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2- nd International Meeting of Amur-Consortium  
November 5–6, 2011, Sapporo, Japan

# The state hydrological and hydrochemical monitoring in the Russian part of Amur river basin.

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In planning and organization of the observation network in the Amur River basin are taken into account the features of this great river. Amur River is in the top ten largest rivers in the world, being the longest river boundary. About half of the basin area is Russia. In our country the Amur river flows across five administrative entities.

# The tasks of the hydrological network

- regular hydrological observations, including the dangerous hydrological phenomena;
- execution of the primary processing of the results of hydrological and related observations;
- transmission of operational information on the actual status of water bodies; Provision of public authorities, industries and the public information on the actual status of water bodies on land, forecasts and warnings received from the forecast of Roshydromet.

# observation programs

Type of post	observation	works
level	for water levels, water temperature, the phenomena of ice conditions (visually), the thickness of the ice, sludge and snow depth on ice, the spread of aquatic vegetation (visually) for the slope of water surface, the Meteorological characteristics (program of additional work).	
discharge	for water levels, water temperature, the phenomena of ice conditions (visually), the thickness of the ice, sludge and snow depth on ice, the spread of aquatic vegetation (visually) for the slope of water surface, the Meteorological characteristics (program of additional work).	determining the discharge of water, determining the discharge of suspended sediment: the selection of single water samples for turbidity, water sampling to determine the size distribution of suspended sediment, soil sampling to determine the size distribution of bottom sediment.
hydrochemistry		the sampling for chemical analysis

Hydrological work is very heavy, especially in the harsh climate and because of the large distances.





These observations are transmitted in an organization to analyze the Hydromet their authenticity. After fixing, the systematization of established forms of observational data are transmitted ultimately to the State Water Register. Under Russian law, the Registry is responsible for maintaining the Federal Agency for Water Resources. Information about accessing State Water Register is available at <http://voda.mnr.gov.ru>.

## Current status of hydrological network

The average density of the network in the European part of Russia is  $2829 \text{ km}^2 / \text{post}$ , on the Asian side -  $8110 \text{ km}^2 / \text{post}$ . Density of hydrological network in the Amur basin is now **7230**  $\text{km}^2 / \text{post}$ . Number of items with details on the basins is presented in Table 2.

Density of stock positions in the Amur basin is 10 280 km<sup>2</sup> / DC. In accordance with the recommendations of the World Meteorological Organization (WMO), the density of the stock positions shall be as follows

Physico-geographical areas *	The minimum density of stock positions
seaboard	2 750
mountain	1 000
plain (domestic)	1 875
hilly	1 875
small islands	300
Polar / arid / hard-to-get	20 000

WMO recommends that to determine the minimum density of hydrological networks use designs for specific river basins, taking into account the following general principles.

***The observation network should***

- effect the existing social, economic, physico-climatic conditions
- be optimally located and the cost for its operation
- ***consider particular areas (in particular, their inaccessibility)***



### *The main approaches to the observations of the water regime of river :*

- The main task of a network is to provide information on the availability of surface water resources, their geographical distribution and variability in time.
- Usually along the main flow of large rivers should be enough stock positions to between them was possible interpolation discharge of water. The special position of these posts is determined by the topographical and climatic conditions. If the difference in runoff between the two points of a river does not exceed the permissible error of measurement on the gauges, then the additional positions is not needed.
- Runoff of a small tributary can not be accurately determined by subtracting the discharge of two stations located above and below the mouth of the tributary.

Where runoff flows is of particular interest, needed a separate position. Stock cross-sections can be mixed with the water level posts. These posts are located:

- a) in all major towns along the river, the water level is used for flood forecasting, water supply and for transport;
- b) on the major rivers, in point between the gauges, water levels can be used for flood forecasting and recording their movements with the flow.

Not all of these principles are observed today in the Amur basin. The analysis shows that the necessary increase in hydrological observation is at 20% of their optimal arrangement.

- Today made steps to address this complex, costly task. Significantly upgrade the existing network in the basin of the Ussuri to the installation of automatic systems for measurement of water levels, rainfall, snow cover, it is possible to measure the discharge by means of modern equipment. New observation points. The Ussuri basin is the most populated and suffers from dangerous floods, so upgrading the hydrological network started with this site. We have proposals to develop Roshydromet project and transfer it to the whole Amur River basin. However, much depends on the financing of these works.

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- Another existing problem, which depends not only on funding, although this component is probably decisive. On cross-border sections of the Argun, Amur, Ussuri, many years, no work is underway to measure the discharges .
  - Russian and Chinese sides are in talks to create a simplified procedure for crossing the state border.

No less acute issues the replacement of obsolete equipment in the existing network, reconstruction of destroyed positions after floods. Such a large river, like the Amur River, requires the use of hydrological works fairly large boats. The funding gap leads to the fact that there are gaps in the measurement of discharges on the relevant sites. So, in 2011, because of the broken boat, these works are not carried out at the closing of the Amur near the Bogorodskoe.



# National network for monitoring water pollution (hydrochemical network)

In the Amur basin monitoring pollution of surface waters are carried out on 88 water bodies. Sampling for chemical analysis - in 119 observation points. The number of water bodies on which observations are made and items with details on the basins is presented in Table 4.

**Table 4. Hydrochemical positions in the Amur River basin (Russia)**

Basin	Number water bodies	Number observation points on them
The Upper, Middle, Lower Amur	41	53
The Shilka, Argun, Amazar	25	38
The Ussuri	22	28
In all	88	119

Mainly we study the sections of rivers to anthropogenic influence.

Four of our major laboratories conduct tests of water samples - in gg.Chita, Blagoveshchensk, Khabarovsk and Vladivostok. We also have several small laboratories. The number of chemical parameters for which the analysis is 70-90. Samples may also be sent for analysis to laboratories accredited by other organizations.

Water quality is assessed by specific composite index of water pollution (UKIVZ). Classification of water quality of watercourses in the corresponding values UKIVZ presented in Table 5.

**Table 5. Classification of water quality of watercourses**

class and level	characterization state water pollution
<b>1</b>	<b>Value added</b>
<b>2</b>	<b>Weakly polluted</b>
<b>3</b>	<b>Polluted</b>
level «a»	polluted
level «б»	very polluted
<b>4</b>	<b>Dirty</b>
level«a»	dirty
level «б»	dirty
level «B»	very dirty
level «Г»	very dirty
<b>5</b>	<b>Extremely dirty</b>



Mainly the studied water bodies belong to classes 3 and 4.

*The most common pollutants are copper, lead, nitrogen compounds, organic compounds, in some periods-phenols. In addition, in the waters of the land marked elevated levels of iron and manganese compounds, mostly related to natural factors, the formation of the surface waters of the Far Eastern region.*

## Joint Russian-Chinese monitoring the quality of transboundary waters.

An important part of studies of surface water quality are the joint Russian-Chinese working.

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- In accordance with the Agreement between the Administration of Khabarovsk Territory and the People's Government of Heilongjiang Province of China (PRC) "On the joint environmental activities in the period 2000 to 2005." Since 2002, work was begun on joint monitoring of the Amur and Ussuri rivers. The project focuses on a complex of chemical analysis, hydrobiological and hydrological work to obtain information about the content of chemicals in the transboundary waters of the Amur and Ussuri Rivers on 25 indicators.
- Work was carried out on two cross-sections of the Amur and one of the Ussuri to three times a year.

- *Now planning of joint monitoring has reached a level of government. In 2006 he was adopted five-year work plan.*

Plan provides more in-depth study of the quality of these water bodies: the Argun River (Chita Region), the Amur River (Amur Oblast, Jewish Autonomous Region, Khabarovsk Territory), the wellhead area the Ussuri River (Khabarovsk Territory), and the Razdolnaya River, Lake Hanka (Primorskiy Kray). In some areas has increased the number of the studied parameters, samples are taken in all phases of water regime, including the winter. The prospects are that this year will develop a plan for the next five years. It must be the basis for continued work on the already fulfilled the program, as well as its possible extension.

***Studies have shown that in general the quality of transboundary waters has remained stable and in some chemical indicators have improved, which may be due to the efforts of China to improve the basin r.Sungari.***

# finale

- Monitoring data and surface water pollution, of course, are a necessary basis for the design of water systems, construction in coastal zones, environmental protection measures, scientific research. Understanding the importance of this type of monitoring at the state level leads to the design and development of federal programs aimed at the optimization of the observation points, technical and technological re-equipment of all parts of the observational network. Since 2012 Russia is planning to launch one of these major federal programs.
- International cooperation in monitoring and pollution are also actively developing in recent years. To optimize the Russian-Japanese cooperation and further development of the Project Amur-Okhotsk offer to the Japanese side to go to the Ministry of Natural Resources with a proposal for the conclusion of the Cooperation Agreement. between the parties

**Thank you  
for your  
attention**

