i.e. quality control, making time series of certain areas, etc) has been done by FERHRI, and analyzed results were shared between the institutes. Climatologies with 1 degree resolution over isopycnal surfaces will be available for research community.