The database "Aerosols of Siberia"

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The database includes archived data on the concentration of different components of the atmospheric air. The data have been obtained by analyzing samples collected in the Siberian region. The database is convenient for work with the data, it enables one to perform statistical analysis, combine data from different tables, and create new tables for further investigations.

Systematic study of atmospheric aerosol (AA) in Siberia began in 1991 within the frames of the project "Aerosols of Siberia."[1] The project's goals and its structure are described in Ref. 2. In particular, one of its parts presumed creation of a database on the characteristics of AA in the Siberian region.

In this paper, we describe the state of the work on the database at the Institute of Chemical Kinetics and Combustion, Siberian Branch of the Russian Academy of Sciences. The database contains the results of aerosol sampling in ICKC expeditions in Siberia. At present, a system of ground-based monitoring has been arranged in the Siberian region.[1–3] Based on this system, synchronous measurements are being conducted in different seasons. The organization of monitoring enables one to obtain information about spatiotemporal variations of AA characteristics in Siberia and identify the causes of variations connected with the emissions of both natural and anthropogenic origin. The data make it possible to estimate effects of sources on AA properties in the atmospheric processes on the local, regional, and global scales.[4]

In addition to the results obtained in ICKC expeditions, the database contains information about characteristics of atmospheric aerosols sampled in Irkutsk, Mondy, Listvyanka, and Tiksi in 1993–1996. The data were presented by the Limnology Institute of Siberian Branch of the Russian Academy of Sciences.

Table 1 presents information about places and time of ICKC expeditions, which are now placed in the archive of the created database. As seen from Table 1, the number of expeditions increased from year to year. At present, they are organized simultaneously in different places during all seasons.

In addition to data on atmospheric aerosols, the laboratory possesses the results of analysis of biological samples: blood, hair, pollen, plants, as well as, of snow and surface waters.

The methods used to analyze the samples were described in Ref. 5. In addition, a part of samples is now analyzed by the method of chromatomass-spectrometry which determines the content of organic compounds (ecotoxicans) in the air, e.g., polyaromatic hydrocarbons, chlororganic pesticides, polychlorinated biphenyls.

Most of the experimental data are information about mass concentration of different components contained in the air (depending on the method of analysis, these are chemical elements, ions, ecotoxicants, organic and inorganic carbon). From these data, the following statistical characteristics are calculated for every series of observations: geometric mean values, root-mean-square deviations, factor and correlation matrices.

To bring all the data to a form convenient for work, the database "Aerosols of Siberia" has been developed. It is installed on a 32-bit Access 97 system. Programs written using Visual Basic Application process users' requests.

The main objects of the database, the tables, contain the following information:

1) the place of expedition, type of sampler, data about filters (type, section), time of sampling, volume of the pumped through air, number of measurements, methods of analysis;

2) concentration of components obtained from analysis of a sample. Two additional tables are available for multi-element compositions: (a) relative concentration $<X_{Fe}> = C/C_{Fe}$, where C is the concentration of the elements, C_{Fe} is concentration of iron (iron is chosen as the most stable element in the Earth's crust); (b) the enrichment factor $<EF> = <X_{Fe}>/C_{EC}$ where C_{EC} is the element's content in the Earth's crust;

3) the data of statistical analysis: correlation and factor matrices.

Users can easily choose data of their interest (by place, date, components), perform simple statistical analysis (arithmetic mean, geometric mean, standard deviation, maximum and minimum values, sum), construct plots, print out the results, export chosen data into files for a more complicated processing.

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Table 1. Expeditions on aerosol sampling

Year	Winter	Spring	Summer	Fall	Total
1991			Baikal		1
1992	Karasuk		Karasuk Klyuchi		3
1993		Klyuchi	Klyuchi	Baikal Klyuchi Akademgorodok	5
1994	Akademgorodok Klyuchi Barnaul		Klyuchi Chany Zav'yalovo Barnaul		7
1995	Akademgorodok Klyuchi Krasnoyarsk		Akademgorodok Klyuchi Krasnoyarsk Ust'-Kamenogorsk	Altai	9
1996	Isetsk Tarko-Sale Samburg			Klyuchi	4
1997	Klyuchi Karasuk Tarko-Sale Samburg		Klyuchi Karasuk Zav'yalovo	Klyuchi Karasuk	9
1998	Klyuchi Karasuk	Klyuchi Karasuk	Tarko-Sale Samburg Klyuchi Karasuk	Tarko-Sale Samburg Zav'yalovo	11
1999	Tarko-Sale Karasuk	Tarko-Sale Samburg Krasnosel'kup	Zav'yalovo Tarko-Sale Samburg Krasnosel'kup Novosibirsk	Tarko-Sale Samburg Novosibirsk	11

N o t e : Karasuk, Klyuchi, Zav'yalovo, Akademgorodok are settlements of Novosibirsk Region; Samburg, Tarko-Sale, Krasnosel'kup, Isetsk are settlements of Tyumen' Region.

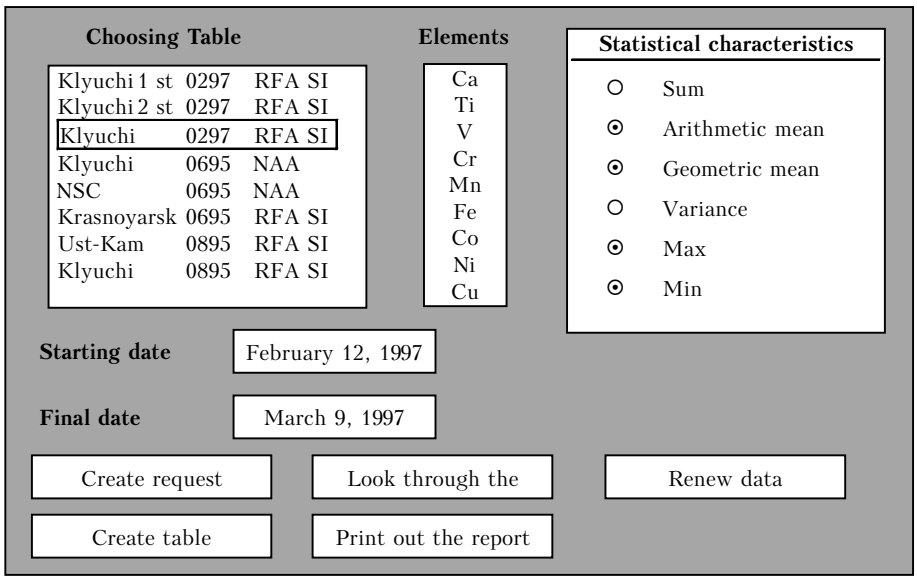

Fig. 1. A pattern for data selection.

Distribution of Ca (ng/m^3) in Klyuchi and Karasuk

Date		Karasuk	Klyuchi
February 1997	19.02.97	3183	3001
	20.02.97	1260	2628
	21.02.97	3443	3111
	22.02.97	2965	5252
	23.02.97	1639	5851
	24.02.97	2134	7110
	25.02.97	3234	2993
	26.02.97	1394	6081
	27.02.97	723	5621
	28.02.97	200	2862
	Results for 28.02.97 (10 records)		
	Sum	20176	44510
	Avg	2018	4451
	Min	200	2628
	Max	3443	7110
March 1997	01.03.97	1363	4603
	02.03.97	1606	4924
	03.03.97	407	1138
	04.03.97	553	1356
	05.03.97	925	4438
	06.06.97	1016	4939
	07.03.97	381	2404
	08.03.97	1592	1864
	09.03.97	1233	1556
	10.03.97	2302	5323
	11.03.97	2220	5335
	12.03.97	689	1304
	Results for 12.03.97 (12 records)		
	Sum	14286	3938
	Avg	1190	3282
	Min	381	1138
	Max	2302	5523

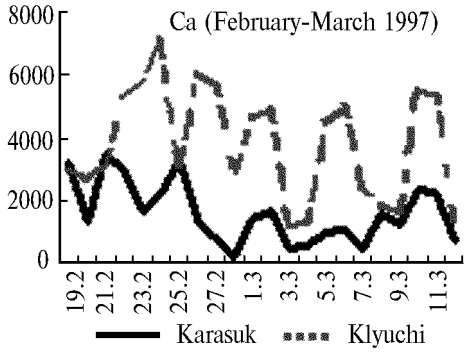

Fig. 2. A report obtained as a result of processing of the data of two simultaneous expeditions.

Figure 1 presents an example of the interface form for data selection. In Fig. 2, the results of analysis of the data of two simultaneous expeditions are presented.

Besides, the database will present information about meteorological quantities at the time of aerosol sampling. These are the chart of wind distribution and air temperature. For this purpose, the data will be taken, in particular, from the database Reanalysis. Global Atmospheric Analyses. National Centers for Environmental Prediction/National Center for Atmospheric Research.

Then, each series of data will be accompanied by an expert estimate on the potential sources of air pollution.

The database will also present literature on the AA of Siberia.

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