USING OF INFORMATION RESOURCES OF HYDROMETEOROLOGICAL SERVICE OF UKRAINE FOR PURPOSES OF WATER RESOURCES ASSESSMENT AND HYDROMETEOROLOGICAL FORECASTING

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***Abstract**:* The report examines the result of work, which was executed by the International Research and Training Center UNESCO for Information Technologies and Systems on creation of Ukrainian hydrometeorological databanks network and their adaptation to the decision of a number of scientific and applied tasks, including a water resources assessment and forecasting.

Keywords: hydrometeorology, information technology, forecasting, database, Internet.

BENUTZUNG DER INFORMATIONSRESSOURCEN DES HYDROMETEOROLOGOSCHEN DIENSTES FÜR EINSCHÄTZUNG DER WASSERVORRÄTE UND HYDROLOGISCHE PROGNOSE

***Zusammenfassung*:** Im Vortrag werden die Ergebnisse der durch Internationales UNESCO-Zentrum für Informationstechnologien und- Systeme ausgeführten Arbeiten zwecks der Schaffung des Netzwerkes der hydrometeorologischen Database der Ukraine und deren Anpassung für Lösung von mehreren wissenschaftlichen und Anwendungsaufgaben einschließlich der Einschätzung der Wasservorräte und Prognose des Wasserhaushaltes erörtert.

***Schluesselworte*:** hydrometeorologie, informationstechnologie, prognose, database, Internet.

The regular hydrometeorological observations were started in territory of Ukraine more than 200 years ago. There were 17 hydrometeorology stations in Ukraine 150 years ago, there were 80 stations 100 years ago.

All these unique data for the past 200 years is stored in archives of State Hydrometeorological Service. Their value is obvious – they are completely necessary for precise forecasting of hydrometeorological conditions. However, calculation of hydrometeorological parameters, which are in form of papers, cannot be automated entirely. Consequently, such calculations require huge amount of time and attraction of many highly skilled experts. Hence, the important stage in automation of hydrometeorological data processing will be creation of electronic banks of the archival data. It will allow, on the one hand, to simplify and speed up archival data processing, on the basis of traditional methods applied by hydrometeorology. On the other hand, it will allow to apply new methods and algorithms of data handling and data mining for adequate models construction, which are necessary for long- and medium-term forecasting.

Centralized electronic hydrometeorological databanks (DB) creation in former USSR started in the end of 70th in Obninsk Research Institute of Hydrometeorological Information – World Data Centre (RIHMI–WDC). The principal data was sent to Obninsk from all Republics of former USSR. The data received by the RIHMI–WDC was stored at magnetic carriers; special software was developed there for its further processing.

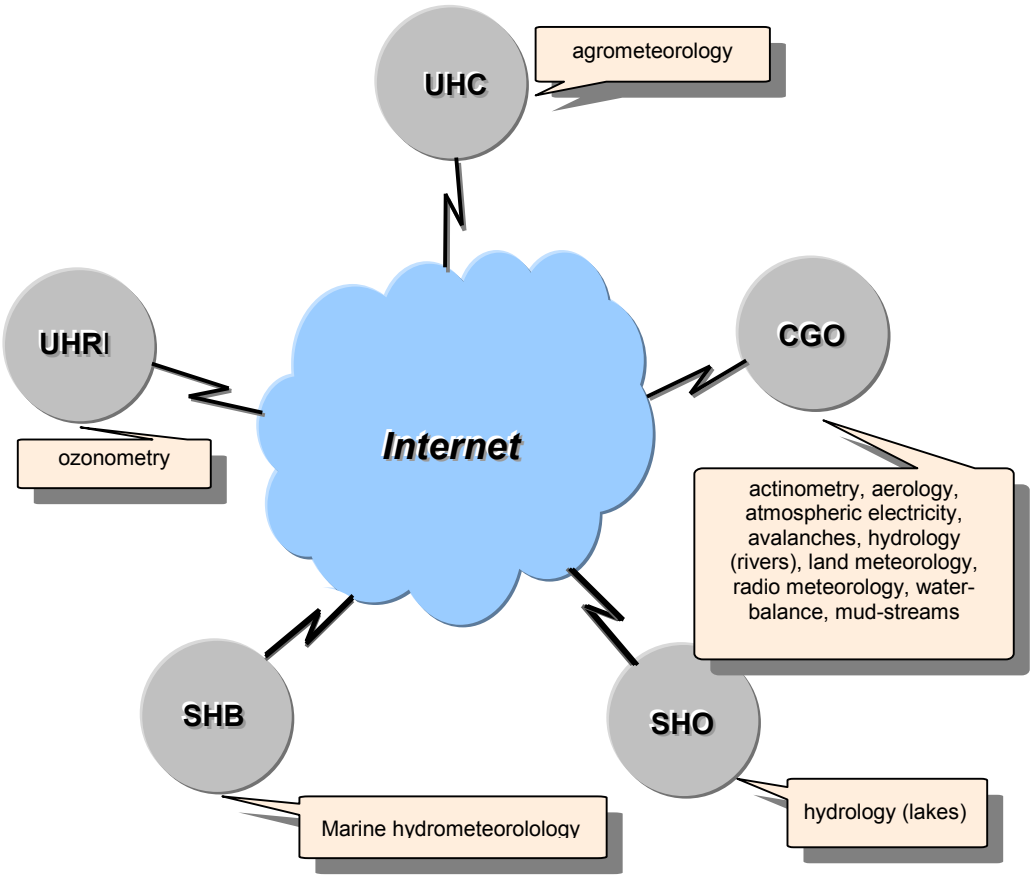
Ukraine received information concerning its data for the period of 1881-1990 after USSR collapse.

Nevertheless, absence of proper software and also large quantity of information only in paper stipulated usage of principally new software for data processing, storage and

analysis. In order to have automated admission to archival data, which are concentrated in State Hydrometeorological Service, International Research and Training Center UNESCO for Information Technologies and Systems (IRTC) within the framework of the National program of informatization realizes the project on creation of a distributed network of the hydrometeorological databanks (DNHD) (Gritsenko et al., 2001).

DNHD is a distributed information system, which unites a quantity of specialized hydrometeorological databases in one problem-oriented information space. These databases are usually geographically distributed, locally formed and maintained. Databases are in turn grouped in DB's in kinds of the hydrometeorological information, i.e. aktinometrical, agrometeorological, hydrological, meteorological etc. Databases are situated at several authorities, dealing in storage, processing and gathering of the corresponding information (Figure 1). Information resources of DNHD in its full volume will consist of approximately 15 specialized DB's according to hydrometeorological data types.

For DNHD implementing the original technology of construction is used. It is offered by the IRTC and supports functioning of information systems including territorially distributed and locally maintained databases with different data presentation models (Gritsenko et al., 1999). This technology presumes usage of widespread program components and web browser as unified user's interface for accessing different data formats.



UHC Ukrainian Hydrometeorological Centre, Kiev
UHRI Ukrainian Hydrometeorological Research Institute, Kiev
SHB Sevastopol Hydrometeorological Bureau
SHO Svetlovodsk Hydrometeorological Observatory
CGO Central Geophysical Observatory, Kiev

Figure 1. DB structure

Specially developed software executes calculation of hydrometeorological parameters in spatial-time context and displays results through the standard interface in convenient form (text, tables, diagrams). This technology allows access to structured (relational model) and unstructured (e.g. hypertext) data and based on dynamic web pages generation (Ursat'yev et al., 1999).

Used solutions provide access to the information for virtually unlimited number of users irrespective of their geographical location and provide integration of DB's in global information space.

The accepted by State Hydrometeorology Service priority of DNHD implementation presumes first of all creation of meteorological and agrometeorological databanks.

At present, agrometeorological DB launched for operation testing in Ukrainian Hydrometeorological Center. It includes archival data about growth of crops and accompanying weather conditions (the information of 184 Ukrainian meteorological stations in 24 regions). It also stores meteorological constants; it allows comparing current parameters with norms. The specially designed software allows calculation of more than 700 agrometeorological parameters in a spatial-time cut for various crops (Figure 2).

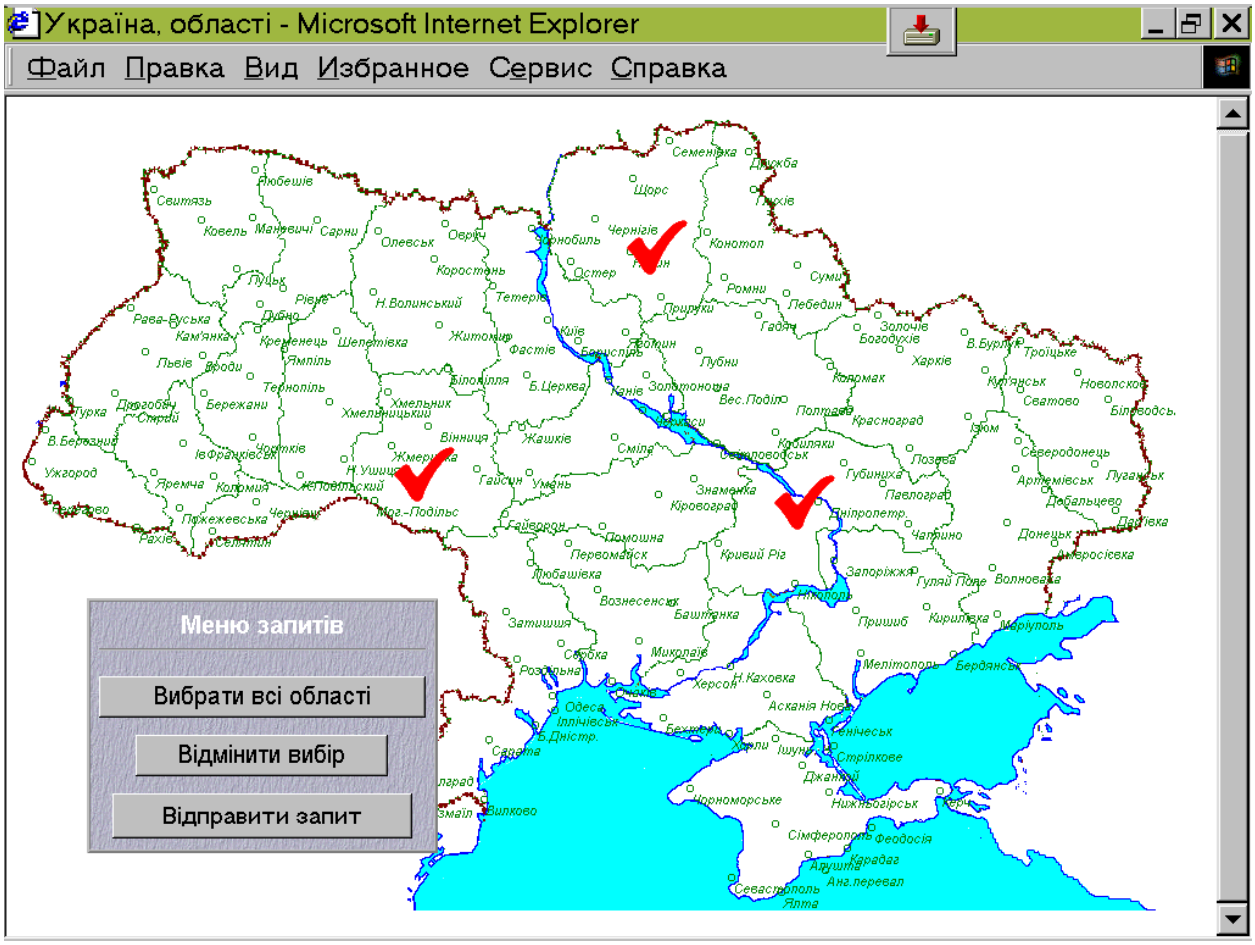


Figure 2. A choice of regions for agrometeorogical parameters calculation

The work is carried out for populating of DB by archival data for the period of regular observations (now DB contains data for the last 10 years, since 1990), this will allow to use DB effectively for forecasting growth and development of crops.

The works on hydrometeorological DB populating are currently conducted. At present time it contains results of measurements received for the period from 1971 to 1975 on 195 meteostations in Ukraine.

There was created a software making calculation of more than 120 meteorological parameters in a spatial-time cut and their presentation as tables (Figure 3) and diagrams (Figure 4). The works on expansion of a temporary line of archival monitoring are conducted.

Розповсюджені запити з метеорології - Microsoft Internet Explorer

Відповідь на запит | Уточнення запиту

Країна: Україна | Метеостанція: VLVOLIN4.10
Область: Волинська | Початок періоду: 1-1-1971
Район: Володимир-Волинський | Кінець періоду: 31-12-1975
Обране значення параметру знаходиться між "-5" та "8"

[ТЕМПЕРАТУРА ПОВІТРЯ]

Мінімальна температура по місяцях

РОКИ \ МІСЯЦІ	Січень 01	Лютий 02	Березень 03	Квітень 04	Травень 05	Червень 06	Липень 07	Серпень 08	Вересень 09	Жовтень 10	Листопад 11	Грудень 12	Рік
1971	-21,9	-11,8	-24,6	-2,3	-0,6	5,6	4,9	3,2	-1,9	-5,9	-9,9	-7,6	-6,17
1972	-31	-16,8	-11,9	-3,7	0,9	5,1	9,1	7,3	2,3	-1,9	-4,5	-17,6	-5,75
1973	-17,2	-18	-7,7	-2,1	-1,3	6,9	9,3	1,7	-2,8	-4,6	-9,1	-16	-5,53
1974	-14	-8,3	-5	-6,3	1,3	3,6	8	7,6	-0,6	-0,4	-4,3	-3,9	-4,58
1975	-5,5	-11,9	-5,4	-1,2	3,5	5,7	10,4	5,7	1,6	-2,8	-12,5	-24,1	-4,25

показати графік

Мінімальна температура за період з 1-1-1971 по 31-12-1975 склала: -31 градусів по Цельсію (15-01-1972)

запит виконано

Figure 3. Minimal temperature of air on months of year for the chosen period

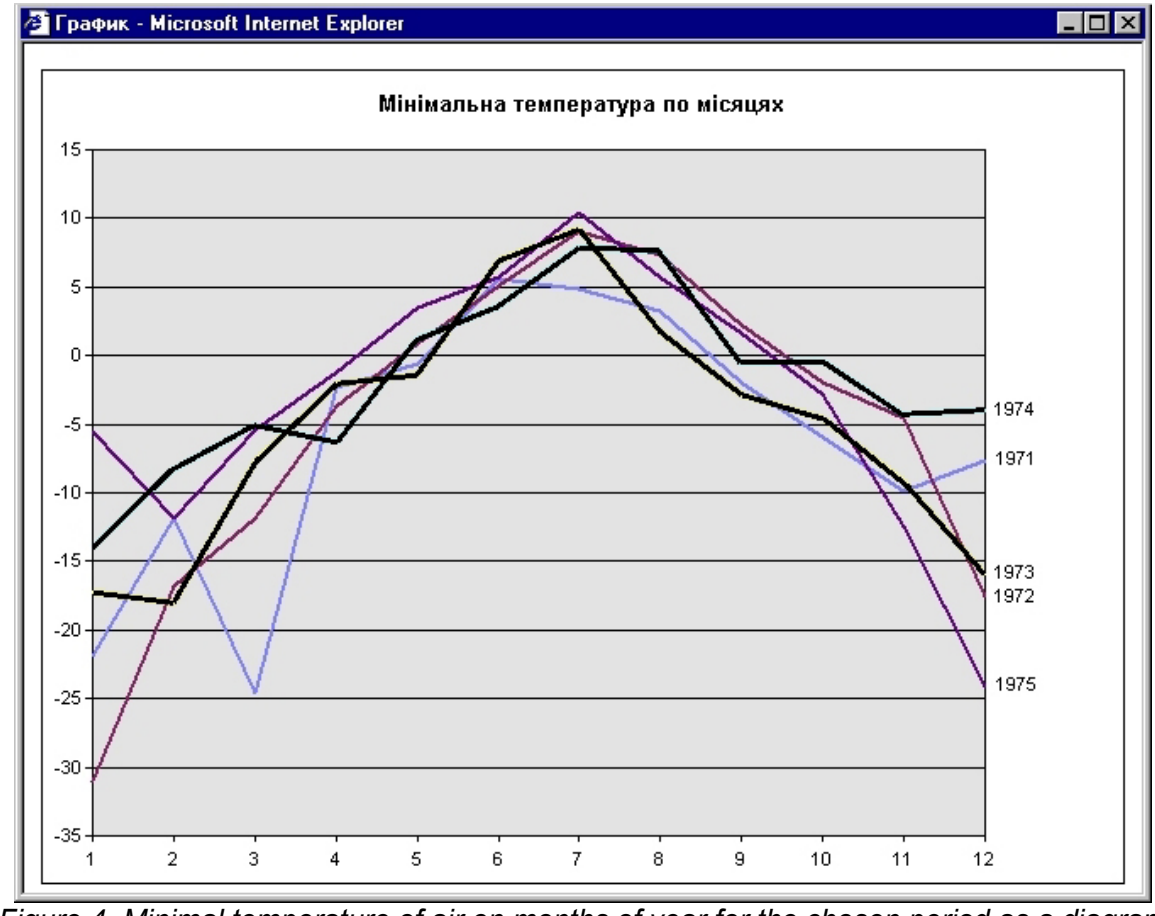


Figure 4. Minimal temperature of air on months of year for the chosen period as a diagram

The creation of DB will allow using methods of forecasting developed by the IRTC from the end 60th for processing the hydrometeorological information. (Müller and Ivachnenko, 1984). Use of self-organizing principles (Ivachnenko et al., 1974) and Group Method of Data Handling allows building exact models in hydrometeorology even at small volume of data. At the large volumes of hydrometeorological parameters measurements results, the same methods allow to build the effective forecasts from the point of view of time and computing resources effective use.

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