

RUSSIAN PERMAFROST MAP BIBLIOGRAPHY AND INDEX

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Abstract

A bibliography of 730 permafrost maps published in the Former Soviet Union and Russia has been compiled from a review of over 1500 monographs, books, and papers. Maps published separately were included as well. The maps are classified into four types: geocryological conditions, regionalization, predictive, and special. These subdivisions follow the traditional Russian categories. The maps range in scale from Large (<1:5000) covering particular research or construction sites, to Small (1:400,000,000) with global or hemispheric coverage. Maps for a user's area of interest can be located with the indexing system which keys each citation to the International Map of the World quadrangle designation.

Introduction

Geocryological maps published in USSR (Former Soviet Union, FSU) and Russia were identified and catalogued to form an inventory beginning in 1995. The bibliography is being developed under the framework of the International Permafrost Association (IPA) and its Global Geocryological Database (GGD). As of July 1997, it contains information on 730 maps, with additional maps being added as recent and older publications are located. The inventory contains maps compiled and published from the 1930's up through 1997 (Figure 1). Maps compiled and published in the FSU before 1952 were identified by N.I. Egorov of the former Obruchev Permafrost Institute (Egorov, 1952).

Bibliography

The Russian map inventory was compiled using the literature available in a number of personal libraries and in libraries from the following institutions:

1. Moscow State University
2. Russian State Library
3. Industrial and Research Institute of Investigations for Construction (PNIIS)

4. Earth Cryosphere Institute, Siberian Branch, Russian Academy of Sciences.

Institutions were chosen based only on their accessibility and the completeness of their catalogues. More than 1500 monographs, books, and papers were reviewed. While the review was very extensive, it was not possible to do an exhaustive review of all publications for the period of the study. We did make an effort to include peripheral publications not recently acquired by the central libraries and those not normally accessible to a wide range of scholars.

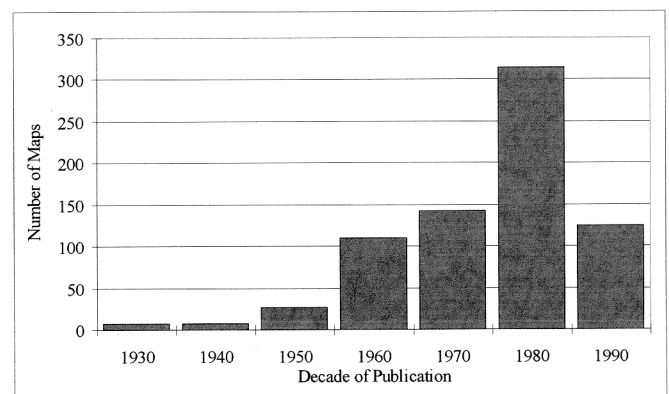


Figure 1. Decadal histogram by publication date of Russian permafrost maps.

Table 1. A sample entry of the map bibliography

Field name	Field Content
AUTHOR:	Afanasenko, V.E., Goncharov, S.V., Zaitsev, V.N.
TITLE:	Geocryological-hydrogeological regionalization of the territory
PUB:	Moscow, Moscow University Publishers, 1981
SCALE:	1:3,500,000
SOURCE:	"Natural conditions Transbaikal railway industrialization zone", p. 18. In the article by Afanasenko, V.E., Goncharov, S.V., Zaitsev, V.N., p. 4-20.
REGION:	Transbaikal
TYPE:	Regionalization
LEGEND:	Cryohydrogeological massif of deep discontinuous freezing, cryoartesian basins of continuous and discontinuous shallow freezing
LAT/LONG:	54N00-57N00/120E00-127E00
INSTITUTE:	Moscow State University
NUMBER:	332

A preliminary version of the bibliography was published in 1995 (Streletskaia and Leibman, 1995). This version was arranged alphabetically by author. The updated version is presented in database and spreadsheet formats so that it can be sorted in any other order according to the user's request. Each listing includes: full reference (title, authors, publisher, scale, source, publication year), the year of compilation, geographic region, map content type, legend descriptions, map coordinates (latitude and longitude) defining the rectangular area of map coverage, and the institution of the map compilation. A permanent reference number was assigned to each map in the sequence that it was added to the database. A sample entry of the bibliography is shown in Table 1.

The 730 maps cover various geographic regions, with some overlap. The geographical distribution of permafrost maps is shown in Table 2.

A large number of the maps cover regions undergoing economic development. Regions under active develop-

Table 2. Geographic distribution of Russian Permafrost maps

Geographical coverage	Number of maps
Global	15
Northern Hemisphere	11
Asia and Eurasia	11
Former Soviet Union and Russia	114
European North of Russia	55
West Siberia	204
Middle Siberia	68
East Siberia and Northeast Russia	62
Yakutia	49
Southern Siberia (Altai, West and East Sayan, Tuva Republic)	14
Baikal and Transbaikal area	81
Russian Far East	14
Kamchatka	9
Chukotka	6
Alpine permafrost of Central Asian mountains (Tien Shan, Pamirs)	5
Alpine permafrost of the Caucasus	1
Off-shore permafrost and cryotic deposits of the Barents and Kara seas	7
Islands of the Arctic Ocean	4

ment are the West Siberian oil and gas province; Yakutian gold, coal, and diamond areas; and Baikal and Transbaikal coal, metals, wood, and hydro-electric power production areas. Many maps are associated with transportation network investigations (pipelines and railway routes in West Siberia and the European North, Baikal-Amur Mainline, Amur-Yakutian Mainline, and a number of local projects). Fewer maps have been compiled and published for regions lacking industrial activities (Northeast and Far East of Russia, Central Asian mountains, Arctic shelf). Some data and maps are of limited circulation.

Map content is classified into four categories as follows: geocryological conditions, regionalization, predictive, and special (Figure 2). These categories reflect the mapping traditions in the Former Soviet Union and the approaches of the geocryologist in building cartographic models of permafrost.

Maps of geocryological conditions are usually compiled on a base-map of landscape patterns by extrapolation of parameters (measured at the key sites or calculated for a range of permafrost conditions) to the corresponding types of landscapes. These maps show all the main characteristics of permafrost: composition and origin of frozen materials, ice content and cryogenic structure, permafrost distribution and thickness, ground temperature, active layer depth, cryogenic (periglacial) processes and features as illustrated in color, shading, separate symbols, and/or isolines. Some maps include talik and ground water information as well.

Regionalization maps are attempts to define geographical regions based on the regularities in permafrost distribution and features, and on comprehensive classifications of factors that determine permafrost properties as well as permafrost parameters themselves. These maps are compiled based on geomorphologic, geological or landscape units or subdivisions. Subdivided taxons are provided with more or less detailed permafrost characteristic assembled in a table or legend. A range within which characteristics may

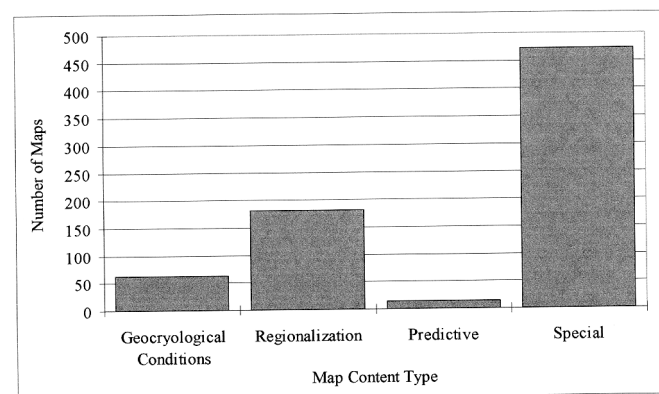


Figure 2. Histogram by content type of Russian permafrost maps.

change for a taxon are shown in the table. Sometimes the patterns controlling the occurrence of maximum or minimum characteristics are shown.

Predictive maps include information on possible changes of contemporary permafrost features under various impacts, both natural (such as climate changes) and anthropogenic (most often the destruction or construction of covers, embankments and so on). Development of these maps employed conceptual or numerical modeling. Most of these maps are at the same time regionalization maps, and information on contemporary and changed permafrost characteristics is shown in a table as a range linked to a separate taxon.

Special maps usually show several interrelated characteristics of permafrost. These maps prevail in the literature, and thus in the inventory. Most abundant are the maps of ground temperature and permafrost thickness or of periglacial (cryogenic) processes and phenomena.

Various scales of maps are found in the inventory, but most often small-scale or large-scale maps were published due to the technical problems of publishing medium-scale maps as illustrations in books and journals. Sometimes scale was not shown or the original scale was reduced while publishing. In these cases the print-copy scale was calculated by measuring the known objects on the figure in the publication.

General maps of the FSU use scales of 1:30 million (MM) or 1:50 MM, and sometimes 1:10 MM. Separate regions are covered by maps of 1:1 MM to 1:7.5 MM, while parts of the regions are mapped in scale 1:1.5 MM to 1:0.3 MM. Schematic maps and plans of separate construction objects or research sites are of larger scale. The most popular scale for West Siberia: 1:1 MM; for Middle Siberia: 1:20 MM; for East Siberia: 1:1 MM, and for South Siberia: 1:7.5 MM.

Map index

The entries in the Russian Permafrost Map Bibliography are indexed to the International Map of the World (IMW) alpha-numeric quads. This system is published in many sources, including the Defense Mapping Agency (n.d.) World Plotting Series. The IMW alpha-numeric system numbers quads longitudinally from 1 through 60 beginning at the 180° date line in the Pacific Ocean and moving around the world easterly in 6° increments. Latitudinally, the quads are labeled with letters "A" through "W" beginning at the Equator and moving away from the Equator in 4 increments. Latitudes above the Equator are preceded by "N" for North and those below the Equator are preceded by "S" for South. All maps in the Russian Permafrost

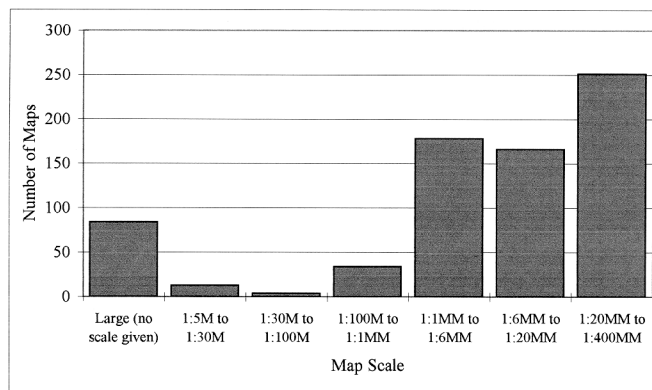


Figure 3. Scale distribution of Russian permafrost maps.

Bibliography, excluding maps with global or Northern Hemisphere coverage, are located within a rectangle whose southwest corner is quad NC31 (latitude 10° N, longitude 0° E) and whose northeast corner is quad NW2 (latitude 90° N, longitude 170° W).

Example of an Index entry for scale 1:10,000 to 1:6,000,000:

NO51-NO52 332, 360, 729

The first column in the index is the map quad reference designation (e.g., NO51) and the second column is the map citation number(s) in the Russian Permafrost Map Bibliography (e.g., 332) falling within that quad. If latitudinally adjacent quads have identical map citation numbers, these are listed as a range of map quads containing the identical map citations (e.g., NO51-NO52).

The 730 maps included in the inventory range in scale from Large (less than 1:5000) to Small (1:400 MM), and are grouped in the index by map scale (Figure 3).

To index the maps, first a smaller database was prepared containing only the map reference number, a group code (in this case, the grouping used was map scale as shown in Figure 3), and the latitudes and longitudes defining the rectangular area of the map. Using a program written in QBASIC, for each group code, an array of map reference numbers is assigned to each map quad based on the map coordinates. The program then compares the map listing for each quad to that of the next adjacent quad to determine the range of quads with identical listings and groups those together. The program creates a text of the resulting index for each group code. The program may be used to index any map inventory by any desired grouping.

Conclusion

The Russian Permafrost Map Bibliography provides an inventory of the extent of permafrost mapping in Russia, shows examples of mapping in various

geocryological zones, and also contains information on publications dealing with permafrost in Russia. The indexing system allows the user to easily find maps with the desired scale in the location of interest. The QBASIC program developed may be used to index any map listing by quad.

Similar map databases for other countries should be prepared, expanding the map bibliography to North America (Alaska and Canada), Europe, Asia (Tibet Plateau, Mongolia, etc.) and the Southern Hemisphere. A database has been started for Alaska based principally on United States Geological Survey reports containing maps, with sixty-nine maps identified to date.

The Russian Permafrost Map Bibliography and Index, the indexing QBASIC programming code, and a search program will be available on International Permafrost Association Circumpolar Active layer and Permafrost System (CAPS) CD, prepared for the Seventh International Conference on Permafrost.

Acknowledgments

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