The oceanographic data bases on the Sakhalin shelf

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The Regional Oceanographic Data Center (RODC) was established at the Far Eastern Regional Hydrometeorological Research Institute (FERHRI) as a Far Eastern branch of the Russian National Data Center. Its main function is to archive oceanographic data which were obtained by FERHRI research vessels. At the same time, RODC must deal with archived data obtained by other organizations/institutions.

Oceanographic observations by Russia in the Pacific Ocean began in the last century. After the revolution, the archives of the Hydrographic Department, in which the data were stored, were plundered. The oceanographic organizations in Vladivostok were repeatedly created, closed, reconstructed and moved.

There are four oceanographic organizations at the present time in Vladivostok, where oceanographic data sets were made and collected (FERHRI, Pacific Oceanological Institute (POI), Pacific Research Institute of Fisheries and Oceanography (TINRO), and the Hydrographic Service of the Navy). The research vessels of these departments until recently had in common the largest scientific fleet in the world (more than 30 units of large specialized ships). Annually they made about 10,000 hydrographic stations (observations of temperature, salinity, oxygen, chemical elements, currents, meteorological parameters). All of these data were collected in Vladivostok basically as handwritten reports in which copies were sent to the central establishments of departments. Because of the possibility of data loss in Vladivostok, the regional oceanographic data center was organized in the Institute of Automatics and Data Management. However, not being an oceanographic establishment, the center was not able to solve the problems of data set preservation and has stopped this work. Departmental data centers, at the same time, were organized at FERHI, POI, TINRO and the Hydrographic Service of the Navy.

Some of the data in different departments was lost during the transition to new kinds of computer facilities. So, in FERHRI the data stored as punched tapes and magnetic tapes were lost.

The RODC began work practically from nothing. There were only hand-written reports of cruises since 1959 at its disposal. The material of more than 520 FERHRI cruises have now been collected at RODC (Rykov, 1998a). The routine work of entering, quality control and primary data processing are now carried out from not only the FERHRI archives, but also from other institutes.

The largest problem is international data exchange. For the FERHRI observations to be transferred in an exchange through the Russian National Oceanographic Data Center (NODC) is extremely complicated due to working restrictions. Nevertheless, FERHRI aspires to make available its own numerous (more than 190,000 stations) data sets for the world oceanographic community. About 33,000 stations for the World Ocean are prepared at present for international data exchange.

The total number of oceanographic observations for the Sea of Okhotsk presently include about 70,000 hydrographic stations which were obtained from different countries and organizations. It can be seen that for the cold months oceanographic observations in the Sea of Okhotsk were carried out only in places free from ice cover (Figs. 1–3). Thus the areas of Soya Strait and Tatarskiy Strait are free from ice around the Sakhalin Island, but by May the observations cover most areas of the sea, except the region near the Shantar Islands (where the ice remains almost all summer until August) and the Shelekhova Gulf, where the ice stays until July). The central part of the sea and shelf of Sakhalin Island are least covered with observations in May.

The regional database on the Sakhalin shelf was extracted from the total Okhotsk Sea database. The region of the Sakhalin shelf is covered with a rich network of stations during the warm period (June–October). Such a situation continues until the occurrence of new ice (in late October). Un-

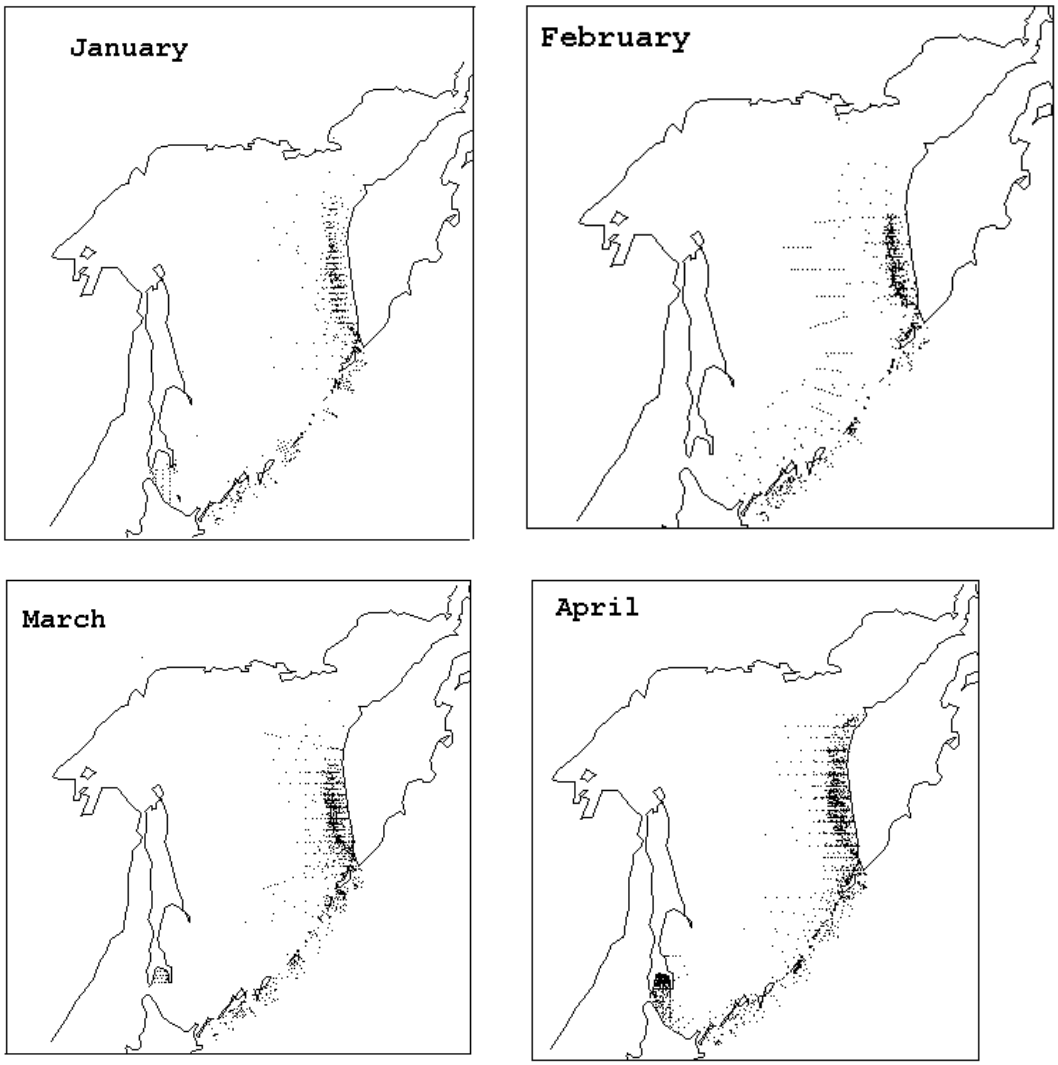

Fig. 1 The data distribution in January–April.

fortunately, the places where coastal polynyas form (including at east coast of Sakhalin) have no oceanographic observations during the cold months of the year. The most valuable data sets are the repeating observations on so-called century sections directed far from Sakhalin Island.

The database includes deep-water observations in the region located from 43° to 56°N and from 142° to 146°E, with a total number of about 13,000 stations. The main measurements were carried out from 1947 to the present and consist of such observations as temperature, salinity, dissolved oxygen, pH, alkalinity and nutrients (see Table 1). However, the composition of observations differs essentially during each cruise.

A large amount of software has been created for data management, processing, visualization and quality control. Part of this software allows the data to be separated into periods, regions, cruises and observed elements.

The system of data quality control allows us to load in the computer memory up to 1,000 stations and to display/print out their locations as well as vertical profiles of measured elements and/or their combinations. A vertical profile of temperature, salinity, oxygen and observation points are shown in Figure 4. This software is used mainly for qualitative data recording.

Another component of the system makes possible

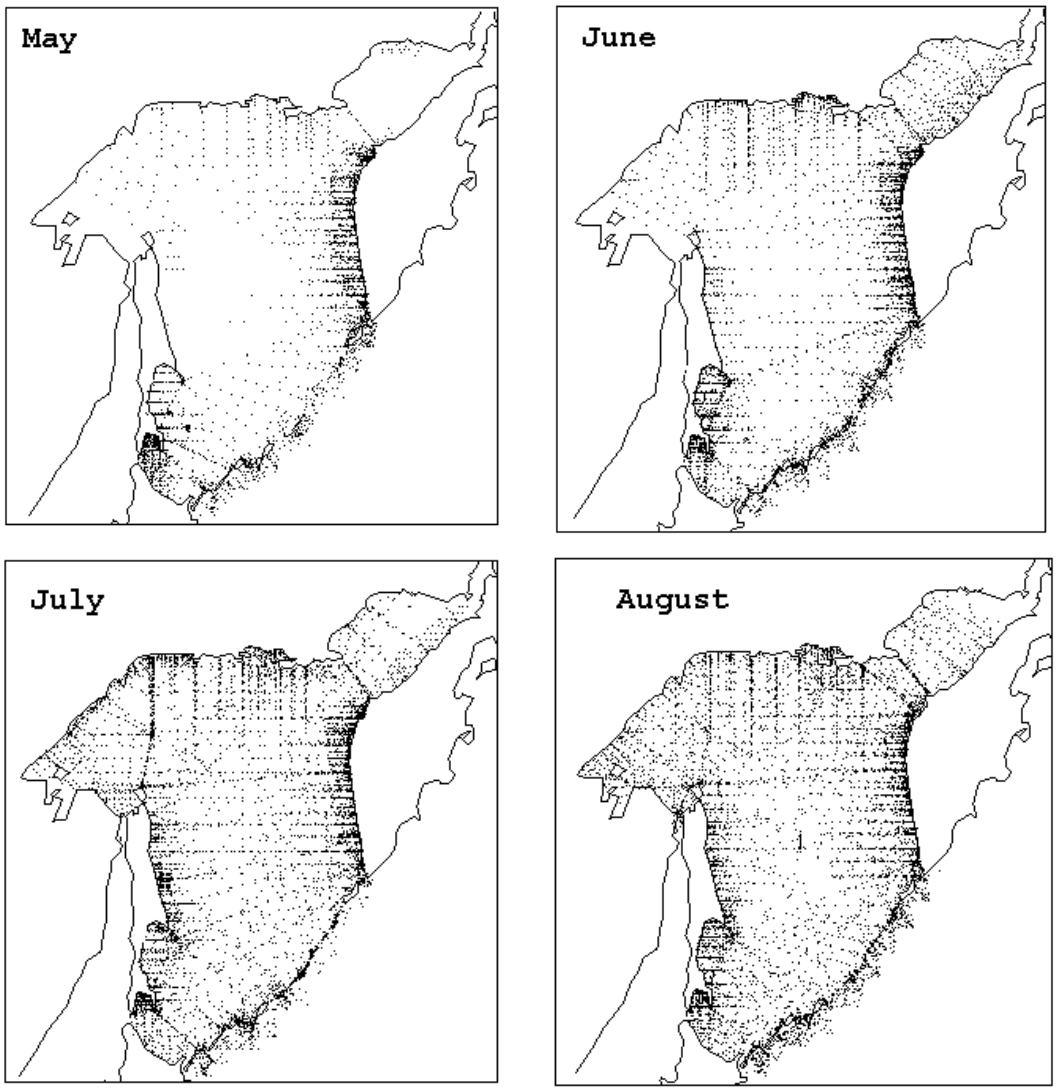

Fig. 2 The data distribution in May–August.

the loading of a random number of stations and the display/printout of vertical profiles of observations for those stations whose measured values differ from the means by more than number of standard deviations set by the operator. It is effective for quality control of historical data in space–time limited sets.

Additionally, the multifunction informational system was created for receiving different references. It allows us to create electronic catalogues of both cruises and stations, to show the points of observations and observed values, to calculate and draw the fields of observed parameters, and so on (see Figure 5).

Processing of sea water density in one degree squares was made in order to estimate whether the number of observations is enough for correct estimation of mean seasonal density fields. The estimates appear to be good over the southern part, but density variability in the northwest part of Sakhalin shelf is too large because of freshwater flowing from the Amur River and elsewhere (Rykov, 1998b).

The data and software tools are used to answer administrational and regional requests in Federal Service of Russia on Hydrometorology and Environmental Monitoring, for joint scientific studies with specialists from TINRO, POI and other home

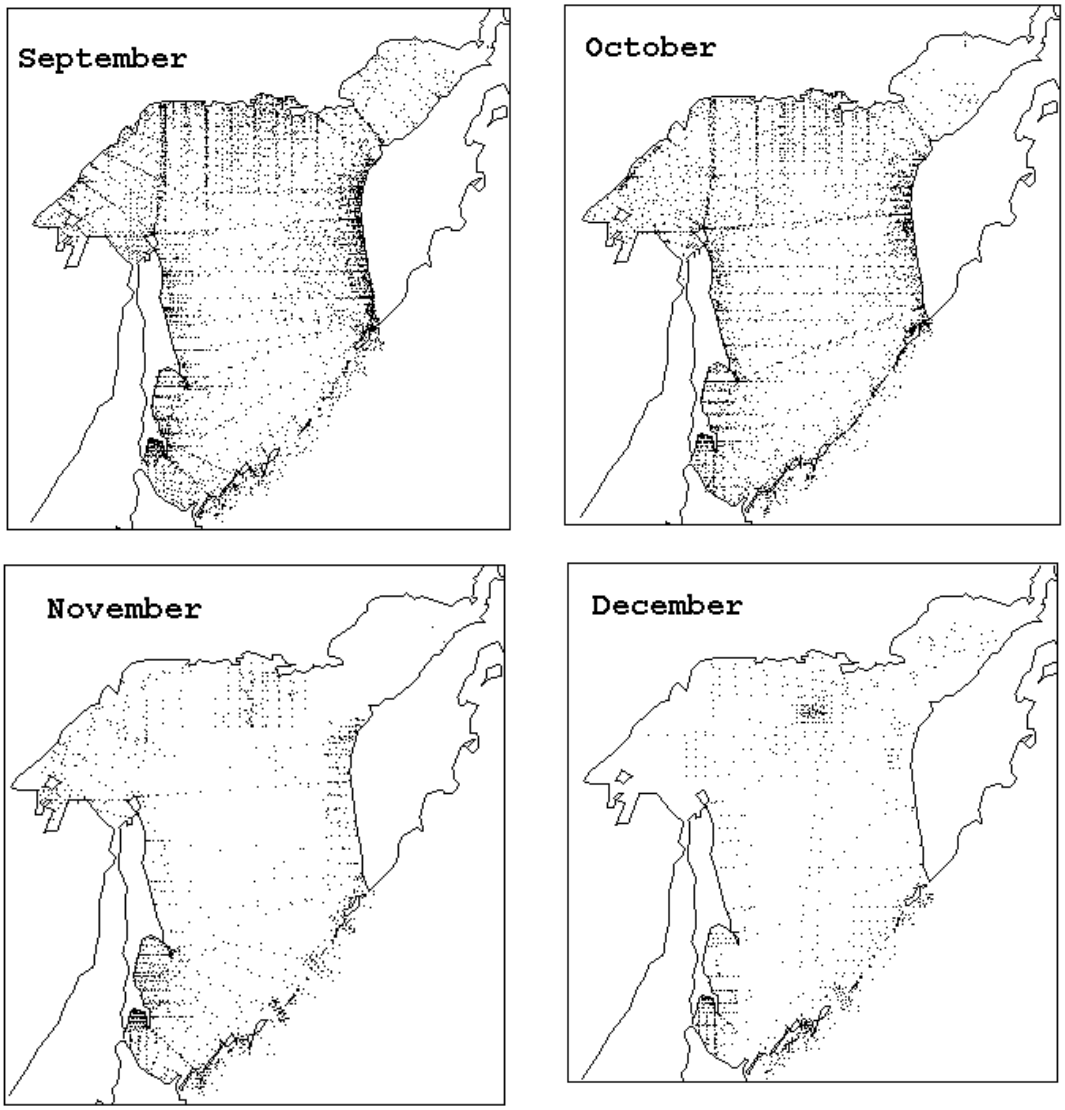

Fig. 3 The data distribution in September–December.

Table 1 Composition of observations on the Sakhalin shelf (43°–56°N, 142°–146°E, 1932–1997).

Month	Temperture	Salinity	Oxygen	pH	Alkalinity	PO_4	SiO_3	NO_2
May	1636	1073	470	315	106	20	34	28
Jun	2203	1555	756	418	140	210	217	216
Jul	2542	1939	917	658	115	167	245	202
Aug	2137	1432	552	355	14	204	217	101
Sep	1583	1301	674	570	93	217	311	191
Oct	1419	1138	627	385	114	188	189	178
Nov	944	710	259	157	88	–	8	15
Dec	410	288	39	6	3	2	2	–
Total:	12874	8836	4294	2864	673	1008	1223	931

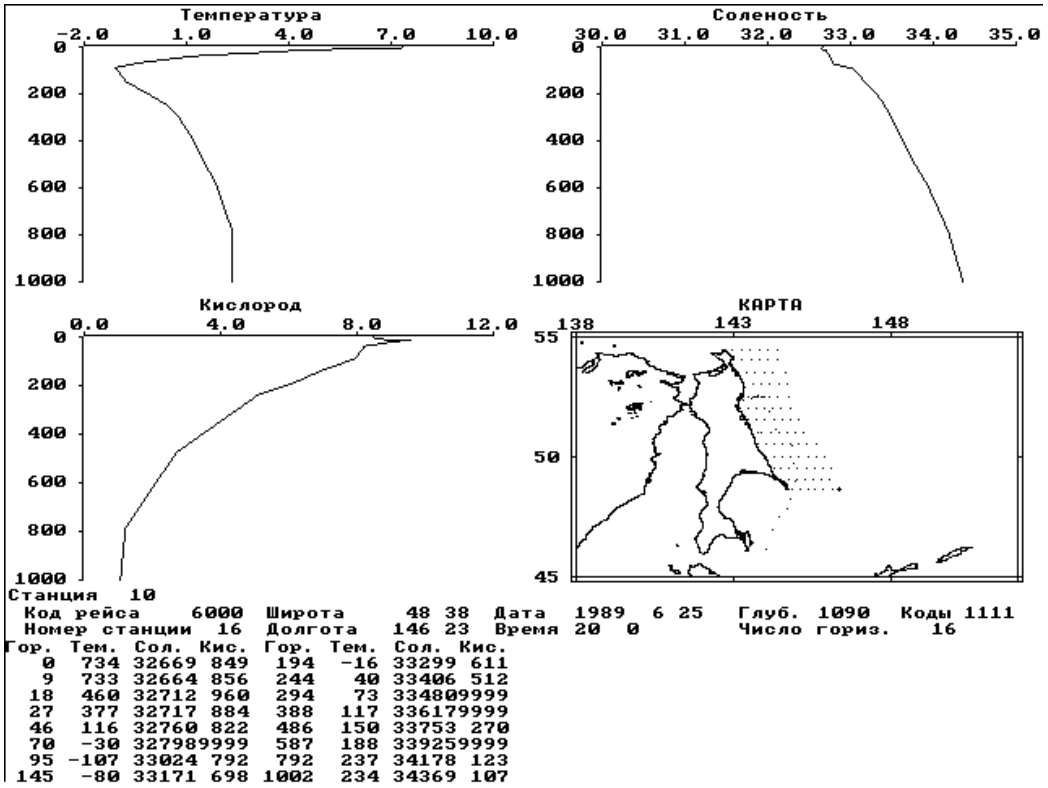

Fig. 4 The working fragment of quality control software.

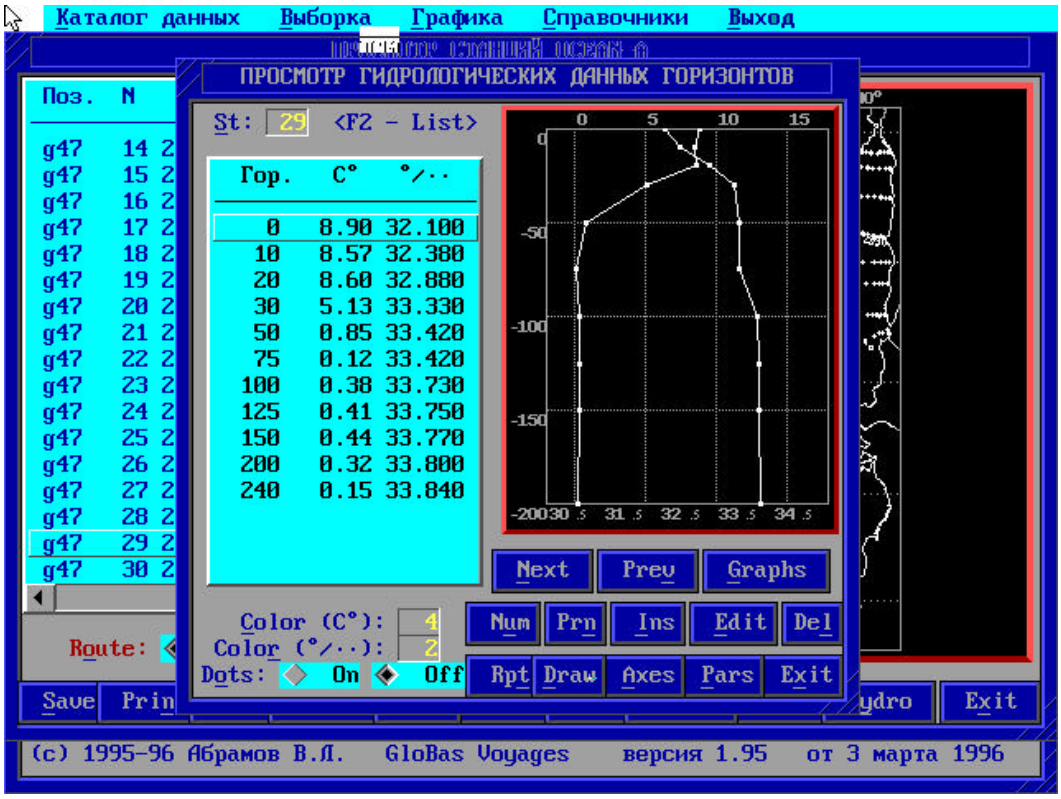

Fig. 5 The working component of the information–reference system.

institutes and agencies, as well as in work on international projects under collaboration in international organizations such as PICES and WESTPAC.

References

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