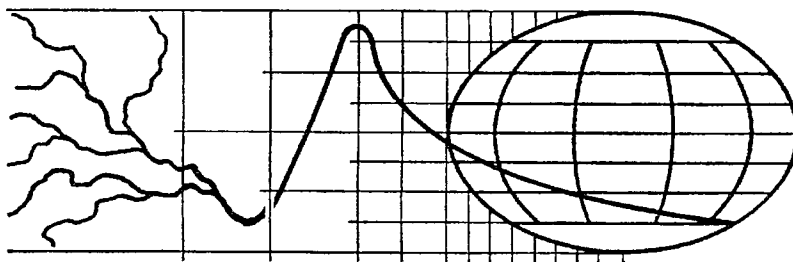


Weltdatenbank Abfluß
Bundesanstalt für Gewässerkunde
Koblenz, Deutschland

Global Runoff Data Centre
Federal Institute of Hydrology
Koblenz, Germany

Report No. 8

**First Interim Report on the Arctic
River Database for the Arctic Climate
System Study (ACSYS)**



GRDC



July 1995

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1. Introduction

This report is the first Interim Report on the Arctic River Database (ARDB) for the Arctic Climate System Study (ACSYS) project. The report reflects the status of available data in the GRDC as of 30 May 1995 which has been updated from the dataset announced for distribution at the 7th session of the GEWEX Scientific Steering Committee in January 1995.

With the submission of this report, the GRDC timely responds to the need of an Arctic River Database (ARDB) spelt out in the Initial Implementation Plan for the ACSYS project.

It is hoped that the compilation of a more comprehensive ARDB will contribute to narrow the estimation bandwidth of Arctic river runoff which presently shows differences of 50% and more (ACSYS Science Plan, 1992). Such an estimation bandwidth is unacceptable for quantitative modelling purposes in the ACSYS project. The GRDC therefor calls for the active efforts from ACSYS participants to submit historical and current data on a regular basis.

2. Rational for the establishment of the ARDB

In accordance with the Initial Implementation Plan for ACSYS (9/1994), the specific objectives of the ACSYS hydrological programme are to:

- Determine the elements of the fresh water cycle in the Arctic region and their time and space variability;
- Quantify the role of atmospheric, hydrological and land surface processes and their interactions;
- Provide an observational basis for the assessment of possible long-term trends of the components of the fresh water balance in the Arctic region under changing climate;
- Develop mathematical models of the hydrological cycle under specific Arctic climate conditions, suitable for inclusion in coupled climate models.

The latter objective will be achieved by the adaption of refined macro-scale hydrological models to the specific environmental conditions of the Arctic.

For selected river catchments in the Arctic region, the development of conceptual or parametric meso-scale hydrological models are foreseen in the scientific strategy of ACSYS. The ARDB forms the principal database for the macro-scale hydrological modelling in the Arctic region.

3. Implementation of the ARDB

The ARDB has been compiled using the state-of-the-art relational database system of the GRDC which allows the import of data in a large variety of formats, the storage of the data in a consistent way and the retrieval of data using the search-and-query capabilities of the INFORMIX databank system implemented under SCO-UNIX. The data have been exported into EXCEL-Spreadsheet format which allows also graphical data processing. The ARDB has been established at the GRDC as a separate ACSYS-Project Databank using the available GRDC databank tools. The ARDB has an identical physical and logical structure as the entire GRDC database. An example for a typical format for daily and mean monthly discharge data and format for missing values is reproduced in figure 1.

The data have been compiled in such a way that not only stations close to the mouth of major rivers into the Arctic Ocean have been selected but also stations of sub-basins of larger rivers. While the stations close to the mouth of the rivers can be easily identified by their coordinates, location on the maps and the fat print in the tables, the sub-basin stations enable the users to derive information about the hydrological cycle and runoff generation far in the coastal hinterland of the continents. This supports the study of seasonal regimes and time-lags in runoff generation during the melting period and the reduction of runoff during the winter season. The seasonal variability of freshwater flux into the Arctic Ocean is of particular interest to quantify effects on the thermohaline circulation which inter alia determines the thermal ocean-atmosphere regime.

It is expected, that the ACSYS database will significantly increase once more data will become available from the territory of the former Soviet Union, possibly in August 1995. In this respect, an agreement has been reached between the State Institute of Hydrology, St. Petersburg and the GRDC in March 1995. In any case, the data holdings have largely increased from 15 stations as stated in the ACSYS-Science Plan (1992) to currently 182 stations including hinterland stations.

GRDC FORMAT FOR MEAN DAILY AND MEAN MONTHLY DISCHARGES AND MISSING VALUES

EXPLANATION OF DAILY RUNOFF DATAFILES

A	B	C	DE
CHINDWIN	HKAMTI		
334.00 9999.320.00305.00296.00292.00288.00276.00268.00264.00		1	11978
264.00256.00252.00248.00248.00244.00244.00240.00236.00236.00		2	11978
240.00240.00240.00232.00224.00216.00212.00208.00204.00200.00196.00		3	11978
196.00196.00192.00192.00192.00188.00184.00184.00184.00184.00		1	21978
180.00180.00176.00176.00168.00168.00164.00164.00160.00164.00		2	21978
168.00172.00168.00164.00164.00164.00160.00160.00		3	21978
152.00148.00144.00140.00136.00140.00140.00136.00148.00148.00		1	31978
156.00148.00140.00136.00124.00124.00120.00120.00112.00112.00		2	31978
108.00108.00104.00104.0099.00099.00097.00097.00096.00096.00097.000		3	31978

COMMENT:

- A = Name of river (40 characters)
- B = Name of station (40 characters max.)
- C = Number of row (there are always 3 rows per month)
- D = Month
- E = Year

The values are in m3/s or l/s (see remark in the station-catalog).

Data rows:

Each data row has a length of 80 characters + line-feed, where the year, month and number of row are right-bound. There are always three rows per month. The first 2 rows contain 10 flow-values; the third will differ from 8 to 11 values, depending on the count of days per month.

Each value consists of 6 characters. There maybe leading blanks.

Missing values will be marked with " 9999." (see 2nd Jan. 1978)

As you may recognize, in the example above the data-rows are only 76 characters of length this is because of formatting as a print-file!

Example:

February 23rd, 1978 = 168.00

EXPLANATION OF MONTHLY RUNOFF DATAFILES

A	B	C	D
AMAZONAS	OBIDOS		
192811100013800018100020600021700021400019800016900011700085300.85500.90200.			
192910400012800014200018200020900021500019900017200013700090900.80100.93900.			
193011400014400017100019400020400020100019200017400013800010100089800.93500.			
193111000013300016300019000020100019400017400014000097600.81500.86400.94000.			
193211900016200018800020500021100020800019600017000013100093500.85800.93000.			
193311100014000016600018900020800020700020000016800010700076900.80500.91400.			
1934110000146000182000202000220000216000210000183000149000119000118000129000			
193514300016000018000020300022100021600019700016700012900091200.75700.79800.			
1936 9999.14200016200017600019300018100016200013500091900.87100.81900.82300.			

COMMENTS:

- A = Name of river (= 40 characters)
- B = Name of station (= 40 characters max.)
- C = Year
- D = data (January - December)

Each value = 6 characters (there maybe leading blanks!)

The values are in m3/s or l/s (see remark in the station-catalog)

Missing values = ' 9999.' (see January 1936)

Each data-row = 76 characters (not including line-feed)

Example:

March, 1935 = 180000 m3/s

EXPLANATION OF MISSING VALUE CATALOGUE FILE

04	Mediterranean Sea Coast (Western Part)									
1104150	Cheliff	Sidi Belatar	AL 3602N	027E	43750	1	1976	8	1978	M 1
1304800	Kert	Dar Driouch	MC 3490N	329W	1353	6	1969	9	1987	D 1

A	B	C	D	E	F	G	H	I	J	K
---	---	---	---	---	---	---	---	---	---	---

COMMENT:

- A = GRDC-Code
- B = Name of river
- C = Name of station
- D = Code of country
- E = Latitude
- F = Longitude
- G = Catchment area in km²
- H = first missing record in database
- I = last missing record in database
- J = Daily/Monthly data
- K = Code of measurement (1 = runoff in m3/s, 2 = runoff in l/s)

GRDC-Code (for example 1304800):

- 1 = WMO-Region (1 = Africa)
- 3 = GRDC-Country code (3 = Morocco)
- 04 = GRDC-Subregion; main river basin (04 = Mediterranean Sea Coast)
- 800 = GRDC-Station code

Length of data-row: max. 133 characters (incl. line-feed)

To E and F:

To get the real values you have to divide the named value by 100. So for example 3627N means 36.27 degrees North.

Figure 1 GRDC-format for mean daily and mean monthly discharge data and missing values

4. Data quality

The data have been checked for plausibility as far as this was possible at the moment. More sophisticated tools will become available in the GRDC later this year. All data are published in national hydrological yearbooks and their quality is assessed as good - satisfactory. Due to the technical difficulties to determine discharge in the Arctic region (see remarks below) there exists a bandwidth of error in the discharge calculation in the order of absolutely 15% at hinterland stations and around 30% at coastal stations. The error bandwidth resulting from discharge measurements and the use of different time-series explain a large part of the differing calculations of runoff into the Arctic Ocean. Considering the quality of hydrological measurements by the hydrological services of the countries contributing to the ACSYS project it is safely assumed, that the time-series of the data from different sources are of comparable accuracy.

5. Access to the ARDB

The database, tables and graphics documented in this report can be obtained through GRDC on diskettes. The ACSYS Science Steering Group may however wish to define user rights for the access to the *entire* ACSYS database in close liaison with GRDC's data dissemination policy endorsed by the Steering Committee of the GRDC on its 2nd session in Koblenz, June 1995. *Subsets* of the database are in principal free for interested users.

6. Data products for ACSYS

Because of the interim character of this report, the freshwater flux into the Arctic Ocean has not been computed. This will be done after the final compilation of the ARDB.

However, just to compare the flux figures given by Aagard and Carmack (1989), reproduced in the ACSYS Science Plan, the figures for the nine largest rivers draining into the Arctic Ocean have been computed from the current hydrological database of the GRDC (figure 2).

GRDC expects that ACSYS defines standard data products as input for further data analysis and hydrological modelling. Specific data products such as graphs and data files of the flow variability of selected rivers can be created on request. Examples of such graphs are presented in figure 3 and 4 for the rivers Ob and Yensisei.

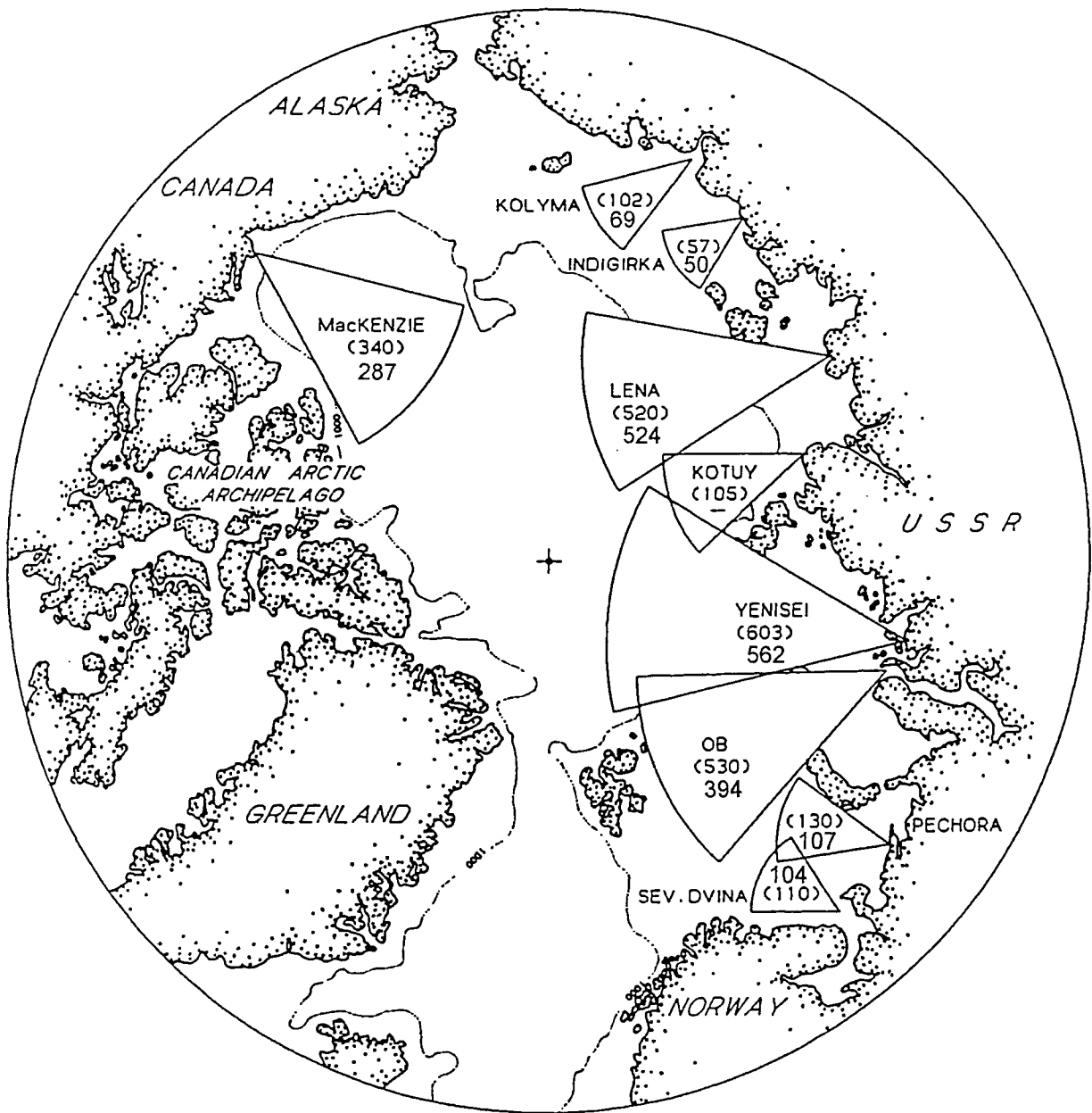


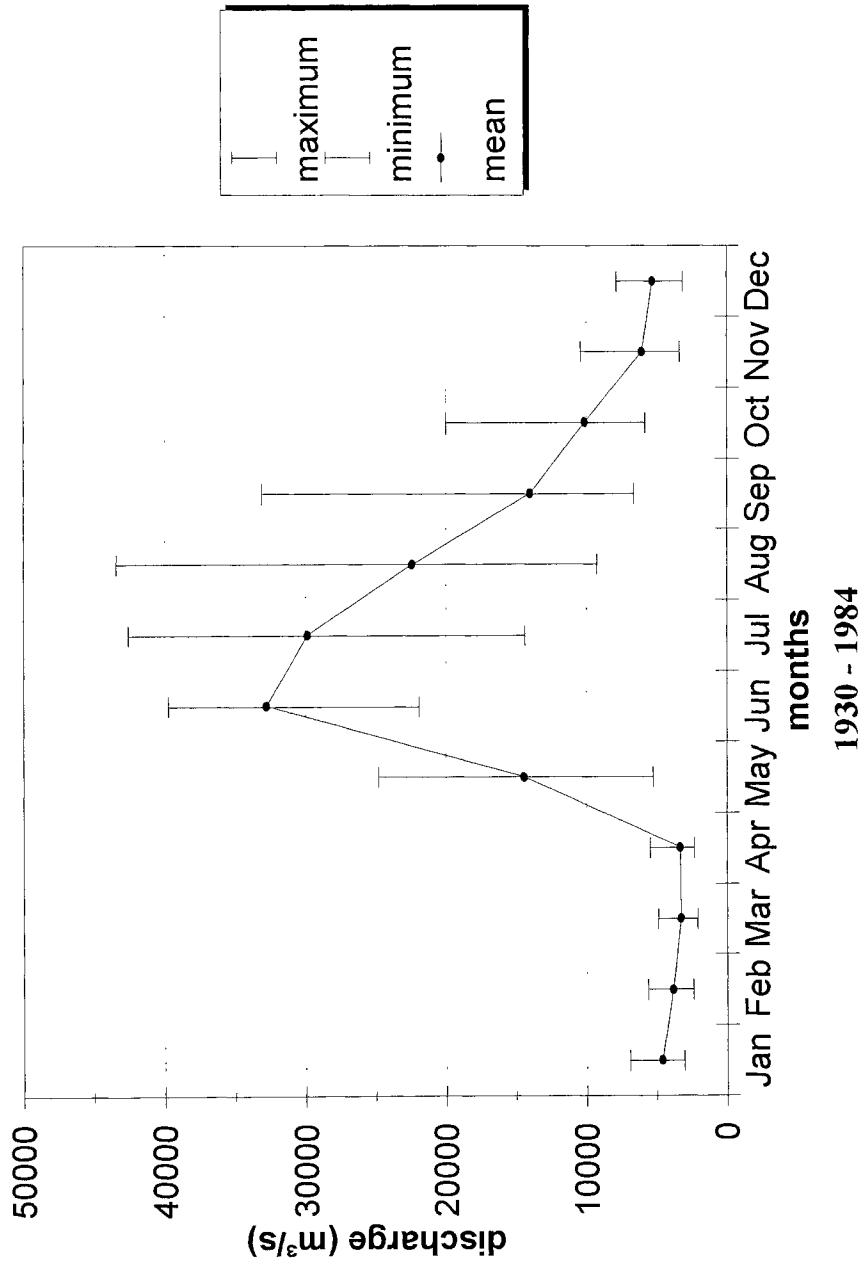
Figure 2 Comparison of Mean annual run-off to the Arctic Ocean in cubic kilometers per year from Aagaard and Carmack, 1989 and GRDC in this report (figures in parenthesis from Aagaard and Carmack). Only the nine largest rivers are shown (figure adapted from Aagaard and Carmack, 1989).

	Aagaard/Carmack	GRDC	DIFF	%
	Km³/a	Km³/a	Km³/a	
Mackenzie	340	287	53	15.59
Kolyma	102	69	33	32.35
Indigirka	57	50	7	12.28
Lena	520	524	-4	-0.77
Yenisei	603	562	41	6.80
Ob	530	394	136	25.66
Pechora	130	107	23	17.69
Dvina	110	104	6	5.45
Kotuy	105	-	105	100.00

GLOBAL RUNOFF DATA CENTRE (GRDC)

OB at SALEKHARD

Subregion: OB

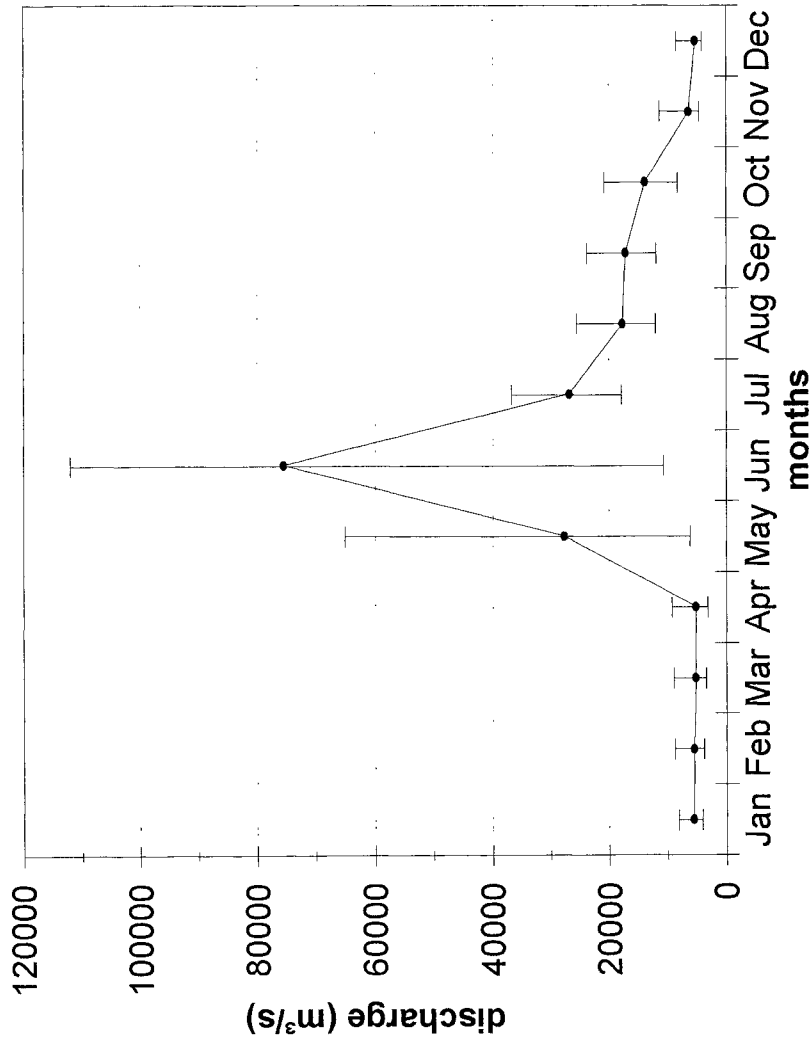


Flow Variability of the Ob River

Figure 3

GLOBAL RUNOFF DATA CENTRE (GRDC)

YENISEI at IGARKA
Subregion: YENISEI



Flow Variability of the Yenisei River

Figure 4

7. Presentation of the ARDB

A look at the maps demonstrates, that many of the GRDC-ACSYS stations are not close to the mouth of the respective rivers into the Arctic Sea. The reason for this is, that hydrological networks have been designed to serve operational hydrological purposes including practical issues of water resources management with a view of downstream effects of discharges from selected gauging station sites. Therefore, in many cases there has been no operational need to establish stations close to the mouth of the rivers. It must be also noted in this context, that discharge measurements in lowland areas with low flow velocities, meandering river courses and permafrost and icing conditions are extremely difficult. In addition, the coastal stations are problematic in access, operation and maintenance due to their remote locations, harsh climatic conditions and the river environment itself. The effect of tidal influences and shelf icing conditions on the discharge of the rivers is not known at the GRDC.

The following tables of overlapping time-series of GRDC-ACSYS stations demonstrate, that for Europe only the timespan 1971-1985 shows sufficient overlap for comparative hydrologic studies. The years of maximum overlap of time-series for Asia are 1976 - 1985 and for North America 1971-1990. To quantify freshwater flux into the Arctic Ocean it is desirable that for Europe, Asia and North America a common time-series is established.

Considering the difficulties to obtain data from the territory of the former Soviet Union for years subsequent to 1990, the compilation of a data set with a reference period 1970 - 1990 should be attempted. For several large rivers with long-term data series however, it is possible to perform comparative statistical analysis to obtain a clue as to the variability of the hydrological behaviour and changes in the water balance of selected rivers draining into the Arctic Ocean. These rivers may be selected from the tables given below. Recognizing, that the Mackenzie river should constitute a test case for Arctic hydrological processes as spelt out in the ACSYS Science Plan it is clear, that the presently available time series for the Mackenzie river (1966-1975) must be urgently updated and the missing values filled up.

The tables showing the compiled time-series of data give a first information also with regard to the size of the territory which contributes to the runoff in the Arctic Ocean.

The tables of missing values show, that the available records are fairly complete in most cases. From the tables it is possible to judge which time series should be completed for analysis and modelling purposes.

It must be noted, that most discharge data are available as Mean Monthly values with the exception of stations in North America, where Mean Daily data are available in the GRDC database. The expectation of the Initial Implementation Plan to archive Mean Daily discharges for all ACSYS stations cannot be met presently. It seems not realistic that this target can be met on a short-term (1 year) basis.

The data from Iceland are special in that they represent Mean Daily discharges of the *calculated natural flows* of rivers in Iceland.

REFERENCES

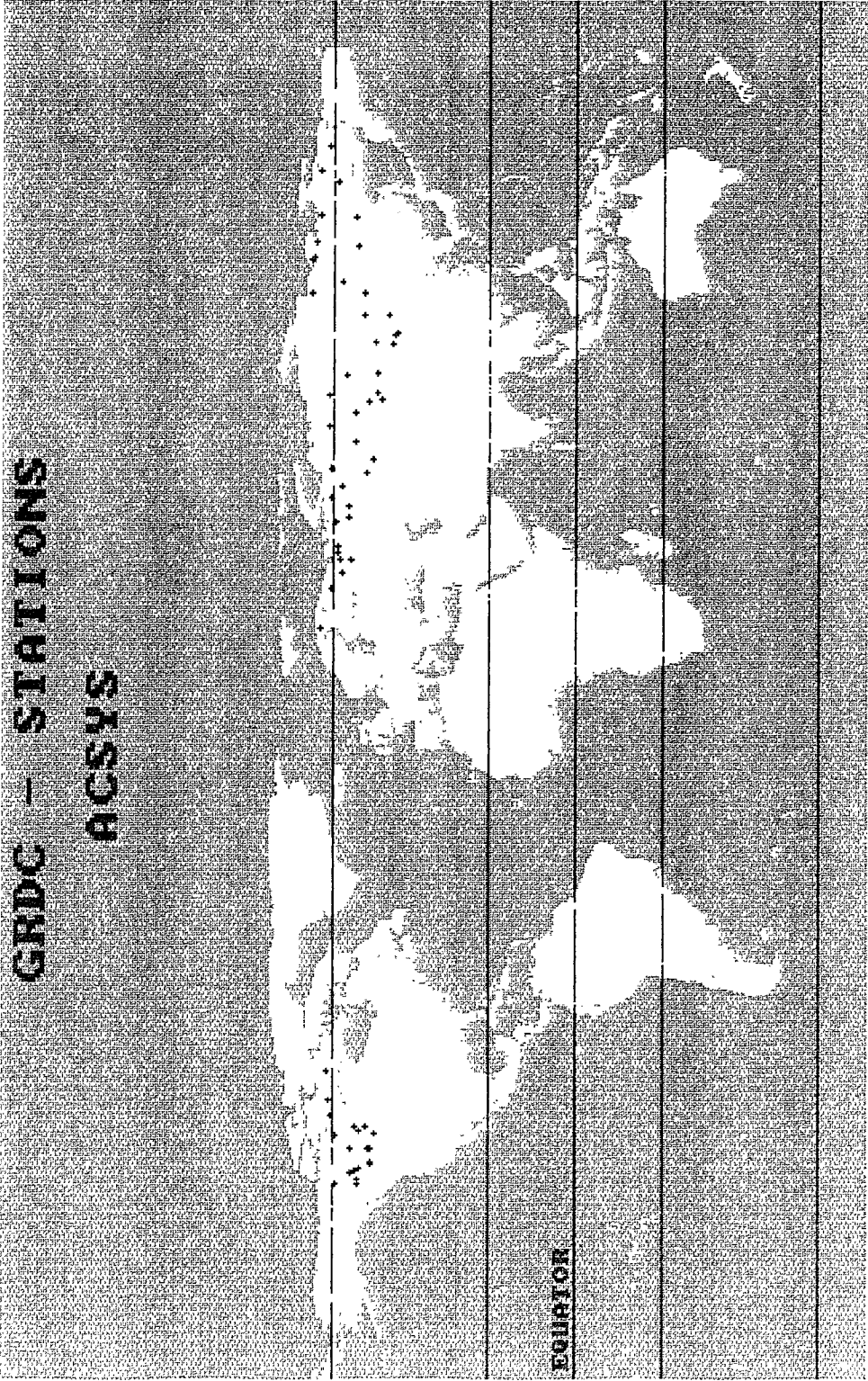
Aagaard, K. and E.C. Carmack, 1989: The role of sea ice and other fresh water in the arctic circulation. *J. Geophys. Res.*, 94, 14485-14498.

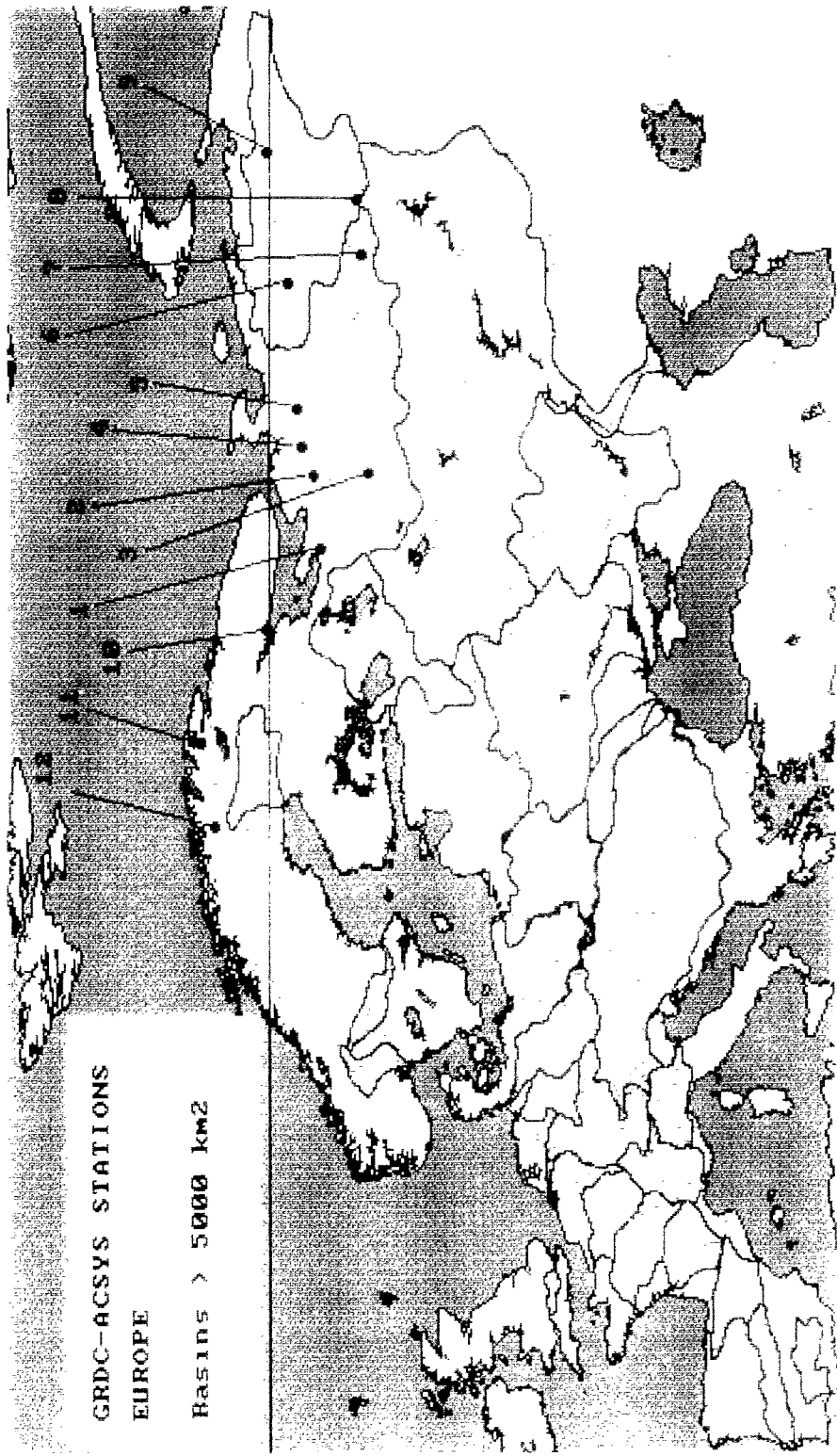
WCRP - 72, 1992: Scientific Concept of the Arctic Climate System Study (ACSYS). Report of the JSC Study Group on ACSYS, Bremerhaven, Germany, 10-12 June 1991 and London, U.K., 18-19 November 1991. WMO/TD-No. 486, 9/1992.

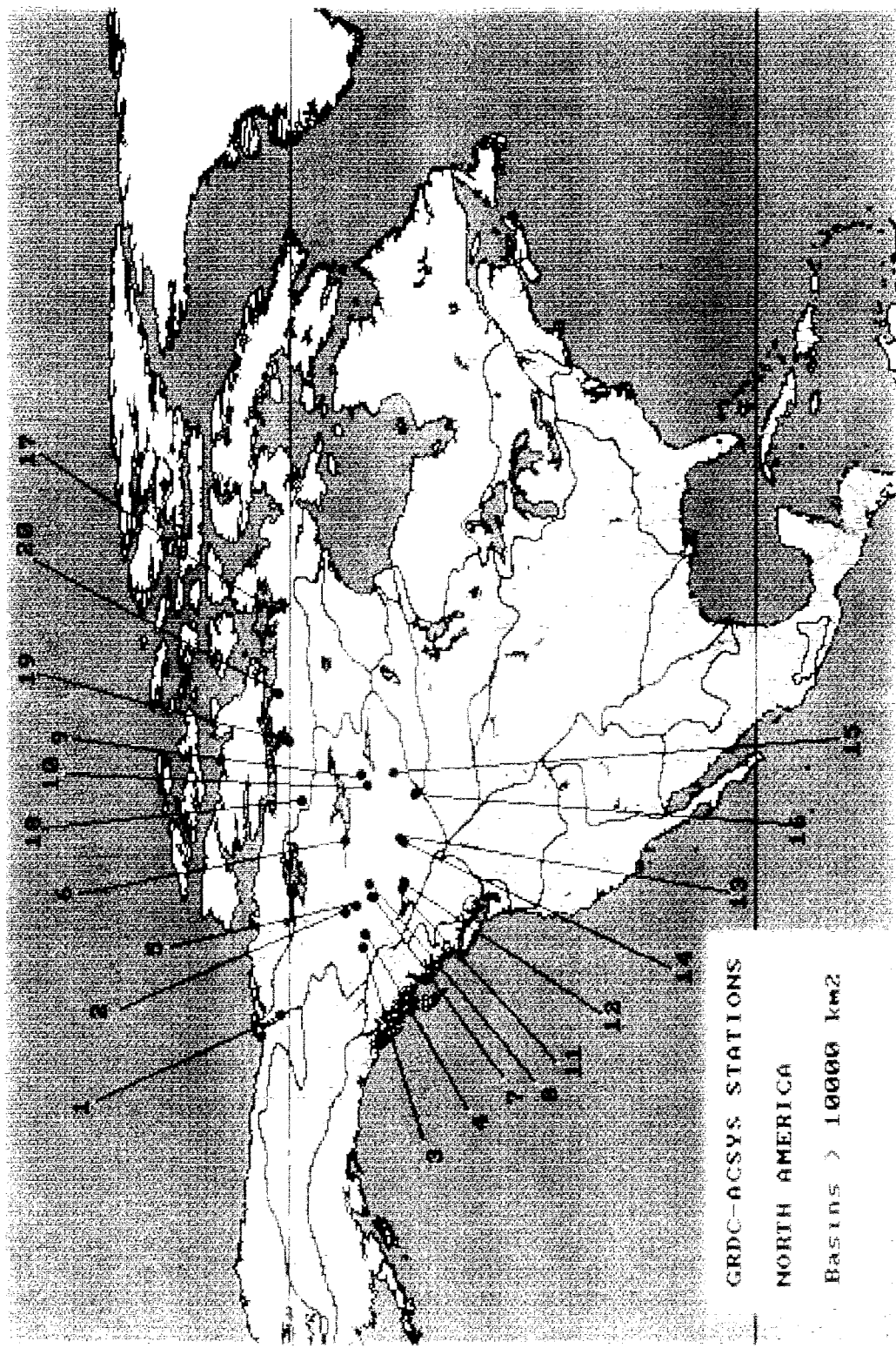
WCRP - 85, 1994: Arctic Climate System Study (ACSYS). Initial Implementation Plan. WMO/TD-No. 627, 9/1994.

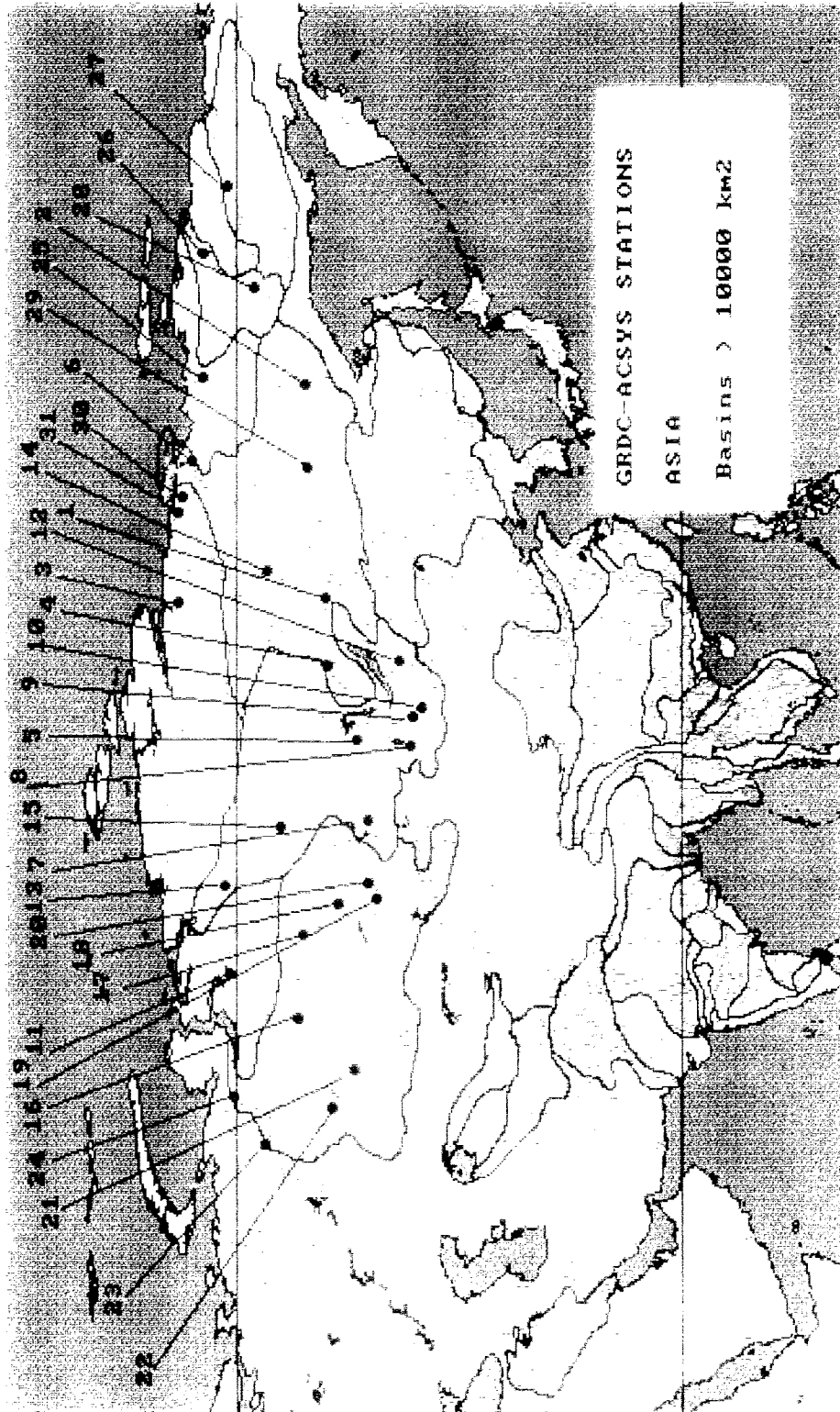
**MAPS AND TABLES OF THE
ARCTIC RIVER DATABASE
(ARDB)**

STATUS: 30 MAY 1995









NORTH AMERICA

Overview of overlapping timeseries of GRDC-ACSYS Stations

Station	Time series	1880	1885	1890	1895	1900	1905	1910	1915	1920	1925	1930	1935	1940	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995
Rengling River	below Highway No. 8	1973	1990																						
Snake River	near The mouth	1975	1990																						
Weldon Creek	near The mouth	1978	1990																						
Carcajou River	below Imperial River	1976	1990																						
Hyland River	km 108.5 Nahanni Range Road	1976	1990																						
Root River	near The mouth	1974	1990																						
Indin River	above Chitaco Lake	1977	1990																						
South Nahanni River	above Clausen Creek	1966	1994																						
Birch River	Highway No. 7	1974	1990																						
Hyland River	near Lower Post	1978	1989																						
Dease River	Outlet of Dease Lake	1978	1984																						
Kechika	mouth	1962	1984																						
Coal River	At The mouth	1978	1989																						
Liard River	Lower Crossing	1960	1984																						
Liard River	Fort Liard	1942	1990																						
Mackenzie River	near Fort Providence	1966	1975																						
Snowdrift River	Outlet of Silaza Lake	1976	1990																						
Marten River	above Thoa River	1977	1990																						
Muskwa	near Fort Nelson	1944	1984																						
Fort Nelson	above Muskwa River	1978	1984																						
Salt River	below Peace Point Highway	1973	1980																						
Slave River	Fitzgerald	1921	1984																						
Peace River	Peace Point	1966	1984																						
Ungahka River	above Swannell River	1978	1989																						
Peace River	Hudson Hope	1949	1984																						
Halfway	near Farrell Creek (Lower Station)	1962	1983																						
Pine	East Pine	1961	1984																						
Parship River	above Misinchinka River	1978	1989																						
Whitemud River	near Dixonville	1971	1990																						
Peace River	Peace River	1915	1984																						
Smoky River	Watino	1956	1988																						
Heart River	near Nampa	1963	1990																						
Hartley Creek	near Fort Mackay	1975	1990																						
Sleepbank River	near Fort McMurray	1972	1990																						
Athabasca River	below McMurray	1966	1984																						
Hangingsone River	Fort McMurray	1965	1990																						
West Prairie River	near High Prairie	1921	1990																						
Waskaganan River	near The mouth	1968	1990																						
Athabasca River	Athabasca	1952	1988																						
Snake Indian River	near The mouth	1971	1990																						
Athabasca River	near Jasper	1913	1990																						
Mileod River	above Embararas River	1955	1988																						
Wolf Creek	Highway No. 16a	1955	1988																						
Lobstick River	near Sval	1956	1986																						
Pembina River	near Entwistle	1955	1988																						
Firth River	near The mouth	1972	1990																						
Babbage River	below Caribou Creek	1976	1990																						
Tree River	near The mouth	1968	1990																						
Back	below Deep Rose Lake	1966	1984																						
Coppermine River	Point lake outlet	1965	1992																						
Burnside River	near the mouth	1976	1992																						
Ellice River	near the mouth	1971	1982																						
Tree River	near the mouth	1968	1992																						
Gordon River	near the mouth	1977	1992																						
Big River	above Egg River	1975	1988																						
Freshwater Creek	near Cambridge Bay	1970	1992																						

Overview of overlapping timeseries of GRDC-ACSYS Stations

table 1

River	Station	Time series	1880	1885	1890	1895	1900	1905	1910	1915	1920	1925	1930	1935	1940	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	
Vitim	Bodaibo	1965 1984																									
Mava	Chabda	1965 1984																									
Zhuva	Svetly	1978 1987																									
Anabar	Saskylakh	1966 1984																									
Kempendai	Kempendai	1978 1987																									
Kirenga	Shorokhovo	1965 1984																									
Trampfon	Nagorny	1978 1987																									
Iya	Tulun	1965 1984																									
Lena	Kusur	1935 1984																									
Ebetem	Ebetem	1980 1987																									
Kenteme	Vorovy Stanok	1978 1987																									
Tuba	Bugurtak	1965 1984																									
Chaplakhai	mouth	1978 1987																									
Radio-Uruyete	near The mouth	1978 1987																									
Podornyi	near The mouth	1978 1987																									
Buor-Iuryakh	Kujusun	1978 1987																									
Malaya Cherepanikha	Tiube	1978 1987																									
Shestakovka	Kamyrdagystakh	1978 1987																									
Ider	Tosontsengel	1978 1982																									
Delgermuren	Muren	1976 1984																									
Khoit Tamir	Ikh Tamir	1978 1982																									
Selenga	Chultc	1976 1984																									
Orkhon	Orkhon	1976 1984																									
Kharza	Barun Kharza	1978 1982																									
Toia	Ulan-Bator	1976 1984																									
Tereji	Tereji	1978 1982																									
Khara-Murno	Murno	1978 1987																									
Bolskaya Rechka	Possolskaya	1978 1987																									
Pur	Samburg	1965 1984																									
Gravyka	Igarika	1978 1987																									
Yenesei	Igarika	1936 1984																									
Us	Ust-Zolotaya	1978 1987																									
Markha	Mal'kai	1965 1984																									
Syda	Oifok	1978 1987																									
Sizim	Sizim	1978 1987																									
Podkamennaya Tunguska	Kuzmovka	1965 1984																									
Nizhnaya Tunguska	Podvolshino	1978 1987																									
Chernaya	Chernoye II	1978 1987																									
Mikhanskiy	Valmo 2	1978 1987																									
Bolshoi Yugan	Lgut	1965 1984																									
Iym	Napas	1965 1984																									
Tom	Tomsk	1965 1984																									
Peschanaya	Tochihoe	1978 1987																									
Mayma	Mayma	1978 1987																									
Bl'ya	Bl'ysk	1895 1985																									
Akkem	Akkem	1978 1987																									
Tom	Novokuznetsk	1894 1985																									
Uss	Mezhdourenchensk	1978 1987																									
Ishim	Petropavlovsk	1965 1984																									
Ishim	Ishimograd	1978 1987																									
Ulba	Ulba Perevalochnaya	1965 1984																									
Levaya Berozovka	Sredigor'nie	1978 1987																									
Bergamak	Pizany	1978 1987																									
Aremzyan'ka	Chukmanka	1978 1987																									
Uy	Stepnoe	1978 1987																									
Tura	Stepnoe	1896 1985																									
Lobva	Tumen	1969 1984																									
Northern Sosva	Lobva	1969 1984																									
Ob	Sosva	1965 1984																									
Reshetka	Salekhard	1930 1984																									
Yalynka	Novoalekseevskoe	1978 1987																									
Ota	Kaltukova	1978 1987																									
Yaguchi	Yaguchi	1978 1986																									
Yodo	Hirakata	1978 1988																									

ASIA

Overview of overlapping timeseries of GRDC-ACSYS Stations

table 2

River	Station	Time series	1880	1885	1890	1895	1900	1905	1910	1915	1920	1925	1930	1935	1940	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995		
Shingu	Oga	1986 1986																										
Kiso	Imawetani	1978 1988																										
Tenryu	Kashima	1986 1986																										
Fuji	Kiamatsuno	1986 1986																										
Ara	Oashibashi	1978 1988																										
Tone	Kuribashi	1986 1986																										
Tone	Kuribashi	1938 1984																										
Abukuma	Iwanuma	1986 1986																										
Kitakami	Torie	1986 1986																										
Yana	Dzanghky	1938 1984																										
Sugoy	3.2km Downstream of Omchikchan	1965 1984																										
Indigirka	Vorontsovo	1937 1984																										
Koyrma	Sredne-Kolymsk	1927 1984																										
Nera	Ala-Chubuk	1965 1984																										
Amquema	mouth of Shoumny Brook	1944 1984																										
Amga	Buyaga	1965 1984																										
Olenek	8km Upstr of mouth of Pur River	1952 1963																										
Olenek	7.5km Downstr of mouth of River Pur	1965 1984																										

GLOBAL RUNOFF DATA CENTRE (GRDC) ACSYS-STATIONS

EUROPE		Kola		(incl. Northern District of Russian Federation)							table 1
No.	River	Station	Area (km ²)	Latitude	Longitude	first rec.	last rec.	day/month			
1	Onega	Porog	55770	N 63.80	E 38.27	1965	1984	M			
	Solza	Soukhie Porogui	1190	N 64.31	E 39.48	1978	1987	D			
2	Northern Dvina	Ust-Pinega	348000	N 64.10	E 42.17	1881	1985	M			
3	Vaga	Filaievskaya	13200	N 61.23	E 42.25	1965	1984	M			
	Mud'yuga	Patrakeyevskaya	305	N 64.96	E 40.50	1978	1987	D			
4	Pinega	Kulogory	36700	N 64.71	E 43.66	1978	1987	D			
5	Mezen	Malonisogorskaya	56400	N 64.95	E 45.67	1965	1984	M			
	Pizhma	Borovaya	4890	N 65.33	E 51.81	1978	1987	D			
6	Pechora	Ust-Tsilma	248000	N 65.47	E 52.25	1932	1984	M			
7	Vyichegda	Malaya Kushba	26500	N 61.67	E 53.73	1965	1984	M			
8	Pechora	Yaksha	9620	N 61.86	E 56.66	1978	1987	D			
9	Usa	Adzva	54700	N 66.65	E 59.10	1965	1984	M			
	Iyema	Izvail	1150			1978	1987	D			
	Egul	Chukhlom	123			1978	1987	D			
	Ema	Novoe	179			1978	1987	D			
	Jena	Jena	1600	N 67.58	E 30.84	1979	1987	D			
	Ura	Ura-Guba	1020	N 69.41	E 32.78	1979	1987	D			
	Kola	Oktyabrsky Railway, km 1429	3780	N 68.88	E 33.05	1965	1984	M			
10	Umba	Paialka	6250	N 66.64	E 34.08	1979	1987	D			

GLOBAL RUNOFF DATA CENTRE (GRDC) ACSYS-STATIONS

EUROPE		Norway		table 2					
No.	River	Station	Area (km ²)	Latitude	Longitude	first rec.	last rec.	day/month	
11	Tana	Polmak	14005	N 70.07	E 28.05	1912	1987	M	
	Eineelv	Stordalsvatn	134	N 59.68	E 6.02	1913	1988	M	
	Vossa	Bulken	1071	N 60.63	E 6.28	1892	1988	M	
	Vefsna	Unkervatn	756	N 65.50	E 14.22	1978	1983	D	
	Kjerringa	Vassvatn	18,5	N 66.40	E 13.18	1917	1988	M	
	Saltelv	Junkerdalselv	426	N 66.82	E 15.43	1938	1988	M	
	Lakselv	Mevatn	178	N 69.23	E 17.78	1978	1983	D	
12	Altaelv	Masi	5693	N 69.42	E 23.63	1978	1983	D	

GLOBAL RUNOFF DATA CENTRE (GRDC) ACSYS-STATIONS

EUROPE		Iceland		table 3					
No.	River	Station	Area (km ²)	Latitude	Longitude	first rec.	last rec.	day/month	
	Hvita i Borgarfirdi	Kljafoss	1685	N 64.69	W 21.42	1951	1993	M/D	
	Oefusa	Selfoss	5760	N 63.94	W 21.01	1950	1992	M/D	
	Bruara	Efstadalsbru	225	N 64.26	W 20.52	1961	1991	M/D	
	Thjorsa	Urriðafoss	7200	N 63.93	W 20.60	1947	1993	M/D	
	Joekulsa i Fjotsdal	Holl	575	N 64.98	W 15.09	1962	1991	M/D	
	Joekulsa Vestari	Godðalabru	799	N 65.33	W 19.09	1971	1991	M/D	
	Djupa	Bru	260	N 63.95	W 17.65	1968	1992	M/D	
	Svarta	Ullarfoss	390	N 65.49	W 19.39	1932	1992	M/D	
	Joekulsa a Fjollum	Dettifoss	7000	N 66.03	W 16.45	1939	1984	M/D	
	Lagarfjot	Lagarfoss	2800	N 65.50	W 14.37	1949	1993	M/D	

GLOBAL RUNOFF DATA CENTRE (GRDC) ACSYS-STATIONS

NORTH AMERICA		Mackenzie		table 1						
No.	River	Station	Area (km ²)	Latitude	Longitude	first rec.	last rec.	day/month		
	Rengleng River	below Highway No. 8	1310	N 67.75	W 133.85	1973	1990	D		
	Snake River	near The mouth	8910	N 65.97	W 134.02	1975	1990	D		
	Weldon Creek	near The mouth	847	N 66.38	W 132.65	1978	1990	D		
	Carcajou River	below Imperial River	6860	N 65.28	W 127.68	1976	1990	D		
1	Mackenzie River	Norman Wells	1570000	N 65.28	W 126.85	1943	1990	D		
	Hyland River	km 108.5 Nahanni Range Road	2150	N 61.48	W 128.23	1976	1990	D		
	Root River	near The mouth	9840	N 62.47	W 123.42	1974	1990	D		
	Indin River	above Chalco Lake	1790	N 64.40	W 115.03	1977	1990	D		
2	South Nahanni River	above Clausen Creek	33400	N 61.25	W 124.03	1969	1990	D		
	Birch River	Highway No. 7	542	N 61.33	W 122.08	1974	1990	D		
	Hyland River	near Lower Post	9450	N 59.95	W 128.15	1978	1989	D		
	Dease River	Outlet of Dease Lake	1520	N 58.80	W 130.08	1978	1984	D		
3	Kechika	mouth	22700	N 59.62	W 127.31	1962	1984	M		
	Coal River	At The mouth	9190	N 59.68	W 136.95	1978	1989	D		
4	Liard River	Lower Crossing	104000	N 59.42	W 126.10	1944	1990	D		
5	Liard River	Fort Liard	222000	N 60.25	W 123.48	1942	1990	D		
6	Mackenzie River	near Fort Providence	970000	N 61.27	W 117.53	1958	1978	D		
	Snowdrift River	Outlet of Siltaza Lake	6030	N 62.17	W 109.85	1976	1990	D		
	Marten River	above Thoa River	736	N 60.60	W 108.97	1977	1990	D		
7	Muskwa	near Fort Nelson	20300	N 58.79	W 122.66	1944	1984	M		
8	Fort Nelson	above Muskwa River	22800	N 58.67	W 122.64	1978	1984	M		
	Salt River	below Peace Point Highway	821	N 59.83	W 111.97	1973	1980	D		
9	Slave River	Fitzgerald	606000	N 59.87	W 111.58	1921	1990	D		
10	Peace River	Peace Point	293000	N 59.12	W 112.43	1959	1990	D		

GLOBAL RUNOFF DATA CENTRE (GRDC) ACSYS-STATIONS

NORTH AMERICA		Mackenzie		table 2					
No.	River	Station	Area (km ²)	Latitude	Longitude	first rec.	last rec.	day/month	
	Ingenika River	above Swannell River	4200	N 56.72	W 125.10	1978	1989	D	
11	Peace River	Hudson Hope	70200	N 56.03	W 121.90	1949	1984	M	
	Halfway	near Farrell Creek (Lower Station)	9400	N 56.23	W 121.48	1962	1983	M	
12	Pine	East Pine	12100	N 55.72	W 121.21	1961	1984	M	
	Parnsip River	above Misinchinka River	4900	N 55.07	W 122.93	1978	1989	D	
	Whitemud River	near Dixonville	2010	N 56.50	W 117.65	1971	1990	D	
13	Peace River	Peace River	186000	N 56.25	W 117.32	1915	1990	D	
14	Smoky River	Watino	50300	N 55.72	W 117.62	1915	1990	D	
	Heart River	near Nampa	1960	N 56.05	W 117.12	1963	1990	D	
	Hartley Creek	near Fort Mackay	357	N 57.25	W 111.45	1975	1990	D	
	Steepbank River	near Fort McMurray	1370	N 57.00	W 111.40	1972	1990	D	
15	Athabasca River	below McMurray	133000	N 56.78	W 111.40	1957	1990	D	
	Hangingsone River	Fort McMurray	914	N 56.70	W 111.35	1965	1990	D	
	West Prairie River	near High Prairie	1163	N 55.43	W 116.48	1921	1990	D	
	Waskahigan River	near The mouth	1040	N 54.75	W 117.20	1968	1990	D	
16	Athabasca River	Athabasca	74600	N 54.72	W 113.29	1913	1990	D	
	Snake Indian River	near The mouth	1580	N 53.15	W 118.02	1971	1990	D	
	Athabasca River	near Jasper	3900	N 52.90	W 118.05	1913	1990	D	
	McLeod River	above Embarras River	2560	N 53.47	W 116.62	1954	1990	D	
	Wolf Creek	Highway No. 16a	829	N 53.60	W 116.27	1954	1990	D	
	Lobstick River	near Soyal	1570	N 53.61	W 115.11	1954	1986	D	
	Pembina River	near Entwistle	4430	N 53.60	W 115.00	1914	1990	D	

GLOBAL RUNOFF DATA CENTRE (GRDC) ACSYS-STATIONS

NORTH AMERICA		Canada (Arctic Ocean)		table 3						
No.	River	Station	Area (km ²)	Latitude	Longitude	first rec.	last rec.	day/month		
	Firth River	near the mouth	5710	N 69.32	W 139.57	1972	1990	D		
	Babbage River	below Caribou Creek	1510	N 68.82	W 138.67	1976	1990	D		
	Tree River	near the mouth	5960	N 67.63	W 111.88	1968	1990	D		
17	Back	below Deep Rose Lake	98200	N 66.08	W 96.50	1966	1984	M		
18	Coppermine River	Point Lake Outlet	19300	N 65.24	W 114.00	1965	1992	D		
19	Burnside River	near the mouth	16800	N 66.44	W 108.49	1976	1992	D		
20	Ellice River	near the mouth	16900	N 67.42	W 104.08	1971	1992	D		
	Tree River	near the mouth	5810	N 67.38	W 111.54	1968	1992	D		
	Gordon River	near the mouth	1530	N 66.48	W 107.06	1977	1992	D		
	Big River	above Egg River	3640	N 72.29	W 123.24	1975	1988	D		
	Freshwater Creek	near Cambridge Bay	1490	N 69.07	W 104.59	1970	1992	D		

GLOBAL RUNOFF DATA CENTRE (GRDC) ACSYS-STATIONS

ASIA		LENA		table 1				
No.	River	Station	Area (km ²)	Latitude	Longitude	first rec.	last rec.	day/month
1	Vitim	Bodaibo	186000	N 57.90	E 114.25	1965	1984	M
2	Maya	Chabda	165000	N 59.75	E 134.75	1965	1984	M
	Zhuya	Svetly	4790	N 58.44	E 116.14	1978	1987	D
3	Anabar	Saskylakh	78800	N 71.98	E 113.95	1966	1984	M
	Kempendai	Kempendai	1290	N 61.91	E 118.68	1978	1987	D
4	Kirenga	Shorokhovo	46500	N 57.67	E 108.07	1965	1984	M
	Timpton	Nagorny	613	N 55.98	E 124.75	1978	1987	D
5	Iya	Tulun	14500	N 54.77	E 100.65	1965	1984	M
6	Lena	Kusur	2430000	N 70.70	E 127.65	1935	1984	M
	Ebitiem	Ebetem	1000	N 70.36	E 127.95	1980	1987	D
	Kenkeme	Vtoroy Stanok	3550	N 62.06	E 129.03	1978	1987	D
7	Tuba	Bugurtak	31800	N 53.77	E 92.77	1965	1984	D
	Chaptakhai	mouth	28,4			1978	1987	D
	Radio-Uruyete	near the mouth	22,8			1978	1987	D
	Podgornyi	near the mouth	20,3			1978	1987	D
	Buor-Iuryakh	Kujdusun	743			1978	1987	D
	Malaya Cherepanikha	Tiube	469			1978	1987	D
	Shestakovka	Kamyrdagystakh	170			1978	1987	D

GLOBAL RUNOFF DATA CENTRE (GRDC) ACSYS-STATIONS

ASIA		(incl. Lake Baikal & Angara)						table 2
No.	River	Yenisei	Area (km ²)	Latitude	Longitude	first rec.	last rec.	day/month
		Station						
	Ider	Tosontsengel	8012	N 48.73	E 98.28	1978	1982	D
8	Delgermuren	Muren	16300	N 49.58	E 100.13	1976	1984	M
	Khoit Tamir	Ikh Tamir	2993	N 47.50	E 101.25	1978	1982	D
9	Selenga	Chutic	92300	N 49.37	E 102.83	1976	1984	M
10	Orkhon	Orkhon	23600	N 48.65	E 103.57	1976	1984	M
	Kharaa	Barun Kharaa	9580	N 48.92	E 106.07	1978	1982	D
	Tola	Ulan-Bator	6300	N 47.90	E 106.92	1976	1984	M
	Terej	Terej	1232	N 48.05	E 107.42	1978	1982	D
	Khara-Murin	Murino	1130	N 51.36	E 104.31	1978	1987	D
	Bolshaya Rechka	Possolskaya	565	N 51.76	E 106.44	1978	1987	D
11	Pur	Samburg	95100	N 67.08	E 78.15	1965	1984	M
	Uda	Alygdzher	4980	N 98.21	E 98.21	1979	1979	D
12	Khilok	Maleta	25700	N 50.77	E 108.25	1965	1984	M
	Oikha	Oikha	590	N 52.10	E 104.03	1978	1987	D
	Graviyka	Igarka	323	N 67.51	E 86.55	1978	1987	D
13	Yenisei	Igarka	244000	N 67.48	E 86.50	1936	1984	M
	Us	Ust-Zolotaya	6110	N 52.03	E 92.66	1978	1987	D
14	Markha	Malykai	89600	N 63.43	E 117.05	1965	1984	M
	Syda	Otrok	1480	N 54.33	E 92.50	1978	1987	D
	Sizim	Sizim	867	N 51.36	E 95.96	1978	1987	D
15	Podkamennaya Tunguska	Kuzmovka	218000	N 62.22	E 92.09	1965	1984	M
	Nizhnaya Tunguska	Podvoloshino	8270	N 58.28	E 108.41	1978	1987	D
	Chernaya	Chernoye II	301			1978	1987	D
	Mikhanskij	Velmo 2	32.3			1978	1987	D

GLOBAL RUNOFF DATA CENTRE (GRDC) ACSYS-STATIONS

No.	ASIA	River	Ob	(incl. Irtysh & Tobol)			table 3		
				Station	Area (km ²)	Latitude	Longitude	first rec.	last rec.
16	Bolshoi Yugan	Ugut		22100	N 60.32	E 74.12	1965	1984	M
17	Tym	Napas		24500	N 59.90	E 81.92	1965	1984	M
18	Tom	Tomsk		57000	N 56.58	E 84.87	1965	1984	M
	Peschanaya	Tochilnoe		4720	N 52.18	E 85.18	1978	1987	D
	Mayma	Mayma		780	N 52.00	E 85.85	1978	1987	D
19	Biya	Biysk		36900	N 52.52	E 85.27	1895	1985	M
	Akkem	Akkem		78,9	N 50.33	E 86.91	1978	1987	D
20	Tom	Novokuznetsk		29800	N 53.75	E 87.10	1894	1985	M
	Usa	Mezhdourechensk		3320	N 53.64	E 88.10	1978	1987	D
21	Ishim	Petropal'ovsk		118000	N 54.97	E 69.12	1965	1984	M
	Ishim	Tselinograd		7400	N 51.11	E 71.46	1978	1987	D
	Ulba	Ulba Perevalochnaya		4900	N 49.93	E 82.83	1965	1984	M
	Levaya Berezovka	Sredigorne		251			1978	1987	D
	Bergamak	Pjazany		371			1978	1987	D
	Aremzyanka	Chukmanka		478			1978	1987	D
	Uy	Stepnoe		3600	N 54.13	E 60.48	1978	1987	D
22	Tura	Tiumen		58500	N 57.15	E 65.53	1896	1985	M
	Lobva	Lobva		2940	N 59.05	E 60.26	1969	1984	M
23	Northern Sosva	Sosva		65200	N 63.67	E 61.88	1965	1984	M
24	Ob	Salekhard		2949998	N 66.57	E 66.53	1930	1984	M
	Reshetka	Novoalekseevskoe		32			1978	1987	D
	Yalynka	Kaltiukova		62,6			1978	1987	D

GLOBAL RUNOFF DATA CENTRE (GRDC) ACSYS-STATIONS

table 4

ASIA		Other Siberian Basins						
No.	River	Station	Area (km ²)	Latitude	Longitude	first rec.	last rec.	day/month
25	Yana	Dzanghky	216000	N 69.67	E 135.33	1938	1984	M
	Sugoy	3.2 km downstream of Omchikchan	5880	N 62.60	E 156.00	1965	1984	M
26	Indigirka	Vorontsovo	305000	N 69.58	E 147.35	1937	1984	M.
27	Kolyma	Sredne-Kolymsk	361000	N 67.37	E 153.67	1927	1984	M
28	Nera	Ala-Chubuk	22300	N 64.68	E 144.07	1965	1984	M
	Amguema	mouth of Shoumny Brook	26700			1944	1984	M
29	Amga	Buyaga	23900	N 59.55	E 126.95	1965	1984	M
30	Olenek	8 km upstream of mouth of River Pu	181000	N 71.67	E 123.98	1952	1963	M
31	Olenek	7.5 km downstream of River Pur	198000	N 72.12	E 123.22	1965	1984	M

**GLOBAL RUNOFF DATA CENTRE (GRDC)
ACSYS - STATIONS**

MISSING VALUES FROM EUROPE		Status: 31.05.1995		
GRDC-No.	Rivername	Stationname	missing days	missing months
6401080	Hvita l Borgarfirdi	Kjafoss	180	6
6401090	Oeifusa	Selfoss	241	8
6401110	Bruara	Efstadalbru	241	8
6401120	Thjorsa	Urriafoss	91	3
6401130	Joekulsa l Fjotsdal	Holl	241	8
6401200	Joekulsa Vestari	Goddalabru	151	5
6401500	Djupa	Bru	180	6
6401600	Svarta	Ullarfoss	241	8
6401700	Joekulsa a Fjollum	Detifoss	241	8
6401800	Lagarfjot	Lagarfoss	327	55
6730500	Tana	Polmak		17
6830100	Inarjoki	Karigasniemi	369	
6731150	Oselv	Roeykenes	2120	
6731200	Vossa	Bulken	2120	
6731250	Lygna	Tingvatn	2120	
6731300	Dramsely	Etna	2120	
6731350	Mosseelv	Hoegfoss	2120	
6731400	Gloma	Langnes		8
6731500	Gaula	Haga Bru	2120	
6731550	Argardselv	Oeyungen	2120	
6731900	Lakselv	Mevatn		11
6970200	Solza	Soukhie Porogui	330	
6970250	Northern Dvina(Severnaya Dvina)	Ust-Pinega		5
6971080	Ura	Ura-Guba	30	
6971100	Kola	Oktiabrsky Railway, km 1429	30	

**GLOBAL RUNOFF DATA CENTRE (GRDC)
ACSYS - STATIONS**

MISSING VALUES FROM CANADA		Status: 31.05.1995		
GRDC-No.	Rivername	Stationname	missing days	missing months
4209010	Firth River	near The mouth	264	
4209100	Trail Valley Creek	near Inuvik	779	
4209100	Trail Valley Creek	near Inuvik	779	
4209400	Coppermine River	Point Lake Outlet	240	
4209450	Big River	above Egg River	741	
4209500	Tree River	near The mouth	250	
4209550	Burnside River	near The mouth	230	
4209580	Gordon River	near The mouth	754	
4209650	Freshwater Creek	near Cambridge Bay	1663	
4209800	Back	below Deep Rose Lake		29

**GLOBAL RUNOFF DATA CENTRE (GRDC)
ACSYS - STATIONS**

MISSING VALUES FROM MACKENZIE REGION				Status: 31.05.1995
GRDC-No.	Rivername	Stationname	missing days	missing months
4208020	Mackenzie River	Inuvik (East Channel)	82	
4208025	Mackenzie River	Arctic Red River	14	
4208030	Rengleng River	below Highway No. 8	328	
4208050	Snake River	near The mouth	650	
4208110	Carcajou River	below Imperial River	227	
4208150	Mackenzie River	Norman Wells	5986	22
4208190	Hyland River	km 108.5 Nahanni Range Road	379	
4208200	Root River	near The mouth	13	
4208210	Indin River	above Chalco Lake	26	
4208220	South Nahanni River	above Clausen Creek	721	28
4208230	Birch River	Highway No. 7	15	
4208240	Hyland River	near Lower Post	361	
4208255	Kechika	mouth		16
4208270	Liard River	Lower Crossing	1572	6
4208280	Liard River	Fort Liard	4626	9
4208300	Mackenzie River	near Fort Providence	2655	19
4208320	Snowdrift River	Outlet of Siltaza Lake	144	
4208340	Marten River	above Thoa River	199	
4208360	Muskwa	near Fort Nelson		71
4208365	Fort Nelson	above Muskwa River		9
4208400	Slave River	Fitzgerald	11959	404
4208450	Peace River	Peace Point	129	
4208550	Peace River	Hudson Hope		25
4208560	Halfway	near Farrell Creek (Lower Station)		12
4208570	Pine	East Pine		17
4208610	Whitemud River	near Dixonville	359	
4208630	Peace River	Peace River	9457	317
4208640	Smoky River	Watino	12044	
4208650	Heart River	near Nampa	827	
4208710	Hartley Creek	near Fort Mackay	363	
4208720	Steepbank River	near Fort McMurray	634	
4208730	Athabasca River	below McMurray	177	3
4208740	Hangingsstone River	Fort McMurray	1099	
4208780	West Prairie River	near High Prairie	12992	
4208810	Waskahigan River	near The mouth	264	
4208870	Athabasca River	Athabasca	5021	
4208910	Snake Indian River	near The mouth	3537	
4208920	Athabasca River	near Jasper	14379	
4208955	Lobstick River	near Styal	83	
4208960	Pembina River	near Entwistle	11558	

**GLOBAL RUNOFF DATA CENTRE (GRDC)
ACSYS - STATIONS**

MISSING VALUES FROM ASIA		Status: 31.05.1995		
GRDC-No.	Rivername	Stationname	missing days	missing months
2903150	Anabar	Saskylakh		22
2903200	Kempendai	Kempendai	361	
2903450	Ebitiem	Ebetem	24	
2903500	Kenkeme	Vtoroy Stanok	52	
2903700	Tuba	Bugurtak		6
2903920	Radio-Uruyete	near The mouth	1	
2903930	Podgornyi	near The mouth	461	
2903950	Malaya Cherepanikha	Tiube	2	
2903960	Shestakovka	Kamyrdagystakh	2	
2707050	Ilder	Tosontsengel	549	
2707200	Khoit Tamir	Ikh Tamir	31	
2707900	Terejij	Terejij	194	
2907500	Pur	Samburg		41
2908400	Khilok	Maleta	1	
2909100	Graviyka	Igarka	295	
2909280	Markha	Malykai		9
2910480	Akkem	Akkem	2401	
2911200	Ishim	Petropavlovsk		17
2911300	Ishim	Tselinograd	255	
2911940	Aremzyanka	Chukmanka	41	
2912200	Uy	Stepnoe	361	
2912550	Northern Sosva	Sosva		12
2998100	Yana	Dzanghky		10
2998400	Indigirka	Vorontsovo		4
2998500	Kolyma	Sredne-Kolymsk		96
2998600	Nera	Ala-Chubuk		21
2998900	Amguema	mouth of Shoumny Brook		126
2999900	Olenek	8km Upstream of mouth Of Pur River		4

Reference of GRDC-Reports

- Report No. 1** Second Workshop on the Global Runoff Data Centre, Koblenz, Germany, 15 - 17 June 1992; May 1993
- Report No. 2** Dokumentation bestehender Algorithmen zur Übertragung von Abflußwerten auf Gitternetze. (Incl. abstract in English by GRDC: Documentation of existing algorithms for transformation of runoff data to grid cells). G. C. Wollenweber, May 1993
- Report No. 3** GRDC - Status Report 1992, June 1993
- Report No. 4** GRDC - Status Report 1993, June 1994
- Report No. 5** Hydrological Regimes of the Largest Rivers of the World - A Compilation of the GRDC Database, November 1994
- Report No. 6** Report of the first meeting of the GRDC Steering Committee, Koblenz, Germany, 20 - 21 June 1994
- Report No. 7** GRDC - Status Report 1994, June 1995
- Report No. 8** First Interim Report on the Arctic River Database for the Arctic Climate System Study (ACSYS), July 1995