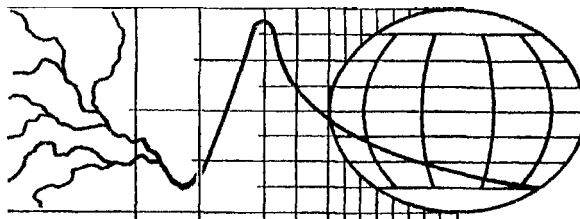


Weltdatenzentrum Abfluß
Bundesanstalt für Gewässerkunde
Koblenz, Deutschland

Global Runoff Data Centre
Federal Institute of Hydrology
Koblenz, Germany

Report No. 3

GRDC - Status Report 1992



GRDC



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June 1993

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Germany

GRDC - Status Report 1992

1 Introduction

The knowledge of the river discharge and other hydrological elements is basic information which is central to various kinds of hydrological investigations.

Within the studies of the impacts of climate change and climate variability a great demand arises for hydrological data, such as precipitation, evaporation, runoff etc. based on a regional, continental or global scale.

These hydrological data are needed for various purposes such as:

- global or continental water balance studies,
- investigating regional and global trends in hydrological time series,
- regional studies,
- estimations of inputs of water and matters into the oceans,
- validation of climate models simulations, coupling of hydrological and meteorological models

Within WMO's World Climate Programme the WCP-Water Project A.5 "Collection of Global Runoff Data Sets" was created and the Global Runoff Data Centre (GRDC) was established at the Federal Institute of Hydrology in Koblenz on November 1988.

Recently the WCP-Water Project A.5/GRDC has expanded to provide a general service for the collection and storage of internationally available sets of hydrological data.

The GRDC now operates with the support of the Federal Republic of Germany under the auspices of the World Meteorological Organization (WMO) for the benefit of WMO Members and the international scientific community.

The task of the GRDC is to collect, store and distribute runoff data and river basin information for national and international programmes such as :

- WCP-Water Projects (WMO)
- GEWEX (WMO / ICSU)
- GCOS (WMO / UNEP / IOC / ICSU)
- IGBP (ICSU)
- IDNDR (UN)
- IHP (UNESCO)
- FRIEND (UNESCO).

GRDC also participates in the UNEP Global Environment Monitoring System for water quality (GEMS/WATER) by providing selected river discharge data to the GEMS/WATER data bank at the WHO Collaborating Centre for Surface and Groundwater Quality at Environment Canada's "Canada Centre for Inland Waters" in Burlington.

2 Data Bank

The GRDC data bank currently (per 31 December 1992) consists of flows for 3,070 stations on 2,500 rivers from 140 countries. Daily flows for 1,834 stations are available and

monthly flows for 1,509. These numbers include 273 stations with both daily and monthly data. The numbers of gauging stations in the WMO-Regions are as follows :

WMO -Region	monthly	daily	both	Σ
Africa	461	382	98	843
Asia	186	215	17	401
South America	163	260	22	423
N. and. C. America	379	473	87	852
SW - Pacific	96	211	15	307
Europe	224	293	34	517

The core of the data bank consists of the daily flows for 1,327 stations from 75 countries which were collected by the Hydrology and Water Resources (HWR) Department of the WMO Secretariat for the WMO/ICSU Global Atmospheric Research Programme. GARP presented the first opportunity to collect flow data on a global scale. Within the First GARP Global Experiment (FGGE) data for the years 1978 to 1980 were collected. The selection of stations was done according to the following criteria :

- uniform distribution consistent with network conditions,
- higher station densities in areas of high variation in flow,
- coverage, to the greatest extent possible, of each type of hydrological homogenous region of each country,
- relatively small river basins (up to about 5,000 km², and in exceptional cases, up to 10,000 km²),
- flow data should represent natural flow, i. e. they should be corrected for diversions, abstractions and redistributions by storage,
- availability of good quality data.

The first request for flow data was sent to WMO Member Countries in August 1982. The circular letter was answered by 67 countries with submission of daily data for 1,207 stations.

Further circular letters were sent to WMO Member Countries in June 1984 and June 1990 in which they were asked to supply the data for the period 1981 up to now. This letters were answered by 42 countries (daily flows for 665 stations) respectively 27 countries (daily flows for 435 stations).

In order to enlarge the data basis, efforts were started to enter flow data which were already available from publications. The principal source in this context was the UNESCO publication "Discharge of selected rivers of the world". Within the scope of the International Hydrological Decade (IHD) and the International Hydrological Programme (IHP) UNESCO has collected monthly flows from 969 stations of 111 countries for the period 1965-1984. For 144 stations the data are available from the beginning of each observation. The longest serie exists for the station Göta at Vänersborg starting 1807. It should be noted that the UNESCO data are mainly for larger basins. Therefore only 49 stations appear together with the data both collected by the WMO and published by UNESCO.

It is now intended to collect daily runoff from gauging stations from all rivers with :

- mean annual discharge grater than 100 m³/s,
- river basins larger than 1,000,000 km²,

- basins with more than 1,000,000 inhabitants.

A further source of flow data are hydrological yearbooks, monographs and special reports. Up to now data for 692 stations from 44 countries (334 with daily flows, 366 with monthly flows) have been stored. A major part of the stored data results from the entry of data out of yearbooks which were collected by the WMO Secretariat and UNESCO and were submitted to GRDC.

Additional data have been received through direct contact with other institutions. From the Office de la Recherche Scientifique et Technique Outre-Mer (ORSTOM) daily flows for 77 stations from the Niger basin were obtained. This data set comprises flows from the beginning of observation up to 1980. Furthermore, daily flows for long series from six stations were collected by GRDC itself.

The collection of monthly flows within WCP-Water Project A.2 "Analyzing Long Time Series of Hydrological Data" gave the opportunity to enter monthly flows for 181 stations from 15 countries into the data base.

Within the framework of the WCP-Water Project A.8 "Detecting Global and Regional Runoff Trends by Monitoring Discharges of Selected Rivers" daily flow data are available. These data represent the runoff from 50 of the world's greatest river systems.

GRDC also includes monthly flows from 740 stations in 40 countries which have been compiled by Professor T. MacMahon, Australia.

Finally, GRDC data bank keeps flow data of 2124 stations from 13 countries of Northern and Western Europe which were collected within the FRIEND project. These data are available for exchange under terms of that project only.

3 Retrieval Service

The GRDC has developed a suite of programs to provide users with a selection of retrieval options in order to make data and information readily accessible.

For a more comfortable selection a catalogue of all stations including additional information is available on a diskette.

The following retrieval options for selected stations are currently available:

- table of daily flows
- table of monthly flows
- hydrograph of daily flows
- hydrograph of monthly flows
- flow duration curve
- flow duration table
- station and catchment information
- creation of data files

Examples of outputs are depicted within the Tables 1 - 4.

Requests may be made in written form or by personal visit to GRDC. The following information should be specified:

- name and address to which the output should be sent (including telephone, telefax and telex number if available),
- description of aim and focus of the research project or other applications respectively,
- hydrometric stations for which data are required,
- options requested,
- transfer media (magnetic tape / diskette / listing).

Charges may be assessed to cover the costs of providing services to users (e. g. costs of tapes or diskettes, shipping and handling). The charges can be waived if the individual or institution is a contributor of data to the GRDC.

Requests should be addressed to:

Global Runoff Data Centre (GRDC)
Bundesanstalt für Gewässerkunde
Kaiserin-Augusta-Anlagen 15 - 17
56068 Koblenz
Germany

Telephone:	National	0261 1306-0
	International	+49 261 1306-0
Telex:		08-62499
Telefax:		+49 261 1306-302

4 Research Activities

The resolution of regional-scale and continental-scale water resources forecasts and many issues of global change depend on a detailed understanding of the state and variability of the global water balance.

Two methods using river runoff data to validate climate and hydrological model performance exist:

- comparison of gridded measured runoff values with runoff estimates in each grid cell,
- accumulation of simulated runoff from all model grid cells within large river basins and comparison with measured runoff near the outlet of the river basin .

The first method will be applied in the WCP-Water Project B.3 "Development of Grid-related Estimates of Hydrological Variables". The specific purpose of the project is to compute gridded estimates of runoff, based on data from streamflow stations in Europe and using procedures, agreed on the 2nd Planning Meeting on Grid Estimation of Runoff Data, Warsaw, April 1992.

The pilot area covers the basins of the rivers Rhine, Weser, Elbe, Oder and Vistula. Estimates of runoff will be developed on a monthly basis in a 0.5° x 0.5° grid set , 1971 - 1980.

In the framework of the WCP-Water Project B.3 a research project "Transformation of Measured Flow Data to Grid Points" was started at GRDC in October 1992, sponsored by the German Minister of Research and Technology under no. 07 KFT 96. The task of this project is to provide monthly gridded runoff values as well as improved information of discharges from the continents into the oceans.

5 GRDC Workshop

For the second time, a Workshop on the Global Runoff Data Centre (GRDC) was held up at the Federal Institute of Hydrology (Bundesanstalt für Gewässerkunde/BfG) in Koblenz, Germany, June 15 - 17, 1992.

The workshop was coordinated by the staff of the GRDC in co-operation with the internal advisory group of the BfG and the Hydrology and Water Resources Department of the World Meteorological Organization (WMO).

The purpose of the meeting was to review the activities of the GRDC since its inauguration in 1988 as well as the future plans of the Centre which include the facilities for the gridding of hydrological data for use in validating General Circulation Models.

Experts involved in the relevant international programmes and projects were invited to take part in this workshop to introduce their programmes and/or projects and to develop potential links to the GRDC.

Two working groups were established by the workshop. The first group discussed major aspects of data collection and storage by the GRDC (Working Group A), the second working group considered problems of gridding of hydrological data (Working Group B). In this way many views could be exchanged so that the major points could be recorded in the final report, published as GRDC - Report No. 1.

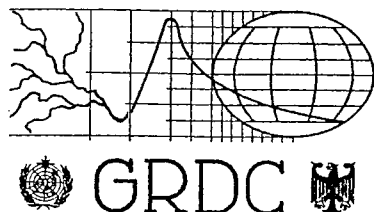
6 Call for Data

The quality of GRDC's response on user requirements strongly depends on the volume and actuality of the data base. Therefore all countries / institutions are kindly asked to co-operate with GRDC and to transmit runoff data regularly to the cited address.

Note

The GRDC operates with the support of the Federal Republic of Germany under auspices of the World Meteorological Organization (WMO). The GRDC has no commercial function.

The GRDC team consists of Dr. Manfred Schumacher (head, since 1 January 1993 Dr. Klaus Wilke), Dipl.Geogr. Brigitte Malm and Dipl.Geogr. Klaus Isele.



Global Runoff Data Centre
Bundesanstalt für Gewässerkunde
Kaiserin-Augusta-Anlagen 15-17
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 Telex 8-62499
 Telefax +49 261 1306280

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GLOBAL RUNOFF DATA CENTRE (GRDC)

I. Africa

01	Medjerda											
1201100	Medjerda	Ghardimaou	TS	3627N	843E	1480	1	1976	12	1979	M	1
1201150	Mellegue	K13	TS	3612N	850E	9000	1	1976	12	1979	M	1
1201500	Medjerda	Sloughia	TS	3658N	952E	20895	1	1976	12	1979	M	1
02	Chott Melhir, Chott Rharsa											
03	Chott Djerid											
04	Mediterranean Sea Coast (Western Part)											
1104150	Cheliff	Sidi Belatar	AL	3602N	027E	43750	1	1976	8	1978	M	1
1104200	Mina	Oued El-Abtal	AL	3550N	068E	6635	1	1976	8	1978	M	1
1104300	Rhiou	Ammi Moussa	AL	3587N	112E	2398	1	1976	12	1979	M	1
1104450	Mazafran	Fer a Cheval	AL	3667N	282E	1912	1	1976	8	1979	M	1
1104480	Boudouaou	Keddara	AL	3665N	342E	829	1	1976	8	1979	M	1
1104500	Isser	Lakhdaria	AL	3662N	358E	4149	1	1976	8	1979	M	1
1104530	Sebaou	Baghlia	AL	3680N	387E	2501	1	1976	12	1979	M	1
1104600	Bouselam	Sidi Yahia	AL	3642N	460E	4309	1	1976	8	1978	M	1
1104700	Rhumel	Oued Athmania	AL	3623N	630E	1220	1	1976	8	1978	M	1
1104800	Melah	Boucheouf	AL	3645N	772E	552	1	1976	8	1978	M	1
1204900	Joumine	Djebel Antra	TS	3695N	947E	235	1	1976	12	1979	M	1
1304100	Emsa	Emsa	MC	3552N	530W	110	4	1971	2	1988	D	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

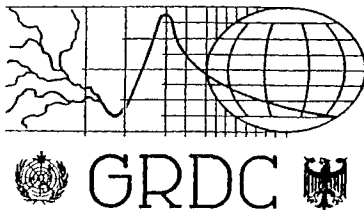
COMMENT:

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 available record in database
 I = last available record in database
 J = Daily/Monthly data
 K = Code of measurement (1 = runoff in m3/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

Table 1: Extraction of Global Runoff Data Centre-Catalogue.



Global Runoff Data Centre
Bundesanstalt für Gewässerkunde
Kaiserin-Augusta-Anlagen 15-17
56068 Koblenz
Federal Republic of Germany

Tel. National (0261)1306-0
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A
AMAZONAS
C D

B
OBIDOS

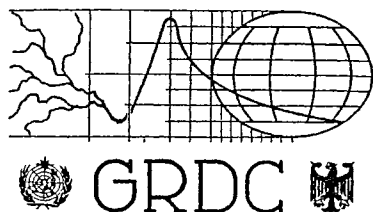
192811100013800018100020600021700021400019800016900011700085300.85500.90200.
192910400012800014200018200020900021500019900017200013700090900.80100.93900.
193011400014400017100019400020400020100019200017400013800010100089800.93500.
193111000013300016300019000020100019400017400014000097600.81500.86400.94000.
193211900016200018800020500021100020800019600017000013100093500.85800.93000.
193311100014000016600018900020800020700020000016800010700076900.80500.91400.
1934110000146000182000202000220000216000210000183000149000119000118000129000
193514300016000018000020300022100021600019700016700012900091200.75700.79800.
193610500014200016200017600019300018100016200013500091900.87100.81900.82300.

COMMENT:

A = Name of river (= 40 characters)
B = Name of station (= 30 characters)
C = Year
D = data (January - December)

Each value = 6 characters
The values are in m³/s.
Missing values = 9999.

Table 2: Example of mean monthly flow data.



Global Runoff Data Centre
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A	B	C	DE
CHINDWIN	HKAMTI		
334.00324.00320.00305.00296.00292.00288.00276.00268.00264.00		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
108.00108.00104.00104.00099.00099.00097.00097.00096.00096.00097.000		3	31978

COMMENT:

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

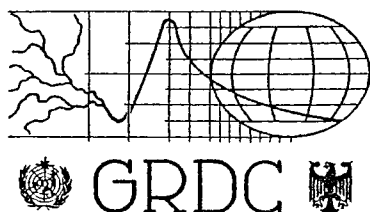
Data rows:

Each data row has a length of 80 characters, 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. Missing values will be marked with "9999".

Example:

February 23rd, 1978 = 164.00

Table 3: Example of mean daily flow data.



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AB	Albania	HU	Hungary	PF	French Polynesia
AD	Azerbeidzhan	HV	Burkina Faso	PH	Philippines
AG	Argentina	IE	Ireland	PK	Pakistan
AH	Afghanistan	IL	Iceland	PL	Poland
AL	Algeria	IN	India	PM	Panama
AU	Australia	IQ	Iraq	PO	Portugal
AX	Armenia	IR	Iran	PR	Peru
BJ	Benin	IS	Israel	PU	Puerto Rico
BM	Myanmar	IV	Cote d'Ivoire	PY	Paraguay
BO	Bolivia	IY	Italy	RE	France (Reunion)
BU	Bulgaria	JD	Jordan	RO	Romania
BW	Bangladesh	JM	Jamaica	RS	Russian Federation
BX	Belgium	JP	Japan	RW	Rwanda
BY	Byelorussia	KA	Micronesia	SB	Sri Lanka
BZ	Brazil	KG	Kirghistan	SG	Senegal
CD	Chad	KN	Kenya	SH	American Samoa
CE	Central African Rep.	KO	Rep. Korea	SI	Somalia
CG	Congo	KR	Dem. Peopl. Rep. Korea	SL	Sierra Leone
CH	Chile	KZ	Kazakhstan	SM	Suriname
CI	China	LA	Laos	SN	Sweden
CM	Cameroon	LI	Liberia	SP	Spain
CN	Canada	LS	Lesotho	SR	Singapore
CO	Columbia	LT	Lithuania	SU	Sudan
CS	Costa Rica	LV	Latvia	SV	Swaziland
CU	Cuba	LX	Luxembourg	SW	Switzerland
CY	Cyprus	LY	Libya	SY	Syria
CZ	Czech Republic	MA	Mauritius	TA	Tadzhikistan
DJ	Djibouti	MC	Morocco	TG	Togo
DL	Germany	MF	France (Guadeloupe)	TH	Thailand
DN	Denmark	MG	Madagascar	TN	Tanzania
DR	Dominican Republik	MI	Mali	TR	Turkmenistan
EG	Egypt	MK	Moldavia	TS	Tunesia
EO	Estonia	MO	Mongolia	TU	Turkey
EQ	Ecuador	MR	France (Martinique)	TW	Taiwan
ES	El Salvador	MS	Malaysia	UG	Uganda
ET	Ethiopia	MT	Mauretania	UK	United Kingdom
FG	French Guiana	MW	Malawi	UR	Ukraine
FI	Finland	MX	Mexico	US	U. S. A.
FJ	Fiji	MZ	Mozambique	UY	Uruguay
FR	France	NC	New Caledonia	UZ	Uzbekistan
GG	Georgia	NG	Papua New Guinea	VN	Venezuela
GH	Ghana	NI	Nigeria	VS	Vietnam
GM	Guam	NK	Nicaragua	YG	Yugoslavia
GN	Guinea	NL	Netherlands	ZA	South Africa
GO	Gabon	NO	Norway	ZB	Zambia
GR	Greece	NP	Nepal	ZR	Zaire
GU	Guatemala	NR	Niger	ZW	Zimbabwe
GY	Guyana	NZ	New Zealand		
HK	Hongkong	OS	Austria		
HO	Honduras	PB	Palau		

Table 4: List of Country Codes.

- | | |
|----------------------------------|--|
| Report No. 1
May 1993 | Second Workshop on the Global Runoff Data Centre, Koblenz, Germany, 15 - 17 June, 1992. |
| Report No. 2
May 1993 | 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 |
| Report No. 3
June 1993 | GRDC - Status Report 1992. |