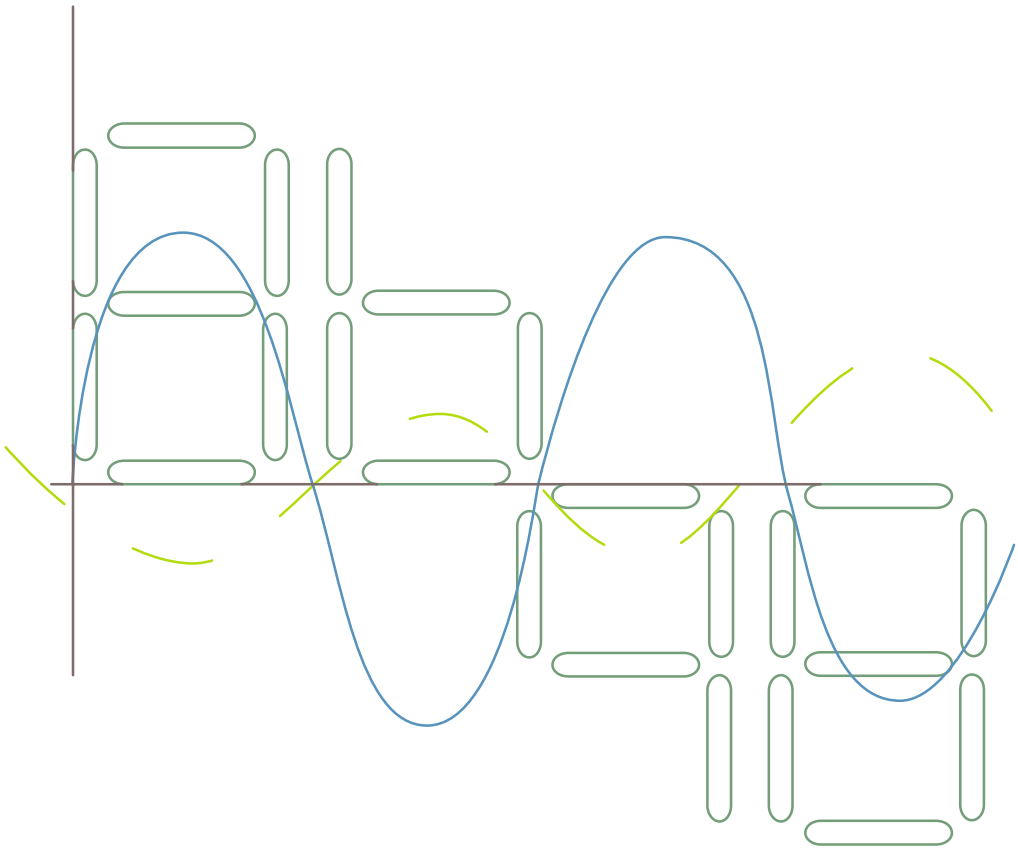
Report 35

GRDC Report Series

Seventh Meeting of the GRDC Steering Committee

6 - 8 July 2005, Koblenz, Germany



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Global Runoff Data Centre

GRDC operates under the auspices of the World Meteorological Organization (WMO) with the support of the Federal Republic of Germany within the Federal Institute of Hydrology (BfG)

Global Runoff Data Centre

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Annexes

The printed version of this report is accompanied by a CD-ROM including the digital annex, alternatively also available from the GRDC ftp-Site at ftp://www.bafg.de/pub/REFERATE/GRDC/GRDC_SC_7.

Report of the 7th Meeting of the GRDC Steering Committee

6 - 8 July 2005, Koblenz, Germany

Executive summary

The international Steering Committee (SC) of the GRDC met for its 7th meeting from 6 to 8 July 2005 at Koblenz, Germany.

The SC reviewed the past activities and developments of both, the GRDC and related international organisations, programmes and projects. From that perspective SC discussed the strategic development of GRDC activities, implementation goals as well as priorities.

7th SC 2005 noted with appreciation progress made with many recommendations given in the previous 6th SC meeting 2003, notably SC appreciated GRDC:

- to have systematically addressed the Permanent Representatives of a country to WMO and their Hydrological Advisors with respect to data acquisition, supported by the WMO HWRP Secretariat;
- to have produce a draft technical note on current GRDC river discharge data plausibility check procedures and to consider the development of an integrated stand-alone software for this purpose, which could be freely distributed to data providers and serve as an incentive to deliver more data in a timely fashion;
- to have intensified collaboration with the experts of the working groups of the Commission for Hydrology, CHy, especially with respect to Metadata and QA/QC issues through Mr Maurer having been registered with the CHy defined pool of experts (OPACHE) following CHy XII (2004);
- to have continued collaboration with GCOS, especially in the extension of the 2AR to the GCOS Implementation Plan and accommodating GTN-R as an action item therein;
- to have improved joint marketing of GRDC, GEMS/Water, GPCC and IGRAC programmes and having worked towards a GRDC-GEMS/Water product biogeochemical flux computation;
- to have proactively advanced the topic of metadata by writing up a GRDC Report 31 on the Metadata issue and starting activities towards the development of a prototype, that demonstrates the advantages and capabilities of standardised Metadata;
- to further have intensified and systematised data acquisition activities;
- to have relaunched on 2 June 2004 and since then continuously have improved and extended a completely new GRDC homepage, including extensive reporting on database status, recent data provisions, database usage and reference to publications on scientific research supported by GRDC data.

7th SC 2005 made a couple of recommendations, mostly suggestions improvements and for possible additional GRDC activities but also some to GRDC partners. They are summarised in the following table:

Recommendation	*Addressee*
Item 5 Recommendations:	
⇒ Develop a scoping paper on the possibilities of cross-programme or cross-project data acquisition as input to agenda for biannual UN-Water meetings.	GRDC WMO
⇒ Deek assistance of water related activities and programmes to support GRDC acquisition	GRDC
⇒ Continue GRDC-GEMS/Water collaboration cross-promotion activities	GRDC GEMS/Water
⇒ Promote that specialised data centres should be recognised by UN-Water, avoid duplication of efforts (e.g. in UN Statistical Division)	GRDC WMO
⇒ Establish contact with ICSU WDC	GRDC
⇒ NHS should send data to GRDC based on WMO Res 21/25	NHS
⇒ Further develop metadata standards	GRDC
Item 6 Recommendations:	
⇒ Aim at a Web site appearance independent from the governmental site (layout, embedding in BfG etc.)	GRDC
⇒ Change "spirit" of GRDC web page: more appealing in order to more positively attract people. Consider involving a policy and marketing expert and a public relation specialist.	GRDC
⇒ Search for examples of incentives that provide short term benefits.	GRDC
Item 8 Recommendations:	
⇒ Consider to prepare short information notes for research institutions and research consortia on what services it could/would like to provide in an international scope (transboundary basins, UN projects, ...), what GRDC were able to deliver in such projects.	GRDC
⇒ Conduct workshops in some research areas, trigger research coordination	GRDC
Item 9 Recommendations:	
⇒ WMO Hydrological Advisor of each member state to be asked by WMO to nominate an institution in the respective country as National Focal Point (NFP)	WMO WMO-HA
⇒ Cg 2007 to prepare a decision to support international data centres and as Cg 2003 did, keep in force Res. 21 (1995). Consider having a parallel meeting of HA during Cg 2007.	WMO WMO-HA
⇒ WMO to contact HA periodical, e.g. once per year	WMO
⇒ WMO to negotiate with UNESCO about unified access to their respective databases GRDC-FRIEND	WMO UNESCO
⇒ Consider a session on data acquisition during 2006 FRIEND conference in Cuba	GRDC

⇒ Prepare a 2-3 pager on data issues to be discussed during UN-Water session covering topics such as:: - Update on types of difficulties encountered in data acquisition, (unsatisfying) opportunity driven nature of current approaches - Communicate the need for a coordinated approach to UN-Water - Mention meeting reports of UN Statistical Division - Draw attention of the GEOSS community and partners to the need to resolve the long-standing problem of hydrological data acquisition and propose to include this in the two year work package for 2006-2007 (in cooperation with GEO secretariat)	GRDC
Item 10 Recommendations:	
⇒ WMO to officially ask UNESCO about status and future of FRIEND databases, discuss merging /unifying	WMO UNESCO
Item 11 Recommendations:	
⇒ Explore the opportunity to transfer the reservoir data from the Greifswald study to GTN-H	GRDC
⇒ GRDC should not only have opportunity-driven research collaborations, but rather proactively trigger research based on a list of research topics to be identified by GRDC.	GRDC
⇒ Consider having user workshops: in English rather then in German, better not attached to GRDC SC meeting but (in order to keep costs low) rather attached to other international meetings such as those of IAHS, EGS, ICSU, FRIEND, Stockholm Water week. (WMO could fund a few people). Same approach could work for WCP-Water and GTN-H.	GRDC
⇒ Regional Workshops, e.g. linked to some East-Asian Session of e.g. the Japan Society of Hydrology and Water Resources which has members from Japan, Korea and China.	GRDC
⇒ Consider introduction of a GRDC prize to stimulate research activities.	GRDC
Item 12 Recommendations:	
⇒ GRDC to take a suitable subset of guiding station selection criteria for individual acquisitions	GRDC
⇒ GRDC to separate station selection criteria items by “or”	GRDC
Item 13 Recommendations:	
⇒ add “WMO” in user declaration item 5 before “GRDC”	GRDC
⇒ in addition, cite GRDC without the German address	GRDC
⇒ as the term “substantial part” is not well defined it is suggested to drop it.	GRDC
⇒ add “subtitle” to data policy: “Guidelines which have been endorsed by the WMO Commission for Hydrology ...”	GRDC
⇒ as data does not belong to GRDC, point out that the ownership of the data remains with the data providers	GRDC

Item 14.1 Recommendations:	
⇒ Presentation Kinosita to be forwarded for consideration in WMO Guide Hydrological Practices.	WMO
⇒ GRDC to develop stand-alone software tool providing the plausibility check routines to data providers as an incentive for NHS.	GRDC
⇒ Use free software "Khronostat" for statistical analysis to detect average variations in hydrological time series available from http://www.hydrosciences.fr (French and English).	GRDC
Item 14.2 Recommendations:	
⇒ Check threshold values for "zero discharge" for congruence with WMO and other standards	GRDC
Item 14.5 Recommendations:	
⇒ GRDC to be invited by WMO to Beijing World Weather Watch Meeting (1st Meeting of CBS Inter-Programme Expert Team on Metadata Implementation, 26 - 30 September 2005).	WMO
⇒ Accommodate GRDC metadata (currently yet in Excel-files) in the WMO metadata profile (ongoing process), Version 0.2 of WMO core metadata profile of ISO19115	GRDC
Item 15.4 Recommendations:	
⇒ Bring freshwater flux product to the attention of the WGCM/CLIVAR Working Group on Ocean Model Development	GRDC
⇒ GRDC to compile a state-of-the-art overview of water related measurement methods from space.	GRDC
Item 16.1 Recommendations:	
⇒ GRDC to explore application of potential and interfaces of software systems WorldWind, Google Maps and Google Earth.	GRDC
⇒ GRDC to continue collaboration with GEMS/Water especially with regard to acquiring data for common stations and cross-promotion of data centres.	GRDC GEMS/Water
Item 17.1 Recommendations:	
⇒ GRDC to contact the various FRIEND projects for discussion of the future of their databases, especially with regard to pristine basins.	GRDC WMO UNESCO
⇒ GRDC to work on a common metadata catalogue with the FRIEND projects, also identifying overlapping stations	GRDC
Item 17.2 Recommendations:	
⇒ SC reinforced its view that GEWEX Continental Scale Experiments (CSE) should provide their discharge data to GRDC.	GEWEX-CSE
Item 18 Recommendations:	
⇒ GRDC was advised to continue to pursue active data acquisition from	GRDC

	HYCOS projects and also to explore the possibility to receive near real-time data from regional HYCOS data centres.	HYCOS-Data Centres
⇒	GRDC should be invited as an observer in the WHYCOS meetings.	WMO WHYCOS
Item 19 Recommendations:		
⇒	List actions which were taken to systematically address the Permanent Representatives of a country to WMO and their Hydrological Advisors with respect to data acquisition, possibly supported by the WMO HWRP Secretariat.	GRDC
⇒	Continue to produce a technical note on current GRDC river discharge data plausibility check procedures and to consider the development of an integrated stand-alone software for this purpose, which could be freely distributed to data providers and serve as an incentive to deliver more data in a timely fashion;	GRDC
⇒	Continue collaboration with GCOS, especially in the extension of the 2AR to the GCOS Implementation Plan;	GRDC GCOS
⇒	Continue to foster joint marketing of GRDC, GEMS/Water, GPCC and IGRAC programs and to explore options to collaborate on a more institutionalised level. Specific suggestions were to produce joint flyers and letters, as well as to plan to hold a workshop with global focus on joint GRDC-GPCC and joint GRDC-GEMS/Water products on rainfall-runoff cross-validation and biogeochemical fluxes, respectively;	GRDC GEMS/Water GPCC IGRAC
⇒	tDevelop closer contacts and collaboration with GWSP of ESSP;	GRDC GWSP
⇒	Develop products of gridded evapotranspiration and soil moisture, based on water balance model with input of precipitation and temperature from climatic water balance;	GRDC
⇒	Consider the PILPS Land surface schemes intercomparison (WCRP to provide GRDC with a list of names to whom to distribute SC Report);	WCRP GRDC
⇒	Continue to ensure GRDC's collaboration and involvement in relevant international research and operational programmes and projects such as GEWEX, CliC, GCOS, GTN-H, WHYCOS etc.;	GRDC WMO WCRP
⇒	Continue to proactively advance the topic of metadata, developing a concept, discussing this in the GTN-H panel and in expert groups, developing in the framework of a pilot study a prototype, that demonstrates the advantages and capabilities;	GRDC
⇒	Actively extend contribution to the Global Terrestrial Network for Hydrology (GTN-H), especially by developing the GRDC Near-Real-Time River Discharge Monitor;	GRDC
⇒	Attract additional temporal staff by e.g. working with students and PhD candidates or seconded experts, send from their home organisations to GRDC;	GRDC
⇒	Explore possibilities to scan earlier GRDC reports and make them	GRDC

available via the GRDC homepage;	
⇒ Publish GRDC contacts (address database of data providers and users) on the GRDC web page;	GRDC
⇒ Store a security copy of the GRDC database to reside at WMO. It is recommended to store an ASCII dump of all GRDC data and metadata at WMO IT security (address to be provided by WMO)	GRDC WMO
Item 20 Recommendations:	
⇒ GRDC has a clear mandate for river discharge collection, should follow own visions and not get distracted by others	GRDC
⇒ Besides GRDC routine work, development of GTN-R and the Metadata issue has first priority. GRDC in 5 years: largely improved access to near real time data to eventually get more and more a operational function. - The collaboration with EFAS is strategically critical for the GRDC! - Real time data acquisition introduces new tasks for GRDC, i.e. especially the need for acquisition of water level data and rating curves. - A good solution were finding funding for updating equipment of many of the around 400 envisaged GTN-R stations (estimate of max. 8000 US$ per station) - GRDC was strengthened in its view not to merge real-time data with the historical quality proofed data	GRDC WMO ALL
⇒ GRDC was recommended to continue its collaboration in GCOS, GTN-H and IGOS-P	GRDC
⇒ Bring GRDC as an important international data centre in mind of the officials, brief GEO Secretariat. GEOSS is a intergovernmental structure potentially providing a more direct link to governmental levels.	GRDC
⇒ GRDC to observe developments regarding satellite derived data of hydrological interest (WatER initiative etc.)	GRDC
⇒ Potential promising contacts are those of national IHP/HWRD committees as well as IAHS national representatives.	GRDC IHP
⇒ GRDC was suggested to regularly send articles to newsletters such as Meteo-World of WMO and IAHS newsletter	GRDC
⇒ Raise GRDC visibility by sending brief material – to users, to providers, not as a link to web page but better paper (officials do not visit homepages!), e.g. prepare a number of one-page project briefs/sketches as suggestions	GRDC

0 General

As always during the SC meeting the past activities and developments of both the GRDC and related international organisations, programmes and projects were reviewed. From that perspective the strategic development of GRDC activities and its priorities have been discussed.

This report (with exception of this section 0) follows the enumeration of the agenda as given in Annex 1. As appropriate, sections have been subdivided into four parts marked by left-indented subheadings set in italics. While "*state of affairs*" summarises input *to* the SC, "*discussions*", "*recommendations*" and "*actions*" reflect the input *from* the SC meeting.

The membership of the Steering Committee by organisation or group is given in Annex 2, the list of attendees in Annex 3 and the list of GRDC staff members in Annex 4.

The MS PowerPoint presentations given during the meeting as well as other related electronic material is provided on a CD ROM attached to the printed copy of this report as well as by the GRDC ftp-Site (ftp://www.bafg.de/pub/REFERATE/GRDC/GRDC_SC_7). A list of all these files is given in Annex 11. Throughout this report this material is referenced by "digital annex, agenda item" followed by the number of the agenda item.

In the electronic version of this report it is possible to click on cross-references to internal links including the annexes as well as to http-links and the associated ftp-directory of the digital annex, if internet connection is available.

1 Opening of the meeting

The 7th meeting of the GRDC-SC was formally opened by the chairman of the GRDC Steering Committee, Mr Klaus Wilke, on 6 July 2005 at 9:00.

2 Greeting from the Director of the Federal Institute of Hydrology

On behalf of Mr. V. Wetzel, Director and Professor of the Bundesanstalt für Gewässerkunde (BfG, Federal Institute of Hydrology) that hosts the GRDC, the 7th meeting of the GRDC-SC was welcomed by Dr Hans Moser, Head of the Division Quantitative Hydrology.

Mr. Moser stressed the intention to continue the support of the GRDC by the BfG as part of the international obligations. Besides the GRDC, the BfG hosts the IHP/HWRP Secretariat of UNESCO and is also involved in several international projects, among them the Global Climate Observing Systems (GCOS) , the Global Monitoring for Environment and Security (GMES) and the Global Earth Observation System of Systems (GEOSS).

The BfG contributes to GEOSS by the definition of earth-observation data and information exchange needs. GRDC's contribution to the Global Terrestrial Network of Hydrology (GTN-H), the Global Terrestrial Network for River Discharge (GTN-R), will help to increase the availability of near-real time data for forecasting purposes as e.g. required in the European Flood Alert System (EFAS) project of the Joint Research Centre of the EC.

Mr. Moser pointed out that the support for the GRDC has remained more or less constant over the recent years. This has to be seen as a success, as annual budgets of public services have been reduced. Funding by the BfG includes staff salaries, provision of office space and office infrastructure as well as data-processing facilities and support of travel of GRDC staff. Given the current economic situation of the German Federal Government and thus the obligation to continue reducing BfG staff, it is unlikely that GRDC staff can be increased in the foreseeable future based on regular federal funds alone.

3 Organisation of work and adoption of the agenda

All member organisations of the GRDC SC (Annex 2) had been invited. The attendees to the meeting are listed in Annex 3. In addition, Annex 4 lists the members of the GRDC staff.

The agenda of the meeting (Annex 1) was discussed and adopted without change.

4 WMO and CHy WG activities relevant to the work of the GRDC

Mr Grabs provided the SC with GRDC relevant news from the point of view of WMO (digital annex, agenda item 4). He stressed the important role of global data centres and appreciated the high level of funding provided by the Federal Institute of Hydrology. He further highlighted the GRDC contribution to the improvement of global flow of data and its links to other programmes.

Mr Grabs mentioned the field of data standardisation to be of high importance and appreciated the activities of the GRDC in this regard. There are many obstacles in the practice of data exchange, many systems are built for special national issues. He encouraged GRDC to continue to take part in international working groups regarding standardisation and definition of transmission protocols.

Through its GTN-H initiative, WMO together with GCOS aims at providing access to real time hydrological data in a global context for the first time, which will be a major step forward. In this context the GRDC contribution GTN-R (see below) is complement to this activities and will help to increase the availability of near-real time data for forecasting purposes as e.g. required in the European Flood Alert System (EFAS) project of the Joint Research Centre of the EC.

Mr Ryabinin mentioned the GEOSS initiative and its societal benefit areas and inquired about its relation to the field of hydrology.

Mr Grabs briefly described GEO and the vision to arrive at a system of systems for Earth Observation (GEOSS) to optimally provide socio-economic benefits. GEO has an overall political dimension and its success highly depends on commitment of governments and requires the coordination of many different interests. Mr Ryabinin recommended to GRDC to find actions that would be useful for GEOSS in accomplishing what is mentioned in its 10-year implementation plan.

5 GRDC self-conception

State of affairs:

Mr Maurer provided the SC with his view of a framework in which GRDC is operating. He summarised the GRDC mission as "Acceleration of data and information flow by collection and dissemination of discharge data" and briefly introduced the corresponding scope of GRDC activities:

- World-wide acquisition, storage and dissemination of historical and near-real time river discharge data in support of the predominantly water and climate related programmes and projects of the United Nations, their specialised agencies and the scientific research community

- Operation and further development of the GRDC database, improvement of integration with external databases, contribution to the development as well as application and propagation of international standards for Metadata, discharge data and data structures
- Preparation and maintenance of applied global data products and discharge-related geo-information, partly in collaboration with specialised external institutions
- Application of mathematical models in various scales for estimation of water balances, water availability and coupling with climate models
- Collaboration with and consulting of international organisations, other world data centres as well as foreign institutions in the fields of hydrology, water resources as well as data management and data acquisition
- Publication of the GRDC Report Series, operation and maintenance of a comprehensive GRDC Web Site

Mr Maurer stressed the many dimensions of the problems a global data centre encounters, involving technical and scientific but also political, organisational/institutional and financial aspects, that all need different treatment at various levels. He pointed out the two basic perspectives from which GRDC pursues accomplishing GRDC's mission:

1. **Short to mid term** horizon (bottom-up path):
   - Data identification and acquisition
   - Data storage and reporting
   - Data distribution and usage (product development)
2. **Long term** horizon (top-down path):
   - Participation in / contribution to international coordinating, integrating and standardising activities such as 2AR, GCOS-IP (UNFCCC), GEOSS-IP, ET-IDM (WMO-CBS), etc.

Mr Maurer further pointed out three principal measures that can be taken towards improving GRDC performance and capacity:

1. Increase of **internal capacity**
   - e.g. fund raising allowing to employ additional staff for a multiplication of the current data acquisition practice ("brute force" approach)
   - e.g. fund raising allowing to employ additional staff for increased communication efforts necessary for the advancement of innovative projects as e.g. near-real time discharge data integration in the framework of the Global Terrestrial Network for Hydrology (GTN-H).
2. Increase of **external capacity**

   Outsourcing of tasks (however some managerial capacity cannot be outsourced):
   - *Data acquisition*: proactive involvement of all kinds of international organisations, programmes and projects, as e.g. GEWEX and its CSEs, WCRP-CliC, and many others => recognition and lobbying needed, which is not a simple task. Strategies have to be developed to spread the idea that all UN funded projects, which involve the collection of river discharge data should contribute this data to GRDC.

- *Data analysis and products*: proactive involvement of all kinds of international organisations, programmes and projects and proactive cooperation with research institutions analysing GRDC data (currently ten under way, see agenda item 11)

3. Foster **automation**
   - Automation of *internal* and *external* processes
   - Inevitably linked to *standardisation* of data formats and transfer and storage schemes, needs to be coordinated internationally. A good start is the recently proposed WMO-Metadata standard (http://www.wmo.int/web/www/WDM/Metadata/documents.html)
   - Experiences gained in the field of *Geomatics*, which came up with a suite of ISO standards on geographic information objects (e.g. ISO 19115 on Metadata), may serve as a basis and template (regarding the standards as well as the organisational processes leading to the standards)

Discussion:

Mr Grabs commented on the point of outsourcing of tasks by suggesting data acquisition activities to be outsourced as possible. In this context he also reasoned about the incorporation of FRIEND data into the GRDC database. Mr Grabs also encouraged to seek cooperation with the WWAP.

Mr Maurer expressed his view, that in project funding negotiations between donors and countries, especially if provided from UN sources or UN coordinated sources, projects always should lead to data provisions to international data centres. High level programmes should work towards a necessary change of mind and give corresponding advice for release of data. Mr Grabs suggested to come up with a scoping paper carrying recommendations of the SC to UN Water meetings taking place twice a year.

Mr Robarts reported the good experiences of GEMS/Water with setting up regional nodes in countries, but admitted that this requires additional funds. He also encouraged the cross-promotion activities GRDC and GEMS/Water have already undertaken.

Mr Rudolf questioned that setting up regional nodes were realistic for GRDC. He posed the question to more directly involve the WMO in data acquisition. The “difficult”, reluctant countries, were not sufficiently convinced in the past and some experiences of the GPCC showed that countries prefer to send data to WMO, rather than to a designed data centre. Thus Mr Rudolf suggested top reason about establishing a place for data acquisition in WMO.

Mr Ryabinin stressed that using opportunities of existing international programmes for data acquisition is essential. As examples he mentioned the IPY for applications for projects as e.g. Arctic-HYCOS and the Global Water System Project. He further questioned why GRDC was not established as an ICSU WDC.

Recommendations:

- to develop a scoping paper on the possibilities of cross-programme or cross-project data acquisition as input to agenda for biannual UN-Water meetings

- to seek assistance of water related activities and programmes to support GRDC acquisition
- to continue GRDC-GEMS/Water collaboration cross-promotion activities
- to promote that specialised data centres should be recognised by UN-Water, avoid duplication of efforts (e.g. in UN Statistical Division)
- to encourage GRDC to establish contact with ICSU WDC
- NHS should send data to GRDC based on WMO Res 21/25
- to encourage GRDC to further develop Metadata standards

6 GRDC public relations

State of affairs:

Mr Maurer introduced the new GRDC Web site which was relaunched on 2 June 2004. More than 1000 entries in a searchable content management system report on all aspects of GRDC operation and discharge related information. A comprehensive glossary explains around 400 acronyms of organisations, programmes or projects with relation to the topics of GRDC including associated URLs and often additional information about inter-relations. In addition, GRDC maintains three specialised project sub-sites. All four sites provide a geographical overview of the associated stations and allow to download Metadata catalogues. These are the URLs for the respective sites:

- GRDC: http://grdc.bafg.de GRDC Homepage
- ARDB: http://ardb.bafg.de Arctic Runoff Data Base
- EWA: http://ewa.bafg.de European Water Archive (EWA of NE-FRIEND)
- GTN-R: http://gtn-r.bafg.de Global Terrestrial Network for River Discharge

Annex 5 lists the sitemaps of the first two hierarchy levels of the four sites. These Web sites are major pillars in GRDC's communication, in particular the Download Section at http://grdc.bafg.de/?861 provides access to all relevant resources, i.e.

- How to get to GRDC
- Station Catalogues
- GRDC Station Selection Criteria
- GRDC Data Policy
- GRDC Data Products
- GRDC Report Series
- GRDC Flyers
- GRDC Information Notes
- GRDC Posters
- GRDC User Declaration
- WMO Resolutions
- GRDC Support Letter from WMO Secretary General (July 2004)
- Papers by GRDC

Most materials presented here are also distributed in printed form, where appropriate.

Particular worth mentioning is that GRDC recently set up two Internet Map Services based on BfG technology for interactive overview of GRDC and GTN-R stations and related basins (http://grdc.bafg.de/?8582). However, due to capacity problems at BfG's IT department, this service is currently only available within the BfG-Intranet.

Furthermore, Mr Maurer provided an overview of GRDC participation in and contribution to more than 30 conferences and workshops in the past two years, as well as receiving 15 visitors and hosting of four meetings, among them a recent German language colloquium on

GRDC data applications, where six presentations of collaboration research groups working with large subsets of GRDC data were given. The presentations have been published within the (German language) report series of BfG colloquia (available at http://grdc.bafg.de/?11230).

Discussion:

The SC expressed its appreciation for the efforts of the GRDC to develop such a comprehensive Web site.

Mr Kinosita remarked, that he was often asked what will be the return from GRDC, implying that the return is too small for many of the providing countries. A feedback and return to the data provider is required. Mr Grabs explained that this is a general problem since the beginning of GRDC operation. The direct and short-term national benefit is really low and the benefit in long term perspective, i.e. general better understanding of how water resources are going to develop, is not of immediate interest to many potential providers from a technical point of view.
An exception for less developed countries is technical assistance, i.e. capacity building in the fields of data management, quality control, input for international programmes and networks, contact to international research, etc.

Mr Ryabinin recommended to make the GRDC Web site more appealing by changing its spirit, i.e. put technical questions more in the back. He felt the site to be overloaded.
He further inquired about the activities of HWRD of WMO regarding training activities of WMO for countries. Mr Grabs explained that WMO has a department for education and training, however its capacity building strategy does not link to the data centres, rather has its focus on other activities, such as connecting countries to guidebooks, technical materials, experts as well as facilities to improve the sampling capabilities of countries.

Mr Robarts explained that the appearance of the GEMS/Water Web site is completely independent from that of the Canadian Government and he stressed this to be an important factor for international acceptance. He also agreed on the need to avoid technical language which is not good for communication.

Mr Grabs mentioned the GRDC Reports on the use of the GRDC data. He suggested, to list the major use of hydrological data by country, so the country can get a recognition for what type of purpose data were used for.

Recommendations:

- GRDC to aim at a Web site appearance independent from the governmental site (layout, embedding in BfG, etc.).
- Change “spirit” of GRDC Web site: more appealing in order to more positively attract people. Consider involving a policy and marketing expert and a public relation specialist.
- Search for examples of incentives that provide short term benefits.

7 Contributions to international reports

State of affairs:

Mr Maurer reported on his activities regarding GRDC contributions of text or comments to a number of international reports related to the topics "water" and "river discharge" as well as "standardisation, Metadata and information infrastructure" as listed in the following table:

Acronym, publication	*Report*	*GRDC Contribution*
GEOSS 2005	Global Earth Observation System of Systems 10-Year Implementation Plan Reference Document	Comments to “Technical Blueprint” (IPTT 201-1) = Zero draft
GCOS-IP Oct 2004	Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC	Participation in preparatory TOPC meetings and a writing team meeting, definition of GTN-R as near-real time baseline river discharge network achieved!
ET-IDM 4 Sep 2004	Fourth Meeting of the Expert Team on Integrated Data Management, Geneva, 1-3 September 2004, Commission for Basic Systems, WMO, Geneva, Switzerland.	Some definitions necessary for hydrological variables in the WMO core Metadata Profile of ISO 19115 (report and documentation of the standard is online available at http://www.wmo.int/web/www/WDM/ET-IDM-4/documents.html,)
IGWCO Apr 2004	IGOS Integrated Global Water Cycle Observation theme report	Written inputs to drafting Rick Lawford
2AR May 2003	Second Report on the Adequacy of the Global Observing Systems for Climate in Support of the UNFCCC	GRDC was contributing author and is pleased to see the issues of "Effective Data Exchange and Access", "Standards" and "Planning and Reporting" being highlighted at prominent position, i.e. in Conclusion 2+3 and 12-15 of the Executive Summary

This kind of activities is regarded as essential in achieving in the mid to long term an improved framework for GRDC to operate in (cf. also agenda item 5). For example, the GTN-R definition in the scope of the GCOS-IP already lead to some acquisition successes shortly after a recently sent-out support letter of GCOS signed by the WMO Secretary General (see also agenda item 15.2).

Discussion:

Mr Grabs informed the SC that WMO is about to take over the coordination of IGWCO (August 2005: decision on a successor of Rick Lawford).

8 Research project proposals

State of affairs:

In view of the necessity of increasing GRDC capacity, Mr Maurer informed the SC about GRDC activities related to fund raising through participation in research proposals of a number of consortia in the European Union and the US.

Proposal full title	A European Earth System Observation Program
Proposal acronym	**AESOP**
Call identifier	FP6-2004-Global-3
Sub-Priority	1.1.6.3 – Global Change and Ecosystems
Sub-priority research area(s)	VI: Operational forecasting and modelling including global climatic change observation systems VI.1 Development of observing and forecasting systems
Type of Instrument	Integrated Project
Co-ordinator names	Craig Donlon and Rob Allan
Co-ordinator organisation name	Hadley Centre for Climate Prediction and Research, Met Office

Within **AESOP** (EU) it was intended to involve GRDC in WP5000 "Creation of terrestrial ECV products" however the entire proposal was unsuccessful in stage 1

Proposal full title	European Flood and Drought Forecasting Integrated Project
Proposal acronym	**EFDIP**
Call identifier	FP6-2004-Global-3
Sub-Priority	1.1.6.3 – Global Change and Ecosystems
Sub-priority research area(s)	II Water cycle, including soil related aspects II.1.2.1 Advances in Flood and Drought forecasting
Type of Instrument	Integrated Project
Co-ordinator names	E. Ruijgh and Dr. P. Reggiani (deputy coordinator)
Co-ordinator organisation name	WL | Delft Hydraulics

Within **EFDIP** (EU), which was successful in stage 1, it was planned to involve GRDC in WP 5.1 "Pan-European Data" (metadatabase/infrastructure). This work package was cancelled due to an overlap and conflict with the intended 2005 JRC tender for compiling a database of fundamental flood modelling relevant information from entire Europe supported by a substantial budget from the European Parliament via DG Environment (EU-Flood-GIS).

Proposal full title	Vulnerability of the Integrated Earth Water System
Proposal acronym	**VIEWS**
Call identifier	FP6-2004-Global-3
Sub-Priority	1.1.6.3 – Global Change and Ecosystems
Sub-priority research area(s)	II.1.1.1. Assessing the Vulnerability of Global Water Resources to Environmental Change
Type of Instrument	Integrated Project
Co-ordinator names	Prof. Dr. Pavel Kabat (Submitting partner) & Prof. Dr. Zbyszek Kundzewicz
Co-ordinator organisation name	Wageningen University and Research Centre | Polish Academy of Sciences

VIEWS (EU) was successful in stage 1, however, though GRDC is mentioned in the proposal it is not part of the consortium.

One of the most promising opportunities for GRDC is a major contribution to the **EUROPEAN FLOOD ALERT SYSTEM (EFAS).** Following a pilot study within the European Flood Forecasting System (EFFS), GRDC was requested in autumn 2004 to offer a near-real time river discharge data acquisition scheme to the EC Joint Research Centre, Ispra, Italy.

TITLE: European Terrestrial Network - River Discharge (ETN-R)

TASK: Development and operation of an information infrastructure for the automated collection, quality control and redistribution of real time or near-real time river water level and discharge data from European national and transboundary river basins.

FRAMEWORK: The European Commission's Enterprise Directorate General (DG ENTR) runs a European programme called "Interoperable Delivery of European eGovernment Services to public Administrations, Businesses and Citizens" (http://europa.eu.int/idabc/en) aiming at supporting the electronic exchange of information between public administrations across Europe by making use of advances in information and communication technology. Its objective is to set up and manage networks and services enabling administrations in the Member States and at EU level to exchange data electronically in order to implement European policies and legislation.

One action of IDABC is to support the development of the EFAS project led by the JRC in Ispra, Italy, by providing funds to develop an information infrastructure for real time river discharge data access to European national and transboundary river basins (LISFLOOD ALERT, see http://europa.eu.int/idabc/en/document/3500/5637).

COVERAGE: European River Basins located in 25 EU-, 4 EU-candidate and some of 15 non-EU-countries (compare figures and table in the annex)

TIME FRAME: 2005 - 2007 (3 years)

STATUS: JRC wishes GRDC to accomplish this task (including a funding, which would – amongst others – allow GRDC to hire 2 persons for 3 years), however JRC first requires consent of the Pan-European eGovernment Services Committee (PEGSCO), an advisory committee made up from European countries representatives. After failing consent in a meeting in December 2004 and postponing the decision in follow-up meeting in May 2005, a decision is now expected during a meeting end of June 2005, which has been well prepared by lobbying of JRC with the countries involved.

Finally GRDC contributed with support letters to several research proposals of Prof. Charles Vörösmarty, UNH, United States, however to date none of the proposals was successful.

- March 2005: Program Solicitation NSF 05-533: US-NSF Program: Partnerships for International Research and Education
  Proposal theme: "A Partnership-Based Framework for Studying Human Transformation of the Global Water Cycle" (linked to VIEWS, see above)
- November 2004: Program Solicitation NSF 03-597: US NSF Biocomplexity in the Environment (BE) Program: Integrated Research and Education in Environmental Systems
  Proposal theme: "Climate and Water Resource Variability as a Source of Civil Conflict"
- August 2004: Support UNH as institutional partner for establishing the National Center for Hydrologic Synthesis (NCHS) initiated by CUAHSI (Consortium of Universities for

Advancement of Hydrologic Science) as one of four elements of its HydroView programme

- December 2002: NASA call NRA-02-OES-05
  Proposal theme: "A Prototype Hydrological Data Assimilation System Using Remotely Sensed Precipitation Fields"

Discussion:

Mr Maurer requested the SC to advise GRDC with regard to strategies for better involvement in research proposals as well as to come up with suggestions for other opportunities.

Mr Grabs commented that current GRDC activities are driven by opportunities that come up. In order to develop a more targeted approach, GRDC should more pro-actively bring itself into the mind of project leading institutions and coordinators, offer products and service for applied research. This kind of GRDC's capacity could be disseminate e.g. through workshops on specific research areas, etc.

Recommendations:

- GRDC should consider to prepare short information notes for research institutions and research consortia on what services it could/would like to provide in an international scope (transboundary basins, UN projects, ...), what GRDC were able to deliver in such projects
- Conduct workshops in some research areas, trigger research coordination

9 Data acquisition activities

State of affairs:

Ms Dornblut reported on GRDC data acquisition activities and results (digital annex, agenda item 9). Besides the continuous, opportunity-driven data acquisition following up promising contacts during visits and meetings (e.g. Zambia, Argentine, Mekong River Commission etc.) a number of concerted actions were carried out:

- January - June 2004: Acquisition letters were sent to almost all European Countries and FSU countries with good response.
- July 2004: Support letter of the WMO Secretary General was sent out to all country's Permanent Representatives and Hydrological Advisers with WMO in 5 languages (facsimile at http://grdc.bafg.de/?6925). It had a marginal response, namely two direct inquiries from Chile and Mexico (only the latter delivered data to date) and three of the European countries, that GRDC contacted shortly before, provided data and informed GRDC that this also completed the request of the support letter.
- October 2004: GRDC data requests and country status report addresses to PRs were distributed to participants of CHy XII. Those countries that did not attend were sent the material by mail.
- December 2004: In context with the GCOS-IP, GRDC drafted a first version of a GCOS letter calling for support of GRDC in developing GTN-R.
- April 2005: The WMO Secretary General sent out a support letter in 5 languages concerning the "Institutionalized regular provision of daily river discharge data for selected rivers and gauging stations of the GTN-R" together with a country-tailored

information package to the PRs and HAs (facsimile at http://grdc.bafg.de/?9419) of 82 countries which feature tentative GTN-R stations. This letter was drafted by the GCOS Secretariat in Geneva with inputs from GRDC. First reactions to the letter are promising (e.g. GRDC received for the first time data from 10 stations in China, though so far only for the year 2004).

So far in 2005 GRDC has got data provisions from 14 countries (2004: 18; 2003: 12; 2002: 14; 2001: 12), see also Annex 6. Ms Dornblut showed maps illustrating the activities.

Discussion:

Mr Grabs stated that the fragmentation of hydrologic data within countries is a problem (e.g.Thailand) and generally recommended that WMO writes support letters to HA to nominate national focal points (NFP) in a institutionalised way. Along similar lines Mr Liebscher suggested that the WMO Congress in 2007 should again encourage WMO member states to support the international data centres. Mr Robarts stressed the need to put more recognition (and funding) to NFP, as e.g. done in the case of UNEP/GEMS/Water.

Mr Grabs suggested to possibly organise a session on data provision during the upcoming FRIEND conference in 2006 to discuss among other topics restrictions in data dissemination and the update mechanisms of FRIEND. GRDC also holds the data from the Northern European FRIEND, i.e. EWA which also shares some data of AMHY FRIEND. EWA is hosted by GRDC but held separately from GRDB as it has its own data policy. There were some synergy effects if both databases could be organised in a common way. Driver for this had to be UNESCO, and Mr Grabs committed that WMO will talk about this issue with UNESCO.

Mr Robarts suggested to accommodate a session on data acquisition in UN Water meetings. Along similar lines, Mr Ryabinin acknowledged that data acquisition is difficult to handle and GRDC has very limited resources and thus suggested to develop a coordinated approach to bring this topic forward. He agreed that bringing it on the table of the UN Water meetings could prove as helpful in drawing the attention of the research community to the data issue.

Recommendations:

- WMO Hydrological Advisor of each member state to be asked by WMO to nominate an institution in the respective country as National Focal Point (NFP)
- Cg 2007 to prepare a decision to support international data centres and as Cg 2003 did keep in force Res. 21 (1995). Consider having a parallel meeting of HA during Cg 2007.
- WMO to contact HA periodically, e.g. once per year
- WMO to negotiate with UNESCO about unified access to their respective databases GRDC-FRIEND
- Consider a session on data acquisition during 2006 FRIEND conference in Cuba
- Prepare a 2-3 pager on data issues to be discussed during UN-Water session covering topics such as:
  - Update on types of difficulties encountered in data acquisition, (unsatisfying) opportunity driven nature of current approaches
  - Communicate the need for a coordinated approach to UN-Water
  - Mention meeting reports of UN Statistical Division
  - Draw attention of the GEOSS community and partners to the need to resolve the long-standing problem of hydrological data acquisition and propose to include this in the two year work package for 2006-2007 (in cooperation with GEO secretariat)

10 Database status and growth

State of affairs:

Ms Dornblut reported on GRDC database status and growth (digital annex, agenda item 10). As evident from the figures presented as well as from the following table the amount of data in the database increased significantly over a 2 year period, especially for daily data where the number of stations grew more than 40% and the data volume grew more than 60%. However, it has to be kept in mind, that the stations are not evenly distributed across the globe and still significant gaps remain in large parts of Africa, Asia and South America, but also in Southern and Eastern Europe, though some encouraging recent acquisitions (e.g. from Zambia, China, Mexico, Belarus) give rise to hope for future improvements, and it may be speculated that this is last but not least a result of such important activities as GCOS-IP and GEOSS, which by-and-by seem to have some mind-changing impact.

Status 31 Dec 2002	Number of stations	Station-years	Values
monthly data (total)	6,395	193,944	2,327,328
original monthly data	5,330	139,512	1,674,144
original daily data	3,294	107,244	39,144,060

Status 31 Dec 2004	Number of stations	Station-years	Values
monthly data (total)	7,201	260,936	3,131,232
original monthly data	5,577	159,485	1,913,820
original daily data	4,669	173,947	63,490,655

Abs. Difference 2004 - 2002	Number of stations	Station-years	Values
monthly data (total)	+ 806	+ 66,992	+ 803,904
original monthly data	+ 247	+ 19,973	+ 239,676
original daily data	+ 1,375	+ 66,703	+ 24,346,595

Rel. Difference 2004 - 2002	Number of stations	Station-years	Values
monthly data (total)	+ 12.6 %	+ 34.5 %	+ 34.5 %
original monthly data	+ 4.6 %	+ 14.3 %	+ 14.3 %
original daily data	+ 41.7 %	+ 62.2 %	+ 62.2 %

As occasionally misleading interpretations of GRDC database statistics continue to circulate, some facts and background information about the GRDC data holdings were put on the GRDC Web site at http://grdc.bafg.de/?943 and related frequently asked questions (FAQs) are referenced there.

- Between 1993 and 2004 the overall number of station-years stored in the GRDC database increased by a factor of around 10 and the increase continues to gain momentum. For daily data this factor is even higher, namely around 15.
- The temporal distribution of GRDC data is triangle-shaped with a peak around 1980, with almost 6000 stations in the temporal distribution of all data stations and a bit more than 3700 stations in the temporal distribution of daily data stations. For explanation see the related FAQ.
- The GRDC database does not reflect the actual status of all globally principally available river discharge gauging stations and thus cannot readily be used to give evidence for the often reported "decline of networks". For further explanation see the related FAQ.

Discussion:

The discussion turned to the FRIEND databases. Mr Boyer reported about the Web site of FRIEND AOC hosted by FRIEND AMHY at http://armspark.msem.univ-montp2.fr/friendaoc/ukpresentation.htm, which is a similar setup as with FRIEND AMIGO officially being hosted at the Meteorological Centre in Havanna but de facto being hosted at IMPTA in Cuernavaca, Mexico.

On Mr Wilke's question about the responsibility for the update of the EWA database Mr Maurer explained that 5 regional data centres, among them GRDC share this responsibility and that the entire process of FRIEND data acquisition has to be reorganised, possibly during the FRIEND conference in Havanna in late 2006.

Mr Grabs inquired about the plans for the AMHY database. Mr Maurer explained that an older version of the AMHY FRIEND data are included in the EWA, however in the overlapping regions (e.g. in France) it cannot be discriminated from the data originating from NE FRIEND. Mr Boyer informed about the Metadata available on the web at http://armspark.msem.univ-montp2.fr/amhy . He offered the AMHY to be delivered for combination with the NE FRIEND database, i.e. EWA. He also explained that there are currently no active Mediterranean and Balkan countries in AMHY. The same is true for AGRHYMET which is literally the identical database to FRIEND AOC. There is currently no acquisition and no response. Mr Boyer suggested to set up a project to define the status of databases by providing Metadata in the same structure as AMHY FRIEND.

Mr Grabs (for WMO) committed to officially contact UNESCO (Mike Bonell as the FRIEND coordinator) to ask about how is the status of FRIEND databases, what is planned for the future and to reactivate the contacts.

Recommendations:

- WMO to officially ask UNESCO about status and future of FRIEND databases, discuss merging /unifying

11 Data dissemination and usage

State of affairs:

Mr Maurer informed the SC that since the provision of data products on the GRDC Web site in 1999 the number of data requests has stablised at around 40 to 50 request per year, while since then the number of downloads from the download section stablised at about 1000 per year. Due to the re-launch of a completely new GRDC Web site in June 2004, this pre-2004 statistics cannot be continued anymore. Based on Web server statistics, the average traffic on the new GRDC Web site between June and December 2004 was 124 visits per day from 75 sites, with together 1700 page impressions per day.

In view of GRDC's limited staff capacity GRDC aims at outsourcing research activity based on GRDC data and has introduced the practice of establishing collaboration contracts with researchers working with significant amounts of GRDC data. This includes especially the publication of their research in the GRDC Report Series in order to demonstrate its application. This serves three major purposes:

- Connecting people and document research on global river discharge

- Increasing awareness and acceptance of data providers by demonstrating GRDC data application
- Demonstrating use and need of the database to the GRDC-funding German ministry

Currently there are two envisaged, 10 ongoing and 4 finalised projects, as evident from the following table. Many project reports are pending.

Research/ Report topic	*Institution*	*started*	*(expect-ed)* ***end***
Streamflow validation among CST-NU participating LSMs during 1986-1995: a part of the validation activity of CST-NU	College of Science and Technology, Nihon University, Japan	Not yet	2007
Trends of discharges over the world's largest basins during the past half century	Laboratoire de Météorologie Dynamique du CNRS, Paris, France	Not yet	2006
Assessment of climate change impacts on global water resources	Global Integrated Assessment Modelling Department of Global Ecology, Hall of Global Environmental Research, Kyoto University	2005	2006
Identification of large scale patterns in seasonal and long term components of global discharge time series'	University of Greifswald, Germany	2004	2005
Trend analysis of long global discharge time series'	Polish Academy of Science, Poznan	2004	**2005**
Large scale variation of the continental water storage – modeling and remote sensing (under consideration of GRACE gravity field data)	GeoForschungsZentrum, Potsdam, Germany	2004	2006
Verification, extension and attribution by discharge data of a map representation of the major global streams in the context of the generation of a hydrogeological map of the world within the scope of the World Hydrologeological Mapping and Assessment Programme (WHYMAP)	Federal Institute for Geosciences and Natural Resources (BGR), Germany	2003	2006
Examination of extreme precipitation and flood events in Europe during the past 100 years	Institute of Meteorology, University of Bonn, Germany	2003	2006
Development of a physically consistent system model for the examination of rotation, morphology and gravitation field of the earth	Lohrman Observatory, TU Dresden, Germany	2003	2005
Estimating hydrological extremes of the 20th century in major river basins: inter decadal and inter-annual variation of seasonal floods and droughts	Institute of Industrial Science, University of Tokyo, Japan	2003	2005

Streamflow validation among GSWP-2 participating LSMs during 1986-1995: a part of the validation activity of GSWP-2	Institute of Industrial Science, University of Tokyo, Japan	2003	2005
Study and examination of the adjustment of gridded precipitation for orographic effects	University of Washington, USA	2003	2005
Relation between flow regimes and potential political conflicts on water in transboundary river basins	Oregon State University, USA	2002	2005
Assessment of global annual runoff using Total Runoff Integrating Pathways (TRIP)	Institute of Industrial Science, University of Tokyo, Japan	1998	**2000**
Development of Global Composite Gridded Runoff Fields	University of New Hampshire, USA	1998	**1999**
Development of the Global Water Assessment and Prognosis model WaterGAP	Center for Environmental Systems Research, University of Kassel, Germany	1998	**1999**

Discussion:

The discussions especially on the collaboration contracts led to the following recommendations:

Recommendations:

- Explore the opportunity to transfer the reservoir data from the Greifswald study to GTN-H
- GRDC should not only have opportunity-driven research collaborations, but rather proactively trigger research based on a list of research topics to be identified by GRDC.
- Consider having user workshops: in English rather than in German, better not attached to GRDC SC meeting but (in order to keep costs low) rather attached to other international meetings such as those of IAHS, EGS, ICSU, FRIEND, Stockholm Water week. (WMO could fund a few people). Same approach could work for WCP-Water and GTN-H.
- Regional Workshops, e.g. linked to some East-Asian Sessions of e.g. the Japan Society of Hydrology and Water Resources which has members from Japan, Korea and China.
- Consider introduction of a GRDC prize to stimulate research activities.

12 Review of GRDC collection criteria for discharge stations

State of affairs:

Mr Maurer gave a brief overview of the "Information note on GRDC station selection criteria, data format and data transfer" available from the GRDC Web site. It is subdivided in 5 sections, namely:

1. Which information the GRDC is interested in?
2. Metadata
3. Guiding criteria
4. Method of data transfer
5. GRDC's preferred data file format

In the 17 years of existence of the GRDC the collection criteria have widened due to the requirements of different clients. A strict general categorisation of discharge stations remains difficult without exact knowledge of the local characteristics. E.g. at Environment Canada it took a large project to classify Canadian stations involving the hands-on experience of locally based employees, handling the equipment on a day-to-day basis.

Discussion:

There was some discussion on especially the "guiding criteria". Mr Grabs remarked that this list of criteria takes care for the most, however, they should not be misunderstood to have to apply all at for the same station. Not all criteria can be used for all countries. Mr Ryabinin, again also referring to the issue of making the Web site more appealing, suggested coming up with less exhaustive, but possibly summarised criteria. Mr Wilke suggested to make things clearer by separating individual criteria by introducing an "or" between them, clearly indicating, that not all criteria have to be fulfilled.

Recommendations:

- GRDC to take a suitable subset of guiding criteria for individual acquisitions
- GRDC to separate criteria items by "or"

13 Review of GRDC data policy and acquisition strategy

State of affairs:

Mr Maurer gave a brief overview on the GRDC data policy, (see also the associated PDF-file in the digital annex, agenda item 13). In a nutshell the current data policy encompasses the following points:

- Free and unrestricted (but identified) access to all hydrological data and products;
- Data are free of charge (only costs of services and reproduction);
- No commercial use, commercial use may be subject to conditions;
- Ownership of data and responsibility for errors lies at the data providers;
- No redistribution of data by the user;
- No distribution of the whole database (or substantial parts)

Current practice is that a potential data user has to identify himself and his purpose and to agree upon the data policy by signing a declaration (which can be sent by fax). After identification, GRDC's basic data provision method is to disseminate the requested data non-bureaucratically as an email attachment, by providing it by FTP or by mailing CDs.

Mr. Maurer introduced the topic of data acquisition strategy. Taking up suggestions of previous SC meetings, GRDC tries to apply the following approaches:

- Opportunity driven acquisition: follow up of promising contacts during meetings and visits, including opportunities such as WMO RA WGH meetings and WMO-CHy
- Systematic acquisition letters being sent to a region, such as e.g. Europe, possibly accompanied by a support letter from the WMO Secretary General such as that from June 2004

- Project related acquisition accompanied by a support letter from the WMO Secretary General such as that from April 2005 in the framework of GTN-R as a contribution to GCOS-IP and GTN-H.
- "Outsourcing" of data acquisition: liasing with other data collecting initiatives such as projects of NHS or international organisations and programmes.
- Provision of incentives: value added software components such as a stand-alone plausibility check tool (see item 14.1) and a Metadata management suite (see item 14.5)

Discussion:

There was some discussion on the issue of the data policy which lead to the following recommendations:

Recommendations:

- add “WMO” in user declaration item 5 before “GRDC”
- in addition cite GRDC without the German address (Ryabinin)
- as the term “substantial part” is not well defined it is suggested to drop it
- add “subtitle” to data policy: “Guidelines which have been endorsed by the WMO Commission for Hydrology ...”
- as data does not belong to GRDC, point out that the ownership of the data remains with the data providers

14 Internal quality assurance/ improvement projects

14.1 Plausibility check methodologies/ Quality assessment and quality control of GRDC data

State of affairs:

Following the recommendation of the 6th SC, Mr Maurer presented a draft technical note of the flow and treatment of data from its arrival at GRDC until its dissemination, including the plausibility checks that are currently applied as well as those that are under planning (see Annex 7).

Mr Kinosita gave a presentation on aspects of database quality. Mr Kusuda gave a presentation on the outline of the Hydrological and Water Quality Database (HWQDB).

Discussion:

After his presentation on how to keep the quality of a discharge database Mr Kinosita stressed that “GRDC really can contribute to advise all providers to improve their observation system based on its practical experiences.” Mr Grabs encouraged Mr Kinosita to forward his comments to WMO for inclusion as part of the 6th edition of the “WMO Guide of Hydrological Practices”.

Recommendations:

- Presentation Kinosita to be forwarded for consideration in WMO Guide Hydrological Practices.
- GRDC to develop stand-alone software tool providing the plausibility check routines to data providers as an incentive for NHS.

- Mr Boyer recommended free software "Khronostat" for statistical analysis to detect average variations in hydrological time series available from http://www.hydrosciences.fr (French and English).

14.2 Revision and harmonisation of station data export and data statistics

State of affairs:

Mr. Maurer presented the currently ongoing revision and harmonisation of station data export and data statistics, which go hand in hand with streamlining the plausibility check methodologies, GRDC redesigned its 4 types of station data files as there are:

- Daily data file
- Monthly data file
- Newly introduced => Daily Primary Values (long term mean characteristics based in daily data)
- Monthly Primary Values (long term mean characteristics based in monthly data)

Emphasis is on thorough documentation and consistent application of methods for the treatment of missing values in aggregations:

- aggregations are calculated at each level, however the number of missing values is given as a flag
- depending on the following thresholds these aggregations are not used for further aggregations at higher level:
  - months with more than nD=5 missing days are not used for aggregation over all months
  - years with more than nM=3 months missing (including the aggregated month from too few daily data) are not used for aggregation over the entire period
  - entire period (yearly or monthly) is not aggregated if less than nY=1 years can be used

Discussion:

Mr Boyer noted that sometimes in drought periods no data are available because of technical problems, which may lead to the problem to distinguish real data gaps from zero discharge periods. Mr Kinosita stressed that "zero" value is not the same than "missing value" (as considered by GRDC). Mr Wilke was interested on what basis the thresholds nD, nM, nY were defined? Mr Maurer replied that GRDC needs a pragmatic solution, because time series often are incomplete. Mr Kinosita remarked that there are standards to define the thresholds (congruence with WMO or other available common standards) .

Recommendations:

- GRDC to check threshold values for congruence with WMO and other standards

14.3 Acquisition activities database

State of affairs:

Ms Dornblut presented the recent practice of documenting GRDC acquisition contacts in the "acquisition activities database". In order to support targeted acquisition and reporting about, GRDC has formalised its workflow.

Discussion:

SC appreciated the work of GRDC done in this regard. Mr Grabs added that WMO currently develops the WMO document tracking system based on the MS-ACCESS database.

14.4 Dissemination activities database

State of affairs:

As the previous item, in the context of GRDC improving and formalising its workflow, Mr Maurer presented plans to streamline documentation of the data dissemination analogously to the "acquisition activities database" by introducing a "dissemination activities database" which will help to improve GRDC reporting and better link data users.

14.5 Metadata and data infrastructure

State of affairs:

The 6th SC had recommended GRDC to write up a report on the Metadata issue, develop a concept, discuss this in the GTN-H panel and in expert groups. Based on this, within a pilot study a prototype should be developed, that demonstrates the advantages and capabilities.

Mr Maurer provided the SC with an overview of GRDC Report 31 on the topic of Metadata and actions taken in the context of a demonstration project in the framework of GTN-H.

Metadata and data infrastructure: Earth science data originate from both, research networks and already existing operational networks with all the well-known and discussed-at-length problems of data sharing. The success of future projects depends – among others – on the advancement of a solution to the problem of data *accessibility* of principally already *available* data. In order to improve accessibility, it will be necessary to dispose of two prerequisites:

(a) The establishment of a networked technical infrastructure for state-of-the-art, standardised management of Metadata and data flows in a heterogeneous distributed environment, ideally requiring to document a given data set only exactly once (preferably by the data originator), but traceable and retrievable by everybody.

(b) A well developed network of institutions and individuals that contribute information **(Metadata providers)** and a not necessarily congruent and likely smaller network of institutions and individuals that organise this information into the given infrastructure **(service providers)**. This data then has to be accessible to the generally much larger group of users **(clients)**.

Many international, regional and national initiatives currently put large efforts in the fundamental advancement of the development of this critical infrastructure, in order to facilitate the generation of an *operational* global compendia simplifying access to critical data, among them:

- GEOSS (Global Earth Observation System of Systems, http://earthobservations.org);

- GSDI (Global Spatial Data Infrastructure, http://www.gsdi.org);
- INSPIRE (INfrastructure for SPatial InfoRmation in Europe, http://inspire.jrc.it);
- OGC (Open Geospatial Consortium, http://www.opengeospatial.org);
- FWIS (Framework for the WMO Information System).

Watching the current developments it seems likely that the ISO 19100 series of standards will become a fundamental building block for a global geo-spatial data infrastructure (including the attributes, i.e. variables and parameters attached to the geographic features). As far as Metadata are concerned, the respective standards are ISO 19115 (Metadata), ISO 19139 (XML-Implementation Specification of 19115) and ISO 19119 (Catalogue Services Web).

Regarding (a) above it must be avoided by all means to continue the practice of starting custom made (and in the worst case proprietary) developments within each project. Rather, the way forward is to apply emerging web-based more or less commercial-of-the-shelf (COTS) software, that builds on established standards and best-practice examples from related areas of Earth Science. Some costs will be involved for acquiring licenses, installing and maintaining systems, adjusting them to project needs and getting started using it. The choice needs to be a product that is up-to-date with current technologies, i.e.

- It should be configurable in order to cope with the situation that Metadata schemes or profiles according to ISO 19115 may change over time
- Local installations should be capable of being integrated into a larger network, i.e. connectable with central Metadata-brokers (clearing houses) by means of standardised Catalogue Services Web (CS-W)

Building such web-based, standardised solutions will also provide the principal option of co-sponsoring of Metadata management capacities, i.e. "wealthier" projects may allow less fortunate projects to use their infrastructure for the management of their Metadata (while virtually all appears as one database, thanks to CS-W).

Regarding (b) above, filling such an infrastructure with sufficient amounts of meaningful project related Metadata (including information on how to access the data, ideally in an automated mode) is an even more demanding task than establishing the infrastructure. It is limited by the amount of man-month funded, in context with the effectiveness of communication with numerous Metadata providers and the degree of automation that can be reached.

The solution to this problem requires to take two perspectives, a long term and short-mid term perspective:

- In the long term it will be routine to maintain the distributed standardised infrastructure and all relevant Metadata to date will already be input. All what is required in this ideal world is the maintenance of the infrastructure and the institutionalised obligation to add any new data set (once) by the originators (**Metadata providers** become **service providers)**. This needs to become an inescapable obligation for granting funds of both, research and operational networks (i.e. funds need to comprise the resources for thorough documentation).
- In the short-mid term we will be in the transition period to arrive at such a system. This must be regarded as a major tidy-up effort, which cannot be economically solved at an individual project scale. Especially the acquisition of Metadata on data that is used by many projects needs to be organised and funded independently from a project, to avoid

redundant efforts and application of proprietary systems. This is a classical librarian task, but not for printed material but electronic data.

GRDC regards itself as a such a librarian for river discharge data. In order to avoid the development of just another proprietary Metadata management system, GRDC currently develops the specifications of services for a call for tender of a project to migrate an existing ISO 19100 compatible solution that has been developed in the framework of NOKIS, the North and Baltic Sea Coastal Information System (http://nokis.baw.de) and provide its interface via the GRDC Web site. However, resources are required for both purchasing and installing the software and getting it filled up with a comprehensive set of Metadata. BfG has informally agreed to finance the adaptation of the existing software to the WMO core Metadata Profile of the ISO 19115 standard (see also the GRDC project status report on the Metadata issue to the GTN-H panel in Annex 9).

Discussion:

Mr Grabs briefly referred to the Future WMO Information System (FWIS) and posed the question on how WMO can support GRDC. This led to the following

Recommendations:

- GRDC to be invited by WMO to Beijing World Weather Watch Meeting (1st Meeting of CBS Inter-Programme Expert Team on Metadata Implementation, 26 - 30 September 2005)
- Accommodate GRDC Metadata (currently yet in Excel-files) in the WMO Metadata profile (ongoing process), Version 0.2 of WMO core Metadata profile of ISO19115

15 Product development and updating

15.1 GIS Layers of Major River Basins of the World

State of affairs:

Mr de Couet gave an overview of GIS activities at GRDC (see also digital annex, agenda item 15.1). In close connection with the GTN-R project, see below, a number of products have been developed that can be viewed at http://grdc.bafg.de/?8088 and be ordered from GRDC:

- Polygons of 391 basins from the river mouth at the erosion base
- Attributed lines of 661 rivers within the 391 basins
- Points and Metadata of the 380 gauging stations within the 391 basins
- Polygons of the associated 380 station-based basins

15.2 Global Terrestrial Network for River Discharge (GTN-R)

State of affairs:

Mr Maurer informed the SC about the GTN-R, which is a GRDC contribution to the Global Terrestrial Network for Hydrology (GTN-H). GTN-R will use the GRDC NRT Monitor, which is an infrastructure, suitable for managing arbitrary networks of near-real time gauging stations. Currently, GRDC has identified a priority network of around 400 river discharge reference stations as a contribution to the Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC, Action T4 (GCOS 2004a). The GTN-R network constitutes the "GCOS Baseline River Discharge Network" and a first application of

GRDC NRT Monitor. It will serve an increasing number of purposes and projects in the field of climate research but also as basis for future versions of the GRDC product "Long Term Mean Annual Freshwater Surface Water Fluxes into the World Oceans" and for the estimation of biogeochemical fluxes in cooperation with the UN GEMS/Water Programme Office of UNEP/DEWA.

The basic idea of the GTN-R project is simple: by application of an automated procedure (software), regularly draw together heterogeneously available information on near-real time river discharge data provided by the world's National Hydrological Services, harmonise and store the information in a database, and regularly redistribute the harmonised data in a standard format. In essence, this task is nothing more than a copying and reformatting routine. However, the devil is in the details.

Depending on the level of development of the national networks and data exchange policies in individual countries it is more or less demanding to upgrade the national infrastructure and to create a climate of trust and consequently cooperation. The provision of financial assistance may be required occasionally. The following levels of network development may exist at individual National Hydrological Services (from higher developed to less developed networks):

1. NHS that already provide ready to read data in near-real time via internet (though possibly in their proprietary format).
2. NHS that already publish some kind of near-real time river information via internet (but not ready to read).
3. NHS that have to create a new interface to their digital and automated national networks.
4. NHS that have to automate their inland data transfer schemes of already digitally recording gauging stations.
5. NHS that have to upgrade their non-digital gauging stations.

Within the current first phase of the GTN-R project, concentration is on NHS of level 1-3. As an organisational prerequisite in many cases individual cooperation agreements between GRDC and the individual NHS involved are necessary, clarifying issues of data policy and possibly appropriate technical capacity and infrastructure, i.e. gauging stations need to automatically transmit their data digitally to NHS in near-real time and an automated interface into the internet is required at the national level. Furthermore, GRDC has to be flexible with regard to interchange formats. Though ideally a standardised format of GRDC will be applied, for pragmatic reasons provider defined formats have to be accepted as well.

GRDC is expecting to receive a major fund in the framework of its participation in the EFAS project described in section 8. Further details and status of the development is provided in the GRDC project status report on GTN-R to the GTN-H panel in Annex 10.

15.3 GRDC NRT-Monitor

State of affairs:

Mr Maurer informed the SC about the GRDC Near-Real Time River Discharge Monitor, which is the underlying core of the GTN-R project (see also the PPT-file in the digital annex, agenda item 15.3). It is a software system (soon) running at a GRDC server that allows:

- to draw together/ download near-real time (NRT) river water level or discharge data (with time steps of at least 1 hour) provided by individual NHS via Internet protocols (HTTP or FTP) in various formats
- to transform water level data into discharge data where required
- to process and store the data in a database
- to classify the data on the background of historical data
- to check the plausibility of the data
- to redistribute/ upload all required discharge data in a harmonised way via the Internet, i.e. provision of the data in GRDC standard format at a FTP-site.

The software can be operated in two basic modes, the configuration mode and the operational mode. It has been developed during a 4 month practical term of a Canadian student of computer science in summer 2004, partly funded by WMO. Extensive explanation is available from a recent publication (see digital annex, agenda item 15.3 or directly download from http://grdc.bafg.de/?8168). Further details and status of the development is provided in the GRDC project status report on GTN-R to the GTN-H panel in Annex 10.

Discussion:

SC appreciated the promising steps taken and encouraged GRDC to continue this important task. Mr Grabs asked what will be done with this kind of data once the near-real time Monitor is operative. Mr Maurer replied that it will be the basis for a number of applications, one of them to display the stations and their current status in an interactive map.

Mr Ryabinin expressed the view that for large water bodies satellite altimetry is likely to take over near-real time monitoring. Mr Maurer was of the view that though the development may go into this direction, this will take its time and ground truth by way of in-situ measurements will continue to be required.

Mr Boyer reported that in the framework of IRD he had spent a lot of time and money for Metadata collection and design of a map service in Western Africa, especially one person for the harmonisations of river names based on “watersheds of the world” (not available at the FRIEND database, 456 Basin > 100.000 km² and time series length > 20 yrs). He offered to forward the data to GRDC in order to avoid duplication of the same work, though the Metadata are in proprietary format.

Mr Maurer reported that the software will be finalised with funds from the EFAS project. SC encouraged GRDC to develop this opportunity as a matter of priority. Mr Ryabinin noted that this development has its very potential of being useful for GEOSS, and Mr Maurer explained that it is already part of the GCOS-IP, which in turn serves as the climate input to GEOSS.

15.4 Long Term Mean Annual Freshwater Surface Water Fluxes into the World Oceans

State of affairs:

Mr Maurer presented the GRDC data product available at http://grdc.bafg.de/?1034 to the SC.

Freshwater discharge from continents into the oceans is of major interest in research concerned with global monitoring of freshwater resources, the flux of matter into coastal areas and the open oceans, and the influence of freshwater fluxes on circulation patterns in the ocean and the atmosphere on regional and global scales.

Following two previous publications of estimated Mean Annual Freshwater Surface Water Fluxes into the World Oceans based on 161 and 181 discharge stations, respectively (GRDC, 1996 and GRDC, 1998), the GRDC has reworked this exercise for a third time, now based on 251 discharge stations close to the estuary, featuring basin areas greater than 25.000 km².

Discharge from land areas not integrally captured by GRDC stations has been determined via estimating mean annual runoff coefficients (RC) by means of regionalisation from nearby monitored areas taking into account data from another 1378 GRDC stations and applying precipitation data from the Global Precipitation Climatology Centre (GPCC).

Application of GIS analysis on a 0.5 degree elevation grid optimised for flow path detection allowed to determine the catchments of all the individual grid cells that form the fringe of the continents (11.853), i.e. all continental grid cells were co-registered with their respective fringe grid cell through which they drain to the oceans. Furthermore, each grid cell was assigned either a calculated or estimated RC. Thus, it is possible to calculate for each fringe grid cell the integral flux from its adjacent catchment as the spatially weighted product of RC and precipitation over all co-registered grid cells. Summarising the fluxes of subsets of continental fringe cells **allows to estimate fluxes for arbitrary coastline sections**.

Fluxes have thus been determined e.g. for global 5 and 10 degree latitude zones intersected with continents and oceans. The results are compared to estimates by other authors and methods, among them the global water balance of Baumgartner and Reichel (1975). These results and comparisons are available from the GRDC Web site (start from http://grdc.bafg.de/?1034).

It is expected that GTN-R will improve the database for this project to eventually allow GRDC to come up with a **time series** of Freshwater Surface Water Fluxes into the World Oceans.

Discussion:

SC was very satisfied to see this product being developed to this stage. Mr Maurer noted, that the scientific community would desire a time series of fluxes rather than only a long term mean. Mr Ryabinin asked for the possibility of an extension for another time period (2000-2005) but Mr Maurer replied that this is not feasible as up-to-date data is missing. GRDC works on changing this unfavourable situation through its GTN-R activities which are the discharge contribution within GTN-H aiming at NRT-access as soon as possible for 10 hydrological variables.

Mr Kinosita recommended that GTN-R should foster application of new technologies for near-real time measurement in the developing countries. Mr Maurer responded that GTN-R aims at arriving at results in the mid-term and thus has chosen a robust approach to collect

NRT information via FTP as not all countries have the opportunity to apply advanced technologies for a number of reasons.

Mr Ryabinin warned not to neglect new techniques which are likely to become operationally available in the mid to long term (e.g. satellite altimetry for large water bodies). SC suggested GRDC to compile a state-of-the-art overview of water related measurement methods from space.

Recommendations:

- Bring freshwater flux product to the attention of the WGCM/CLIVAR Working Group on Ocean Model Development
- GRDC to compile a state-of-the-art overview of water related measurement methods from space

15.5 Long Term Mean Monthly Discharges and Annual Characteristics of Selected GRDC Stations

State of affairs:

Mr Maurer presented the GRDC data product available at http://grdc.bafg.de/?1035 to the SC.

This GRDC data product currently offers statistics of 3035 discharge gauging stations in the GRDC database, selected according to the following criteria:

- station catchments have drainage area of more than 2.500 km²
- station discharge data is available for a minimum of 10 years

Calculated quantities are:

- mean, minimum, maximum monthly discharge and its standard deviation
- time series of mean, minimum, maximum annual discharge

As described in section 14.2 it will soon be harmonised, revised and also extended with a new product based on daily data.

Discussion:

Mr Maurer further explained that number of direct GRDC data requests approximately halved in the last years which likely is due to the availability of this product which provides information for approximately 50% of all GRDC stations.

16 Global Data Centres

16.1 GWPO (GEMS/Water Programme Office)

State of affairs:

Mr Robarts gave a presentation on the status of the GEMS/Water Programme Office (GWPO, http://www.gemswater.org), see also the PPT-file in the digital annex, agenda item 16.1.

There are 446 river gauging stations common in the GEMS/Water and the GRDC database which are now used for the calculation of BGC fluxes which have been integrated into GEMStat (http://www.gemstat.org), the new online water quality database, searchable by

station, by country, by region and by basin and providing statistical analysis and descriptive statistics as well as station profiles (Metadata). In March 2006 the software package GEMSoft is planned to be released, suitable for calculation not only of single but also multiple stations, time series mapping.

Mr Robarts also pointed to recent GEMS/Water activities to exploit the capabilities of the free WorldWind visualisation software tool for global data under development by NASA (http://worldwind.arc.nasa.gov), suitable to generate a 3-D world view with staggered superimposed satellite images or ortho-photos wrapped over SRTM elevation data, manoeuvrable like a 3-D flight simulator. Higher resolution images are downloaded (and cached locally) on the fly from NASA or USGS servers as one zooms in to close-ups (in the US: resolution partly < 1 m). It is suitable for visualising results of earth science computations or measurements, including point data such as GEMS/Water or GRDC river gauging stations along with links to click on. It can be easily customised by adding own data in XML-formats.

Discussion:

In the discussion it was clarified that WorldWind could be used as an attractive 3-D viewer of GRDC Metadata, providing an intuitive geography-based visual access, similar to a map. Similar possibilities are provided by two products from Google, i.e. Google Maps and Google Earth.

Mr Maurer informed the SC that the new set of 446 common GEMS/Water-GRDC stations has been recently compiled. Mr Robarts further explained that it is used to calculate fluxes but that currently no global sedimentation database is available, as the required information (discharges and concentrations) is not available for all relevant rivers.

Recommendations:

- GRDC to explore application of potential and interfaces of software systems WorldWind, Google Maps and Google Earth.
- GRDC to continue collaboration with GEMS/Water especially with regard to acquiring data for common stations and cross-promotion of data centres.

16.2 GPCC (Global Precipitation Climatology Centre)

State of affairs:

Mr Rudolf gave a presentation on the status and activities of the Global Precipitation Climatology Centre (GPCC, http://www.dwd.de/research/gpcc/) located at the German Weather Service DWD (http://www.dwd.de), see also the PPT-file in the digital annex, agenda item 16.2. The SC was among others informed about the experiences in data acquisition, the QA/QC procedures applied to new data arriving at GPCC and ongoing research projects using the GPCC data (currently around 42,000 stations from 173 countries).

Discussion:

Mr Rudolf highlighted the GPCC Visualizer as a front end for users to explore GPCC's gridded data products. It is based on a freeware software technology wide-spread in the meteorological and climatological community. Some institutions have embedded the GPCC Visualizer in their products (e.g. NASA, University of Colorado). GPCC counts around 2,000 downloads per day. Mr Grabs added that the GPCC Visualizer constitutes a map viewer with a simple functionality for gridded data.

17 Interactions in international programmes and projects

17.1 UNESCO-IHP - FRIEND-EWA

State of affairs:

Mr Maurer informed the SC that during the Steering Committee Meeting No. 9 of the Northern European FRIEND project in Koblenz, Germany (16-17 June 2003) it was approved to transfer the European Water Archive (EWA) from CEH Wallingford to GRDC in Koblenz. The EWA remains entirely separate from the GRDC database, retaining the same structure as before. Also the conditions for data release will remain unchanged. Further details are available from the new EWA homepage at http://ewa.bafg.de maintained by GRDC.

Discussion:

Mr Grabs said that he suspects many FRIEND stations to be the same and suggested to start a Metadata comparison project (not of first priority but in the long term perspective). He also repeated that WMO will contact UNESCO (Mike Bonell) in this regard.

Recommendations:

- GRDC to contact the various FRIEND projects for discussion of the future of their databases, especially with regard to pristine basins.
- GRDC to work on a common Metadata catalogue with the FRIEND projects, also identifying overlapping stations.

17.2 WCRP - CliC, Arctic HYCOS and GEWEX GHP

State of affairs:

The World Climate Research Programme (WCRP, http://www.wmo.ch/web/wcrp/wcrp-home.html) is a joint programme of WMO, ICSU and IOC of UNESCO, coordinating a number of projects, among them two where GRDC has a specific interest, i.e. the Global Energy and Water Cycle Experiment (GEWEX, http://www.gewex.org) and the successor project of the Arctic Climate System Study (ACSYS, http://acsys.npolar.no), the Climate and Cryosphere Project (CliC, http://clic.npolar.no), which has been implemented as a global programme.

As in ACSYS, where GRDC contributed the ARDB, GRDC expressed continued interest to serve as repository of discharge data in WCRP projects, especially CliC and the upcoming Arctic-HYCOS. This is an ideal symbiosis, as by definition GRDC is committed to such a task on a long-term basis rather than project related. WCRP-JSC was requested to consider this important difference and to encourage WCRP project scientists to spend some energy in contributing to such a committed data inventory by

- heralding the idea of free and unrestricted data exchange,
- handing over information on where such data may be available and
- redirecting data they might get their hands on whenever feasible,

thus ensuring the access to and use of data with a long-term perspective and avoiding redundant collection efforts by each new project that might follow.

GRDC is member of the GEWEX Hydrometeorological Panel (GHP) and seeks to provide inputs to GHP Continental Scale Experiments (CSE) and modelling efforts by providing improved data sets, especially through ISLSCP, the International Satellite Land-Surface Climatology Project. For example, GRDC contributed its data to the Global Soil Wetness Project 2 (GSWP-2), which is an ongoing environmental modelling research activity of the Global Land-Atmosphere System Study (GLASS) and the International Satellite Land-Surface Climatology Project (ISLSCP), both contributing projects of GEWEX.

Mr. Vladimir Ryabinin gave a presentation on issues related to GEWEX and CliC (PPT-file in digital annex, agenda item 17.2).

He reported about the integration of all WCRP components in COPES (Coordinated Observation and Prediction of the Earth System), the new strategic framework of the WCRP for the years 2005 - 2015. He informed the SC about the plan to reanalyse the past climate system based on reprocessing of all available previously acquired satellite data.

Concerning the Arctic research Mr Ryabinin informed the SC about CPA1. (CliC Project Activity 1) aiming at joining different hydrological and climatological variables in a single model to better understand the hydrology of cold regions. SC was further updated on DISC, the Data and Information Service for CliC (http://clic.npolar.no/disc) and its searchable metadatabase. Within the scope of the International Polar Year (IPY) 2007-2008 (http://www.ipy.org) he further briefed the SC on Arctic-HYCOS, results from the International Conference on Arctic Research Planning (ICARP II, http://www.icarp.dk), and an upcoming Open Science Conference on Global Environmental Change in November 2006 in Bejing) focusing also on multi-discipline research in the Artic region.

Mr Ryabinin also gave information to the Earth System Science Partnership (ESSP) which started several regional studies and where the most important project for the GRDC would be the Global Water System Project (a central contact is Charles Vörösmarty).

Discussion:

During the discussions, Mr Maurer referred to recent findings by an expert team including Dennis Lettenmeier and Eric Wood concerning the CEOP reference sites. It was found that out of 36 reference stations, only 4 have suitable hydrological information, namely Tibet (China), Niamey (Niger), Oumé (Ivory Coast), Berms (Canada).

SC generally recommended storing discharge data made available by WCRP projects, especially GEWEX CSE in the GRDC database. In this regard Mr Freitas mentioned in the framework of LBA two large projects supported by GEF (Amazon and Plata), which seem to be very relevant for GRDC. He promised to try to organise the cooperation with the two multilateral intergovernmental organisations.

Recommendations:

- SC reinforced its view that GEWEX Continental Scale Experiments (CSE) should provide their discharge data to GRDC.

17.3 GTN-H

State of affairs:

GRDC is member of the cooperation panel of the Global Terrestrial Network for Hydrology (GTN-H), which is a joint effort of WMO's Hydrology and Water Resources Programme (HWRP), the Global Climate Observing System (GCOS) and the Global Terrestrial Observing System (GTOS). The GTN-H is a global hydrological "network of networks" for climate that is building on existing networks and data centres and producing value-added products through enhanced communications and shared development. The goal of the GTN-H is to meet the needs of the international science community for up-to-date hydrological data and information to address global and regional climate, water resources and environmental issues.

The Global Climate Observing System (GCOS) together with WMO is a co-sponsor of the Global Terrestrial Network for Hydrology (GTN-H, http://gtn-h.unh.edu). The goal is to present world-wide near-real time (NRT) data of 10 hydrological variables. GRDC participates in GTN-H aiming at contributing the discharge component.
The project has been recognised during the Eleventh Session of the WMO Commission for Hydrology (CHy) in Abuja from 6-16 November 2000 (see items 19.1.17-19 of the CHy report).

Several meetings have taken place to develop an implementation strategy and define products:

- Establishment of a Hydrological Network for Climate, Geisenheim, 26-30 June 2000. Report available at http://www.wmo.ch/web/homs/documents/english/geisenheim.pdf;
- Expert Meeting on the Implementation of a Global Terrestrial Network-Hydrology (GTN-H), Koblenz, 21-22 June 2001. Report available at http://www.wmo.ch/web/gcos/Publications/gcos-71.pdf;
- From 18-20 November 2002 a subsequent WMO Expert Meeting on "Hydrological Data for Global Studies" was held in Toronto, Canada, followed by a meeting of the GTN-H coordination panel from 21-22 November again in Toronto (reports available at http://www.wmo.ch/web/gcos/Publications/gcos-83.pdf and http://www.wmo.ch/web/gcos/Publications/gcos-84.pdf).
- 2nd meeting of the GTN-H coordination panel from 4-5 July 2005 in Koblenz, Germany.

GRDC is contributing to GTN-H by two projects as described in section 15.2 and 15.3 (also see Annex 9 and Annex 10).

Mr Grabs shortly informed about the results of the 2nd GTN-H panel meeting directly preceding the SC meeting.

18 Opportunities for interactions in international programmes and projects

WMO Information System (WIS)

Mr Grabs informed the SC about developments regarding the WIS (formerly also known as FWIS: Framework for the WMO Information System and Future WMO Information System).

The idea is to arrive at a unified platform for multiple purposes that ensures inter-operability of all kinds of data under WMO auspices. Cg-XIV (2003) approved the concept of FWIS which provide a single information structure, common to all WMO programmes, inter-disciplinary, locating data in real and non-real time, featuring an online catalogue, applying state-of-the-art ISO standards (e.g. 19100 series applied for the WMO Core Metadata Standard) as well as industry standards and of-the-shelf software.

The structure will consist of a network of National Centres serving as portal for national users. A number o Data Collection and Production Centres will have coordinative functions supported by five to six Global Information System Centres (GISC).

Regarding the implementation, WMO RA VI is currently developing the prototype of what is called Virtual GISC involving Exeter, Offenbach, Toulouse, ECMWF and EUMETSAT.

The WIS will be a “closed shop” open to all who have an access licence but is not open for the general public. It will be accessible world-wide but only for authorised persons.

WHYCOS

State of affairs:

SC was briefed about the goal of the World Hydrological Cycle Observing System WHYCOS (http://www.wmo.ch/web/homs/projects/whycos.html) to eventually arrive at a network of approximately 1000 stations around the globe that deliver hydrological and meteorological as well as environmental quality data. The current concept is the development and implementation of regional HYCOS projects addressing specific needs of the regions involved. This regional approach makes it easier to secure funding for the projects. All regional HYCOS projects, however, are implemented under a global perspective and ultimate global exchange of the data and information generated in the regional projects. The various HYCOS projects feature different levels of development, the most advanced ones being MED-HYCOS (Mediterranean Sea), AOC-HYCOS (Central and West Africa) and SADC-HYCOS (Southern Africa).

Discussion:

SC expressed the view that each HYCOS is obliged to forward its data to the GRDC. However, data exchange with HYCOS projects is not straightforward, as e.g. MED-HYCOS was started before WMO Resolution 25 became active and thus now many participating countries do not agree to publishing their data.

Mr Grabs briefed the SC on WHYCOS peculiarities. In 1983 the idea was born to arrive at a reference surface network of around 1000 stations (corresponding to a resolution of roughly 5°). Only region-wise implementation was regarded feasible at that time 20 years ago. A

major failure was that from the beginning there was no common data infrastructure with the consequence that the various HYCOS projects cannot "talk" to each other until today. The approach was donor driven and each HYCOS had different objectives (including floods, reservoir management, science) and no uniform look could have been developed. Another severe drawback continues to be that networks quickly degrade as soon as external funding stops.

In order to overcome the inability of HYCOS projects to communicate with each other a first attempt are the final draft WHYCOS guidelines which are currently being developed to set standards for data exchange among others. Point of contact in WMO is Mohammed Tawfik.

Mr Maurer inquired whether the WHYCOS guidelines also contain suggestions how to transfer data from HYCOS to GRDC. Mr Grabs negated but recommended that GRDC should communicate back to WHYCOS. GRDC should be invited as an observer in the WHYCOS meetings.

Recommendations:

- GRDC was advised to continue to pursue active data acquisition from HYCOS projects and also to explore the possibility to receive near-real time data from regional HYCOS data centres.
- GRDC should be invited as an observer in the WHYCOS meetings.

WWAP/WWDR

State of affairs:

Mr Jimbo gave a presentation on the status and future planning of the World Water Assessment Programme (WWAP, http://www.unesco.org/water/wwap/), see also the PPT-file in the digital annex, agenda item 18.

The WWAP has been established as a joint effort composed of 24 partners of UN systems (Programmes, Agencies, Regional commissions, Conventions and Decades). The Secretariat was opened in spring 2000 and is located at UNESCO headquarter in Paris. Financial foundation is provided by national governments (major share by Japan), institutions, NGO, etc.

The WWAP has four major activities, namely

- the biennial World Water Development Report (WWDR);
- an Information Network;
- a Capacity Building component;
- applications, mainly in the area of water conflict resolution.

Discussion:

Mr Jimbo informed the SC about the 2nd phase of WWAP and the WWDR II to be published in March 2006, including case studies in 25 countries applying indicators which have been defined. Mr Grabs noted, that the topic "Water: State of the Resource" would be a field of GRDC contribution including the estimation of freshwater flux to the ocean. Mr Maurer added that this is important because it is based on measured data. Mr Jimbo replied that he is expecting contributions from GRDC. Mr Grabs requested visible consideration of GRDC as a

source of primary information provided by the NHSs. GRDC should be adequately reflected in WWDR II.

WP2 Data base Development in the DITTY Project

Mr Boyer, WP Leader of the Data base Development WP2 in the DITTY Project (Development of an Information Technology Tool for the Management of European Southern Lagoons under the influence of river-basin runoff, http://www.dittyproject.org provided information on the technical approach chosen in this project and offered to share experiences and possibly data, see also the PPT-file in the digital annex, agenda item 18.

19 Review of the action list resulting from the previous SC meeting

State of affairs:

The action table resulting from the executive summary of the 6th SC was reviewed.

Discussion:

7th SC noted with appreciation progress made with many action items defined in the previous 6th SC meeting 2003 as summarised in the Executive Summary.

Recommendations:

Besides the many recommendations given in the end of each agenda item throughout this report, 7th SC made the following suggestions to GRDC:

- to list actions which were taken to systematically address the Permanent Representatives of a country to WMO and their Hydrological Advisors with respect to data acquisition, possibly supported by the WMO HWRP Secretariat.
- to continue to produce a technical note on current GRDC river discharge data plausibility check procedures and to consider the development of an integrated stand-alone software for this purpose, which could be freely distributed to data providers and serve as an incentive to deliver more data in a timely fashion;
- to continue collaboration with GCOS, especially in the extension of the 2AR to the GCOS Implementation Plan;
- to continue to foster joint marketing of GRDC, GEMS/Water, GPCC and IGRAC programmes and to explore options to collaborate on a more institutionalised level. Specific suggestions were to produce joint flyers and letters, as well as to plan to hold a workshop with global focus on joint GRDC-GPCC and joint GRDC-GEMS/Water products on rainfall-runoff cross-validation and biogeochemical fluxes, respectively;
- to develop closer contacts and collaboration with GWSP of ESSP;
- to develop products of gridded evapotranspiration and soil moisture, based on a hydrological water balance model with input of precipitation and temperature from climatic water balance;
- to consider the PILPS Land surface schemes intercomparison (Mr Ryabinin to provide GRDC with a list of names to whom to distribute SC Report);
- to continue to ensure GRDC's collaboration and involvement in relevant international research and operational programmes and projects such as GEWEX, CliC, GCOS, GTN-H, WHYCOS etc.;

- to continue to proactively advance the topic of Metadata, developing a concept, discussing this in the GTN-H panel and in expert groups, developing in the framework of a pilot study a prototype, that demonstrates the advantages and capabilities;
- to actively extend its contribution to the Global Terrestrial Network for Hydrology (GTN-H), especially by developing the GRDC Near-Real Time River Discharge Monitor;
- to try to attract additional temporal staff by e.g. working with students and PhD candidates or seconded experts, sent from their home organisations to GRDC;
- to explore possibilities to scan earlier GRDC reports and make them available via the GRDC homepage;
- to publish its contacts (address database of data providers and users) on the GRDC Web site;
- to store a security copy of the GRDC database to reside at WMO. It is recommended to store an ASCII dump of all GRDC data and Metadata at WMO IT security (address to be provided by Mr Grabs).

20 Future GRDC activities - discussion of long term strategic development, work plan and priority list

State of affairs:

Mr Maurer requested SC to discuss priorities for work in the next years in short, mid, and long term perspective.

Recommendations:

- GRDC has a clear mandate for river discharge collection, should follow own visions and not get distracted by others
- Besides GRDC routine work, the development of GTN-R and the Metadata issue have first priority. GRDC in 5 years: largely improved access to near-real time data to eventually get more and more an operational function.
  - The collaboration with EFAS is strategically critical for the GRDC!
  - Real time data acquisition introduces new tasks for GRDC, i.e. especially the need for acquisition of water level data and valid rating curves.
  - A good solution may be finding funding for updating equipment of many of the around 400 envisaged GTN-R stations (estimate of max. 8000 US$ per station).
  - GRDC was strengthened in its view not to merge real time data with the historical quality proofed data
- GRDC was recommended to continue its collaboration in GCOS, GTN-H and IGOS-P
- Bring GRDC as an important international data centre in mind of the officials, brief GEO Secretariat. GEOSS is an intergovernmental structure potentially providing a more direct link to governmental levels.
- GRDC should observe developments regarding satellite derived data of hydrological interest (WatER initiative, etc.).
- Mr Demuth advised that potential promising contacts are those of national IHP/HWRD committees as well as IAHS national representatives.
- GRDC was suggested to regularly send articles to newsletters such as Meteo-World of WMO and IAHS newsletter.
- Raise GRDC visibility by sending brief material – to users, to providers, not as a link to Web site but better paper (officials do not visit homepages!)
  - e.g. prepare a number of one-page project briefs/sketches as suggestions.

21 Review of membership of the Steering Committee

State of affairs:

The membership of the GRDC-SC was reviewed.

Discussion:

Mr Kinosita who attends as a country representative suggested to consider inviting data providers. Mr Grabs replied that data providers are covered by the representative from CHy (representing NHS), more invitees would be impractical.

Recommendations:

Concerning FRIEND, it was decided that the FRIEND Inter-Group Coordination Committee (FIGCC), which was established 4 years ago, will be the most suitable organisation to represent the international FRIEND community within the GRDC SC.

This leads to the following future membership of the GRDC SC:

Chairman:

- Dr K. Wilke, BfG

Secretary to the SC:

- Head of GRDC http://grdc.bafg.de

Members:

- WMO http://www.wmo.int/web/homs
- UNESCO http://www.unesco.org/water
- UNEP http://www.unep.org/dewa/water
- ICSU/IAHS http://iahs.info
- BfG http://www.bafg.de
- GPCC http://gpcc.dwd.de
- GEMS/Water PO http://www.gemswater.org
- IGRAC http://www.igrac.nl
- FRIEND/FIGCC http://ne-friend.bafg.de
- WCRP http://www.wmo.int/web/wcrp
- CHy http://www.wmo.int/web/homs/chy.html
- Government of Japan/MLIT/River Bureau http://www.mlit.go.jp/river/english

Observers:

- WWAP http://www.unesco.org/water/wwap
- IHP-HWRP Secretariat Germany http://ihp.bafg.de
- GCOS http://www.wmo.int/web/gcos/gcoshome.html

New observers (added by this meeting):

- IGWCO http://www.igospartners.org/Water.htm
- GWSP http://www.gwsp.org

22 Date and venue of next meeting

SC suggested to hold the next (8th) meeting of GRDC SC in summer 2007, tentatively in the beginning of June/July at BfG in Koblenz or at WMO Geneva. SC invited alternative suggestions by December 2005.

23 Any other business

Mr Maurer informed the SC about the already started activities to produce a GRDC calendar 2006 for distribution in early December 2005 to GRDC providers and partners instead of a New Year card as in previous years. The draft calendar was presented and very much appreciated by the SC.

24 Closure of meeting

SC expressed its appreciation of the work of GRDC and the progress made in many regards. Likewise, GRDC is encouraged to extend its activities along the recommendations given during this meeting. (Both also summarised in the Executive Summary of this report.)

Furthermore, SC warmly thanked GRDC for the very enjoyable organisation of the meeting and social by-programme as well as BfG for hosting the meeting within its premises.

The meeting was closed on 8 July 2005 at 12:45.

Annex 1 Agenda of the meeting

7th Meeting of the GRDC Steering Committee

Koblenz, 6 - 8 July 2005

Agenda (Status as of 25 May 2005)

time	*duration*	*item*		*topic*	*contributions from*
Wednesday, 6 July 2005					
9:00	0:10	1		Opening of the meeting	Wilke
9:10	0:10	2		Greeting from the Director of the Federal Institute of Hydrology	Wetzel
9:20	0:10	3		Organisation of work and adoption of the agenda	Wilke
9:30	0:30	4		WMO and CHy WG activities relevant to the work of the GRDC	Grabs
10:00	0:30	5		GRDC self-conception	Maurer
10:30	0:30			*recreational break*	
11:00	0:30	6		GRDC public relations	Maurer
11:30	0:15	7		Contributions to international reports	Maurer
11:45	0:15	8		Research project proposals	Maurer
12:00	1:30			*lunch break*	
13:30	0:30	9		Data acquisition activities	Dornblut
14:00	0:30	10		Database status and growth	Dornblut
14:30	0:30	11		Data dissemination and usage	Maurer
15:00	0:15	12		Review of GRDC collection criteria for discharge stations	All
15:15	0:15	13		Review of GRDC data policy and acquisition strategy	All
15:30	0:30			*recreational break*	
16:00				*meeting adjourns*	
17:00	5:00			excursion + common dinner	
22:00				*approx. back in Koblenz*	
Thursday, 7 July 2005					
9:00	1:30	14		Internal quality assurance/ improvement projects	GRDC-Staff
10:30	0:30			*recreational break*	
11:00	1:00	15		Product development and updating	GRDC-Staff
12:00	1:00	16		Global Data Centres (GPCC, GWPO, IGRAC)	Rudolf, Robarts, van der Gun
13:00	1:30			*lunch break*	
14:30	1:30	17		Interactions in international programmes and projects	All
16:00	0:30			*recreational break*	
16:30	1:00	18		Opportunities for interactions in international programmes and projects	All
17:30	0:30	19		Review of the action list resulting from the previous SC meeting	All
18:00				*meeting adjourns*	
Friday, 8 July 2005					
9:00	1:30	20		Future GRDC activities - discussion of long-term strategic development, work plan and priority list	All
10:30	0:30			*recreational break*	
11:00	0:15	21		Review of membership of the Steering Committee	All
11:15	0:10	22		Date and venue of next meeting	All
11:25	0:30	23		Any other business	All
11:55	0:05	24		Closure of meeting	Wilke, Grabs
12:00				*end of meeting*	

Annex 2 Membership of the Steering Committee by organisation or group

Membership of the Steering Committee by organisation or group

7th GRDC Steering Committee Meeting,
6 – 8 July 2005, Koblenz, Germany

Chairman:

Dr Klaus **Wilke**
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Members:

WMO	World Meteorological Organization
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNEP	United Nations Environment Programme
ICSU/IAHS	International Council of Scientific Unions/ International Association of Hydrological Sciences
GPCC	Global Precipitation Climatology Centre
GEMS/Water	Global Environmental Monitoring System / Freshwater Quality Programme
IGRAC	International Groundwater Resources Assessment Centre
FRIEND	Flow Regimes from International Experimental and Network Data
WCRP	World Climate Research Programme
CHy	Commission for Hydrology
Government of Japan	Government of Japan, represented by the River Bureau of the Ministry of Land, Infrastructure and Transport of Japan (MLIT) and its River Bureau
BfG	Bundesanstalt für Gewässerkunde (Federal Institute of Hydrology)

Observers:

German IHP/OHP Secretariat	German Secretariat of the International Hydrological Programme of UNESCO (IHP) and of the (former) Operational Hydrological Programme of WMO (OHP)
WWAP	World Water Assessment Programme
GCOS	Global Climate Observing System
IGWCO	Integrated Global Water Cycle Observation (Theme of IGOS-P)
GWSP	Global Water System Project

Annex 3 List of attendees

List of attendees

7th GRDC Steering Committee Meeting,
6 – 8 July 2005, Koblenz, Germany

in alphabetic order:

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Annex 4 List of GRDC staff

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Annex 5 Structure of GRDC Web site and specialised Web sites of GTN-R, ARDB and EWA

Global Runoff Data Centre (GRDC) - Homepage

What's New
- Recently changed GRDC pages
- What was new 2004
- What was new 2003
- What was new 2002
- What was new 1999-2001

Quick Access...
- ...to a brief Overview of GRDC
- ...for Providers
- ...for Potential Collaborators
- ...for Users
- ...to Specialised Databases
- ...to Information Networks + (Meta) Data Bases
- ...to Workshops, Conferences & Meetings (Water & Information related)

Rational & Background Information
- Vision and Main Objectives
- Framework
- Approaches to accomplish GRDC's Mission
- Improving GRDC Performance
- Standard Services
- History
- Funding
- Steering Committee
- Data availability and GRDC's Access to River Discharge Data
- Decisions, Comments and Support relevant to GRDC
- Metadatabases that cite GRDC

Collaborations, Cooperations & Participations
- GRDC cooperations in UN-Programmes and Projects
- Research Groups working with large subsets of GRDC data
- Other Collaborations, Projects & Participations
- Partner Data Centres
- National Hydrological Services

Data, Products & Reports
- How to Order GRDC River Discharge Time Series'
- GRDC Data Acquisition
- GRDC Database Status (24 March 2005)
- GRDC Database Usage
- GRDC Data Products
- GRDC Reports & Publications
- Specialised Databases

Downloads
- How to get to GRDC...
- Station Catalogues
- GRDC Station Selection Criteria
- GRDC Data Policy

_____-

(Continued next page…)

Global Runoff Data Centre (GRDC) - Homepage *(continued)*

- GRDC Data Products
- GRDC Report Series
- GRDC Flyers
- GRDC Information Notes
- GRDC Posters
- GRDC User Declaration
- WMO Resolutions
- Support Letter from WMO Secretary General (July 2004)
- Papers by GRDC

Links
- Alphabetic Index & Glossary
- Categorised Water & Information Related Links
- Education Programmes and Research Scholarships

Contact & Directions
- GRDC Team Picture
- How to get to GRDC...

Frequently Asked Questions
- Navigation
- Benefit
- Mandate
- Data Provision
- GRDC Service
- Ordering GRDC Data
- Costs
- Station Selection
- Free Standard Datasets
- Temporal distribution of GRDC stations
- Decline of hydrological networks
- Topicality of GRDC Stations
- Access Restrictions
- GRDC Data Policy
- Other Sources of Discharge Data
- Acronyms

Sitemaps

Global Terrestrial Network for River Discharge (GTN-R) - Homepage

Related action item in the Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC

Support Letter from WMO Secretary General (April 2005) and Information Package

Tentative Station Network + Basins
- Tentative GTN-R Station Network
- Tentative GTN-R River Basins
- Tentative GTN-R Station Network and River Basins

Provision of Near Real Time River Discharge Data

Arctic Runoff Data Base (ARDB) - Homepage

ARDB Detailed Map
- ARDB Map
- ARDB stations - countrywise statistics
- ARDB development over time, classified by data type (daily, monthly)
- ARDB development over time, classified by WMO region
- ARDB development over time, classified by decadal observation periods
- ARDB stations - temporal distribution of daily and monthly data + database growth 1993-2002
- GRDC Long Term Mean Annual Freshwater Surface Water Fluxes into the World Oceans
- ARDB Long Term Mean Annual Freshwater Surface Water Fluxes into the Arctic Ocean

ARDB map, statistics and analysis

ARDB Station Catalogue

Supplementary information on Russian river discharge data

Some literature

Some Links

European Water Archive (EWA of NE-FRIEND) - Homepage

Geographical Overview
- NE-FRIEND Stations by Hydrological Regions
- NE-FRIEND Stations by Hydrological Areas (Sub-Regions)
- NE-FRIEND Stations by Time Series End
- NE-FRIEND Stations by Time Series Length

EWA Station Catalogue

Ordering NE FRIEND River Discharge Data
- Template for FRIEND-EWA data access entitlement mail by NE FRIEND Project Coordinators

Providing River Discharge Data to the EWA

Regional Data Centres

NE-FRIEND Database Project Group

Meetings

Annex 6 Data provision to GRDC

14 data provisions until June 2005 (http://grdc.bafg.de/?855):

2005-06-08 Update Finnland (33 Stations)
2005-06-07 Update China (10 Stations)
2005-06-06 Update Botswana (1 Station: Okavango)
2005-06-06 Update The Netherlands (7 Stations)
2005-05-11 Update Sultanate of Oman (9 Stations)
2005-05-09 Update Zambia (5 Stations)
2005-05-04 Update Greenland (1 Station)
2005-05-04 Update Lithuania (7 Stations)
2005-03-14 Update Sweden (13 Stations)
2005-03-01 Update Lithuania (5 Stations)
2005-03-01 Update Latvia (1 Station)
2005-02-23 Update Panama (13 Stations)
2005-02-18 Update New Zealand (39 Stations)
2005-01-27 Update Mexico (60 Stations)

18 data provisions 2004 (http://grdc.bafg.de/?8169):

2004-12-13 Update Serbia and Montenegro (7 Stations)
2004-12-13 Update Danube river basin (12 Stations)
2004-12-13 Update Democratic Republlic of the Congo (5 Stations)
2004-12-13 Update USA (981 Stations)
2004-10-29 Update Slovakia (15 Stations)
2004-10-29 Update Cyprus (14 Stations)
2004-09-08 Update Switzerland (24 Stations)
2004-09-08 Update Netherlands (9 Stations)
2004-09-08 Update Sweden (25 Stations)
2004-08-26 Update Romania (11 Stations)
2004-08-26 Update Slovenia (10 Stations)
2004-08-26 Update Austria (15 Stations)
2004-07-28 Update Ireland (42 Stations)
2004-06-15 Update Belarus (4 Stations)
2004-06-09 Update Puerto Rico, USA (24 Stations)
2004-05-28 Update United Kingdom (48 Stations)
2004-04-30 Update Japan (Metadata for 152 Stations)
2004-02-02 Update Canada (1115 Stations)

12 data provisions 2003 (http://grdc.bafg.de/?5427):

2003-12-04 Update Russia (27 Stations)
2003-11-10 Update Iceland (9 Stations)
2003-11-10 Update Denmark (14 Stations)
2003-11-10 Update Russia (28 Stations)
2003-10-23 Update USA (595 Stations)
2003-10-01 Update Ghana (12 Stations)
2003-09-01 Update Niger Basin (45 Stations)
2003-08-14 Update Australia (45 Stations)
2003-08-08 Update Vietnam (18 Stations)
2003-05-05 Update Malaysia (8 Stations)
2003-05-06 Update Germany (90 Stations)
2003-01-28 Update Reunion (14 Stations)

Annex 7 GRDC Data Flow and Plausibility Check

Draft (Status 5 July 2005)

GRDC Data Flow and Plausibility Check

1. Raw files in various formats

2. Preparation of data import filter routines

3. Preparation of Metadata
- WMO Region and WMO Subregion
- GRDC Number
- Coordinate
  - Position relative to river and nearby inhabited place
  - Transfer into geographic coordinates (GCS_WGS_1984)
- GRDC Number of next downstream GRDC station
- Standardised geographic names
  - Unified main river name and locally used river names
    - GEOnet Names Server (GNS): http://earth-info.nima.mil/gns/html
    - Getty Thesaurus of Geographic Names (TGN) http://www.getty.edu/research/conducting_research/vocabularies/tgn (rarely used)
    - Alexandria Digital Library (ADL) Gazetteer, 5.9 Mio names of geographic locations worldwide: http://www.alexandria.ucsb.edu (hardly used, as it does not give coordinates, but only shows location in a map)
- Catchment area
  - As provided
  - Derived from HYDRO1K, the Elevation Derivative Database of USGS: http://edcdaac.usgs.gov/gtopo30/hydro
- Data Provider number
- Affiliation with GRDC database subsets
  - ACSYS: if station belongs to the subset of the Arctic Runoff Data Base (ARDB, http://ardb.bafg.de) in the WCRP Arctic Climate System Study (ACSYS, 1994-2003, http://acsys.npolar.no)
  - FLUX2OCEAN: if station is used for the GRDC Product Long Term Mean Annual Freshwater Surface Water Fluxes into the World Oceans
  - GEMSWATER: if station corresponds to a GEMS/Water water quality station
  - GTNR: if station belongs to the subset of the Global Terrestrial Network for River Discharge (GTN-R, http://gtn-r.bafg.de) within GTN-H
  - MPV: if monthly station statistics is available in GRDC Product Long Term Mean Monthly Discharges and Annual Characteristics of Selected GRDC Stations (MONTHLY PRIMARY VALUES)
  - DPV: if daily station statistics is available (DAILY PRIMARY VALUES)
- Known percentage of annual water volume stored in reservoirs (cooperation with University of Greifswald, Germany)

4. Plausibility check and data import in database
- Automated checks
  - Comparison with long term monthly statistics (Min, Mean ± Stand. Dev., Max)
    - Case: overlapping period:
      - A) mHQ> value> mLQ; if not => B

        - B) HQ > value > LQ; if not => dump to list for manual check
        - C) compare old and new values, if difference > 3% => dump to list for manual check
    - Case: no overlapping periods
        - A) mHQ> value> mLQ; if not => B
        - B) HQ > value > LQ; if not => dump to list for manual check
    - Case: new station
        - only visual visual inspection of hydrograph
        - outliers
- Long term average annual runoff-height
    - Absolute value in plausible range
    - Cross-check with neighbouring stations (after completion of attributing the next downstream station))
        - No dramatic jumps without good reason (as e.g. dams)
            - Problem: few information about “good reasons”
        - Discharge usually smaller than at downstream stations
        - Discharge usually larger than at upstream stations
- If there are monthly and daily values, with or without overlap, there is an active decision to keep both time series if they fit together or to discard one, if they differ to much (experience shows that in most cases this is typically the older set of original monthly data). Decision procedure:
    - Preferably compare overlapping period only, differences should be really small
    - If there is no overlap, some differences may be possible due to variability or trend
    - Look at runoff height (=basin area related discharge) in mm/a:
        - If larger than 3000 mm/a check especially carefully
        - Only in the tropics it may exceed 3000 mm/a (some sites in NZ may have > 10000 mm/a)
    - Comparison with nearby stations
    - Look at import date, much older data are more likely to be outdated

5. Calculation of daily values from mean daily water level
- if instead of daily discharge data daily water level data and a rating curve is provided

6. Calculation of monthly values from mean daily discharge
- Calculation only if daily data exists
    - Missing days flag: number of days missing during calculation daily-to-monthly (0-30 or 15 only?), else –999
    - In all -999 cases GRDC adds original monthly data if available ("generated" or "mixed" time series) for monthly statistics

7. Export of the GRDC Catalogue
- Standard STN-file
- Extended STN-file
- ESRI Shape-file

8. Calculation and export of GRDC data
- MEAN DAILY DISCHARGE
- MEAN MONTHLY DISCHARGE

and statistics files
- DAILY PRIMARY VALUES

- MONTHLY PRIMARY VALUES

9. Announcement of new GRDC data in the "What's New"-section of the GRDC Web site.

10. Provision of data files on GRDC Web site
- GRDC Catalogue or Metadata table
- DAILY PRIMARY VALUES
- MONTHLY PRIMARY VALUES

Annotation:

GRDC is providing data statistics based on the time series as GRDC received it. This especially means, that GRDC is not closing data gaps, as various methods exist, which should ideally be chosen by the data provider, who has the local knowledge or, if this is not feasible by the data user, depending on his application. However, the procedure how statistics are derived is thoroughly described in the documentation that will be made available on the GRDC Web site.

While here plausibility checks related to the values of the time series are described, it has to be understood, that an integral part of quality assurance is the existence of a sound data management system, including:
- Relational data model of several tables
- Provider- / update management tools
- Backup routines for the database and original data
- Homogenisation of basic information by using “foreign keys”
- Avoidance of duplicates by using “unique keys”

Mandatory Metadata is enforced by assigning a “not null” constraints

Annex 8 Information note on river discharge quality assurance provided by Mr Kinosita

To Keep the Quality of Discharge Database

Dr. Takeo Kinosita
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1. Introduction

In order to establish data base, the most important issue is in general how to assure the quality of data. In other words, all data must be screened with full care when they are put in the data base. The committee has been organized to keep the good quality of the hydrological data base in Japan. The author is one of the members of the committee and has experienced many examples of quality check of discharge data. The activity of the committee and the procedure of data screening used in the committee were already reported at the 6th meeting of GRDC SC and documented in Annex8 of the Report34. In this information note, simple and effective ways for quality check are illustrated as follows:

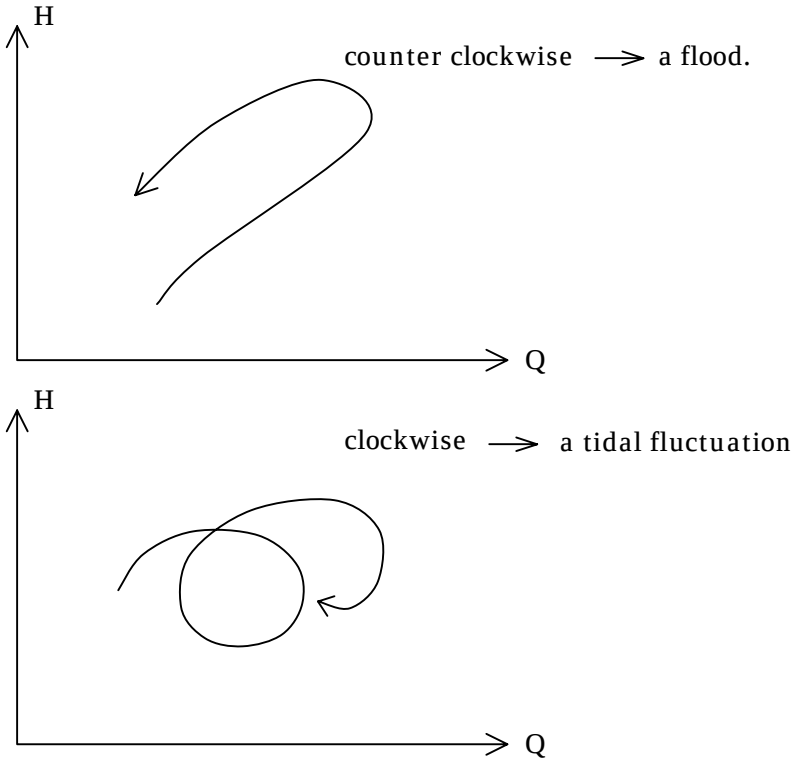
2. Stage-discharge relation

Water stage (level) and discharge are closely related to each other. For instance, Manning's formula $Q=(1/n)i^{1/2}AR^{2/3}$ expresses the one-to-one correspondence between the water level and the discharge, where Q is the discharge, n is the Manning's coefficient, i is the surface gradient, A is the cross-sectional area, and R is the hydraulic radius. A and R are the functions of the water level H. The Manning's formula forms approximately a parabolic curve on the H and Q domain. But the observed data are sometimes separated from the adequate places on the domain due to various kinds of erroneous factors. It is crucial to find them as soon as possible, to revise them if possible, and to immediately improve the observation systems. If the input data is doubtful, an error flag must be attached to the data in the data base.

At the following discussion, the water level H is measured on the ordinate while the discharge Q is on the abscissa on a chart.

① Loop

Concerning changing flow (wave), when the successive plottings make a counter-clockwise loop, the flow (wave) originates from upstream (perhaps a flood wave). When the successive plottings make a clockwise loop, the flow change originates from downstream (perhaps a tidal fluctuation). If a different trend, for instance an 8-shape loop, is found, data must be carefully investigated.

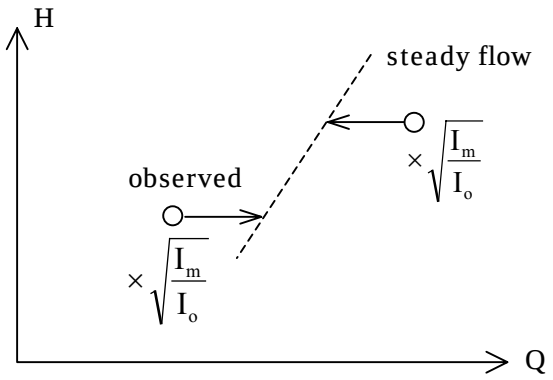


Reference

Kinosita,Takeo: Improvement of ultrasonic flowmeter in rivers in Japan, Proceedings of the Exeter Symposium IAHS Pub. No.134. p.194 (1982)

② Change of surface gradient

When plottings are scattered, the square root of I_m/I_o must be multiplied to the observed discharge, where I_m is the mean surface gradient and I_o is the observed surface gradient. If the plottings lie on a curve, it can be concluded that the scattering is due to change of the surface gradient. Otherwise deep consideration should be given to find errors or to check inadequate observation conditions, for instance degradation on weir operation at the downstream. The gradient must be calculated from the difference of the water level between two stations separated 5～10km according to the experience in Japan.



Reference

The Stage-discharge curve adjusted by the surface gradient, Suimon Kankyo Technical Report No.5 (2002) (in Japanese)

③ Uniform flow assumption

The stage-discharge relation is formulated as

$$Q = a(H+b)^2$$

where Q is the discharge, H is the water stage (level), a and b are determined by observed data. In the case of many observed data, the least square method can be applied to determine a and b. In the case of less data, under the assumption of uniform flow and the steep river bank, the stage-discharge relation can be elongated within some range. a is determined by $V(1+p)^2B^2/4A$ and H+b is $2R/(1+p)$, where V is the mean velocity over the observation section, p is the power of the uniform flow formula (p of Manning's formula is 2/3), B is the width of the flow section, A is the flow area, R is the hydraulic radius. They are all derived from field observation.* If an outlier is found on the HQ diagram, the investigation must be carried out carefully.

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*This relation can be proved as follows:

uniform flow formula $Q = f(H) = (1/n)i^{1/2}AR^p$

HQ relation $Q = a(H+b)^2$

differential $\dfrac{dQ}{dH} = \dfrac{df}{dH}$

$$\frac{dQ}{dH} = 2a(H+b)$$

Two Q's and two dQ/dH's must be equal to each other.

$$f(H) = a(H+b)^2$$

$$df/dH = 2a(H+b)$$

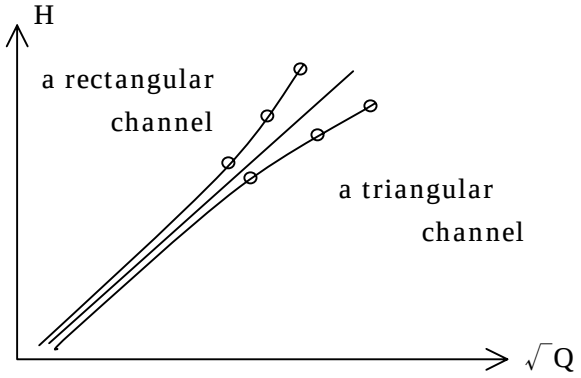
From two equation, a and b can be obtained without consideration of n and i.

Reference

Kinosita, Takeo : Quality check of discharge by uniform flow assumption, Proc.2001 Conference, Jap. Soc. Hydro. Water Res. p.30 (2001) (in Japanese)

④ H√Q domain

On the H√Q domain, plottings mostly lie on a straight line. In some cases, plottings lie on a slightly bent line. Exactly speaking, the plotting line bends slightly upward in a rectangular channel, while it bends slightly downward in a triangular channel. If a different trend is found, some error may be included.

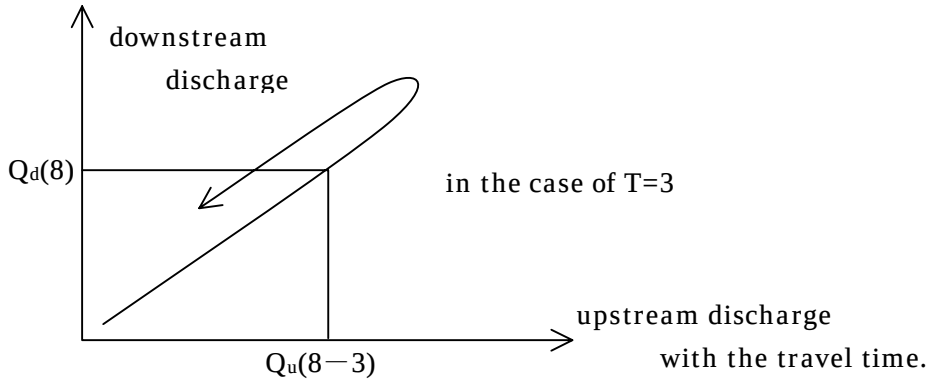


3. Discharge hydrograph

Discharges at the upstream station and the downstream station must be compared with each other for quality assurance. Where there is a confluence, the discharge of the tributary must added to the upstream discharge of the main reach. Where two drainage areas at the upstream station and the downstream station are different, an adjustment may be required based on the areal ratio.

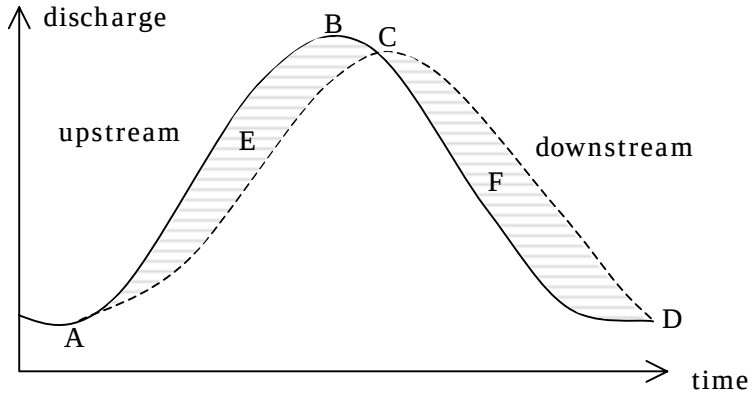
① Correlation

$Q_u(t)$and $Q_d(t)$ respectively denote the upstream discharge and the downstream discharge at time t. Travel time of a flow between two stations is T. Supposing $Q_u(t-T)$ is measured on the abscissa and $Q_d(t)$ is on the ordinate, the plottings stand on a clear curve. If any plotting is at a separate place, it perhaps is erroneous. T can be decided by means of choosing the maximum correlation coefficient between $Q_u(t-T)$ and $Q_d(t)$ from various T's.



② Superposition of two hydrographs

The upstream discharge hydrograph and the downstream one are drawn on the same chart.



At the rising part, the upstream discharge is bigger than downstream one. The difference means the channel storage. At the depletion part, the upstream one is smaller than the downstream one. The difference means the release from the storage. Therefore the area E (the total volume of the storage) must be equal to the area F (the total volume of the release from the storage). Before A and after D, two discharges at the upstream and downstream must be equal to each other. Because they are base flows.

③ The peak of the downstream discharge C appears on the depletion curve of the upstream discharge, shown in the figure above. If the peak C exists at the different place, the observation system must be carefully investigated.

4. Conclusion

Several methods to assure the quality of discharge are shown in this note. They do not mean perfect check systems. They are only examples, which are simple and easy but effective. Other procedures must be introduced to the quality assurance system in wide perspectives. If GRDC always investigates the quality of discharge stored in the data base, it finds many items to be improved in the data provider's observation systems. The GRDC can really contributes not only to collect discharge data on the global scale but also to advise all data providers to improve their observation system based on its practical experiences. Then discharge data will become much more accurate all over the world.

Annex 9 GRDC Metadata project report to the 2nd GTN-H panel

GTN-H Project 1.3 – Demonstration of Metadata (Status 1 July 2005)

Objective:
To propose a standardized detailed Metadata format for selected GTN-H data types and demonstrate their use in enabling the user to discover and access data and related information (e.g. data quality)

Output/deliverable:
(1) Background knowledge: Report on Metadata: Need and current practices
(2) Definition/selection of standard: ISO 19115/19139 conform Metadata profile for GTN-H (discovery and station level)
(3) Provide infrastructure: Web based ISO 19115/19139/19119 compatible Metadata management application that allows a user to input and to explore Metadata for a range of hydrological variables, including a link to the Web site of the data provider; ideally to be combined with a map display and map locator.
(4) Fill infrastructure with live/meaningful data: Example data sets fed into the system under (3)

Methodology:
(1) Synthesis of literature review, current trends and own insights:
Final Draft October 2004: *GRDC Report 31: "Globally agreed standards for Metadata and data on variables describing geophysical processes. A fundamental prerequisite to improve the management of the Earth System for our all future" by T. Maurer* (for download from http://grdc.bafg.de/?911)
(As this topic is dynamical developing, this report must be regarded as a living document, will be updated occasionally)

(2) Propose a ISO 19115/191139 standardized Metadata format for selected data types:

River discharge:	Thomas Maurer
Water quality:	Richard Robarts
GSN–Asheville:	Jeff Arnfield
Precip–GPCC:	Bruno Rudolf
Gridded dataset:	Richard Lammers, UNH + GPCC products
A satellite-derived snow product:	Barry Goodison

An example for a GRDC discovery level Metadata set according to the WMO Core Metadata Standard (WCMS) (Profile of ISO 19115, see http://www.wmo.int/web/www/WDM/Metadata/documents.html) is given at http://grdc.bafg.de/?6487.

(3) As the ISO standards seems to establish, web-based multilingual general software solutions begin to emerge (already close to commercial-of-the-shelf (COTS) software), e.g. in the framework of the German NOKIS-project (North and Baltic Sea Coastal Information System, see http://grdc.bafg.de/?7836). Building on such a product is clearly to favour instead of starting own custom made developments. Buy the encapsulated know-how! The choice should be a product that is up-to-date with current technologies, i.e.

- It should be configurable in order to cope with the situation that Metadata schemes or profiles according to ISO 19115/19139 may change over time
- Furthermore, GTN-H installations should be capable to be integrated into a larger framework, i.e. to be connectable via standardised Web Catalogue Services (CS-W) according to ISO 19119 with a central Metadata-broker (such as e.g. GeoMIS.Bund in Germany, i.e. the GeodatenMetaInformationsSystem, http://www.geomis.bund.de)

GRDC is (yet informally) granted a small BfG fund to put out to tender the development of such a software tool based on the WCMS, preferably by adaptation of the scheme developed in the NOKIS project. GRDC has drafted a specification of services (in German language) which is currently under review of GRDC's preferred collaborator, i.e. the developer of the NOKIS software.

(4) Identify a network of institutions and individuals that contribute information **(Metadata providers)** and a not necessarily congruent and likely smaller network of institutions and individuals

that organize this information into the given infrastructure **(service providers)**. This data has then to be accessible to the generally much larger group of users **(clients)**. For the beginning lets choose ourselves a few stations or products to demonstrate its use. Feed them into the infrastructure. However, in order to become meaningful the amount of information has to be extended over time and the workload ideally to be distributed on many shoulders.

[This latter part will be the much more demanding task and require the majority of the resources (and will be limited by the amount of man-month available, in context with the effectiveness of communication with numerous Metadata providers, e.g. the degree of automation that can be reached). It is crucial to develop a GTN-H community that takes ownership of this infrastructure, i.e. the provider and user community ideally converge.]

Schedule (critical dependent on resources):
(1) Metadata report ready by October 2004 (Thomas Maurer)

(2) Metadata format based on WCMS agreed to by December 2005 (Thomas Maurer and project participants)

(3) Metadata management application based on NOKIS bought, fine tuned, installed and operative March 2006 (Thomas Maurer and externally funded GRDC staff)

(4) Example data input until March 2006 (all project participants). [More Metadata in the years to come, depending on resources spent explicitly for Metadata entry or commitment of a growing number of Metadata providers to act as service providers themselves and input data]

Resources required (prerequisite for schedule):
(1) Project leader (net 3 man-month)

(1) Project leader (net 3 man-month),
Project participants (net 1 man-month each)

(2) External web-software consultant with ISO knowledge (3 man-month), funding may emerge from EFAS project
License fee for software (around 10-20,000 Euro?)
IT-specialist for software installation and administration training (1 man-month)
IT-support staff (continuously from BfG resources)

(3) Project participants (net 0.5 man-month each)
GTN-H community taking ownership (many man-month)

Project lead:
Thomas Maurer

Project participants:
GRDC internal staff and (depending on funding) externally funded staff
All GTN-H Coordinating Group members

Product(s) to be maintained by: Global Runoff Data Centre

Annex 10 GRDC GTN-R project report to the 2nd GTN-H panel

GTN-H Project 2.2 – Map Product on Real time Hydrological Conditions (Status 1 July 2005)

Objective:
To develop a pilot web application that demonstrates the retrieval, integration and presentation of real time hydrometric data for selected large rivers from several countries (Global Terrestrial Network for River Discharge, GTN-R, http://gtn-r.bafg.de)

Output/deliverable:
(1) Core software, GTN-R engine, GRDC NRT-Monitor: collects near-real time (NRT)-discharge data from distributed servers in the internet, harmonises and summarises it, and makes it available again in the standardised GRDC-NRT-Format-V2 (see http://grdc.bafg.de/?6678) via a FTP-server.

(2) Defined Networks of stations within GTN-R: GCOS River Discharge Baseline Network, European Flood Alert Network, etc. Within the technological framework called GTN-R several networks may be defined for different purposes.

(3) Web mapping application: using the harmonized data (1), a piece of software, that graphically displays the collected and harmonized NRT-discharge stations in an interactively scaleable world map at a Web site by means of an internet map server (IMS). Absolute and relative current discharge values will be displayed as attributes (similar to e.g. the USGS WaterWatch).

(4) Acquisition of datasources for the GRDC NRT-Monitor, both near-real time and historical data (for statistical analysis)

Methodology:
(1) Stand alone application programmed in Borland Delphi and Oracle 9i. Has two major parts, (a) the configuration shell and (b) the operative engine.
The configuration shell allows to administrate the attributes of the major information objects, i.e. **Providers**, which may have several **DataSources**, which in turn may hold data of several **Stations**. DataSources are described by several attributes, including a HTTP or FTP location, a data type (discharge or water level), a format identifier and a download frequency. Stations are described by standard GRDC Metadata and can be grouped in upload **Projects**. Projects are described by several attributes, including a FTP location for upload of harmonised station data in **GRDC-NRT-Format-V2**, upload frequency, and upload length (time period back from upload or number of last values stored). All configuration data is held in Oracle database tables. Station Metadata has to be manually generated in the GRDC database on adding new DataSources to the configuration shell (may need to communicate once with the data provider). This includes water level - discharge relationships in cases where the DataSource delivers water level data, to allow for automated conversion in operative mode.
The operative engine continuously monitors all active DataSources according to their download frequency attribute, visits them, downloads the provided data files if there are new versions (for pragmatic reasons in the current absence of standards, each new DataSource may require to author a new access routine to the data, however, use of the GRDC-NRT-Format-V2 is encouraged and will be propagated as the project evolves), reads out the variable discharge or water level, converts water levels if applicable and stores the data in newly defined tables for NRT data in the GRDC database. At the same time the operative engine monitors all defined Projects according to their upload frequency attribute and dumps harmonized NRT-discharge data in GRDC-NRT-Format-V2 to the defined FTP-sites for use by the users.

(2) Identification of a priority network of around 380 river discharge reference stations that constitute a first application of GTN-R (i.e. the GCOS River Discharge Baseline Network, which is the "flow-to-oceans" list of hydrometric stations) as well as the outline of the associated river basins. This network has been selected based on (a) the GRDC Metadata list, (b) a list of discharge stations held at NCAR and (c) visual inspection of maps of all continental coastlines for relevant rivers draining to the ocean the stations. This network can be viewed and downloaded at http://gtn-r.bafg.de (click on the small world map for further details).

(3) Development of a mapping application for the harmonised data product, i.e. a graphically display of the most recent collected and harmonised data of NRT-discharge stations in an interactively scaleable World map at a by means of an internet map server (IMS). Absolute discharge values (3.1) as well as classified percentiles relative to the long term characteristics of the stations (3.2) will be displayed as attributes (similar to e.g. the USGS WaterWatch, see http://water.usgs.gov/waterwatch).

(4) The 380 stations defined in (2) are grouped in three nested categories: (C) all stations, (B) stations of those countries that already provide some kind of online data in the internet and (A) stations that already are making data available in real time **suitable for automated reading**. We start writing individual interfaces for these A-stations, in order to be able to demonstrate the applications (1) and (3) as soon as possible. In a next step, convincing with the good example of A-stations, we are approaching providers of B-stations to provide their data preferably in GRDC-NRT-Format-V2. At the same time the GCOS secretariat is approaching all data providers (C-providers) with an official letter requesting for support of GTN-R.

Schedule (critical dependent on resources):

(1) Version 0 August 2004, first operative version 1 including documentation by March 2006, to be extended as new DataSources in new formats become available. Improved versions 2+ are depending on funding, e.g. European Flood Forecasting System (EFAS)

(2) This software has been developed in a 4 month practical term by a Canadian student of Computer Science in summer 2004, funded by WMO and BfG. First version completed in October 2004, since then improvements, most recent version of February 2005, however several bug fixes are pending. They are expected to be done as soon as external funding will be available (expected in the framework of EFAS in autumn 2005). Further maintenance of the code will be managed by the GRDC. A draft documentation (Methods, User Guide, Programmers Guide) has been developed and has to be finalised, likely to be continued as station data providers are contacted and advise with their local knowledge.

(3) In March 2005 GRDC has set up an IMS based on BfG IT infrastructure, however, currently only online within the BfG intranet. Due to resources constraints of BfG IT department not yet put into the "demilitarised zone" accessible for the world. Will be developed further as resources become available and data begins to flow in.

(4) A-stations (NRT-data and some historical data): as soon as software developer becomes available from expected external funding.

B-stations (NRT and most historical data): after interfaces for A-stations have been developed.

C-stations (NRT and remaining historical data): on 18 April 2005 the WMO Secretary General has sent out a support letter in five languages concerning the "Institutionalized regular provision of daily river discharge data for selected rivers and gauging stations of the GTN-R" together with a country-tailored information package to the Permanent Representative with WMO and the Hydrological Adviser with WMO of 82 countries which feature tentative GTN-R stations. The letter was drafted by the GCOS Secretariat in Geneva with GRDC inputs (see http://gtn-r.bafg.de/?9419 for a facsimile). To date (1 July 2005) eight countries have reacted to the letter and partly already submitted data (e.g. from 10 stations from China).

Resources required (prerequisite for schedule):

(1) Software developer (12 man-month for version 1, 6 MM already spent, (4 MM with external funding from WMO (4000 Euro) and BfG (2600 Euro))). Improved versions 2+ depending on funding, e.g. European Flood Forecasting System (EFAS)

(2) Hydrologist (2 MM, already spent)
GIS-Specialist (4 MM, already spent)

(3) Software developer and hydrologist (4 man-month for 3.1 and 8 man-month for 3.2), funding may emerge from the European Flood Forecasting System (EFAS) project
License for IMS (provided by BfG)

IT-specialist for software installation and administration training (1 man-month), funding may emerge from EFAS project
IT-support staff (continuously from BfG resources)

(4) A-stations (net 3 man-month)
B-stations until 2007 (net 6 man-month)
C-stations until 2009 (net 12 man-month)

Project lead:
Thomas Maurer

Project participants:
GRDC internal staff and (depending on funding) externally funded staff

Product(s) to be maintained by:
GRDC

Programme linkage: BGC flux project (GEMS-Water)

Annex 11 List of contents of CD-ROM attached to this report

file_info.txt

This is the distribution of material related to

GRDC Report No. 35 (Nov 2006): Report of the Seventh Meeting of the GRDC Steering Committee, Koblenz, Germany, 6-8 July 2005.

Besides the meeting report itself the CD contains supplemental material not added into in the annex of the report (such as presentations, articles, photographs taken during the meeting), see liste below.

All digital annex files are available through the following single compressed archive file:

GRDC_SC_7_Annex.zip (80 MB)

Alternatively, individual files can be retrieved according to the following list:

kB	filename
2	file_info.txt
1,400	GRDC_Report_35_SC_7_2005.pdf
23	GRDC_SC_7_Ag__4___CHy-XII_quotations_related_to_GRDC.doc
1,110	GRDC_SC_7_Ag__4___Grabs_on_WMO-WIS.ppt
25,636	GRDC_SC_7_Ag_10+7_Dornblut_on_GRDC_data_acquisition_activities_status.ppt
116	GRDC_SC_7_Ag_13___Policy guidelines for the dissemination of data.pdf
9,610	GRDC_SC_7_Ag_15.1_de_Couet_on_GIS_Activities.ppt
2,556	GRDC_SC_7_Ag_15.3_GTN-R_Article_gi4dm-2005.pdf
1,510	GRDC_SC_7_Ag_15.3_Maurer_GTN-R.ppt
10,757	GRDC_SC_7_Ag_16.1_Robarts_on_Status_GEMS-Water_Programme_Office.ppt
1,323	GRDC_SC_7_Ag_16.2_Rudolf_on_Status_Global_Precipitation_Climatology_Centre.ppt
13,583	GRDC_SC_7_Ag_17.2_Ryabinin_on_Status_of_WCRP-GEWEX-CliC.ppt
2,621	GRDC_SC_7_Ag_18___Boyer_on_DITTY_Project.ppt
7,859	GRDC_SC_7_Ag_18___Jimbo_on_Status_World_Water_Assessment_Programme.ppt
1,504	GRDC_SC_7_IMG-4688_Participants.JPG
1,449	GRDC_SC_7_IMG-4691_Marksburg_from_River_Rhine.JPG
1,477	GRDC_SC_7_IMG-4700_River_Rhine_from_Masksburg.JPG
1,451	GRDC_SC_7_IMG-4720_Marksburg_close-up.JPG
1,437	GRDC_SC_7_IMG-4722_during_dinner_1.JPG
1,420	GRDC_SC_7_IMG-4723_during_dinner_2.JPG

Annex 12 List of acronyms and associated URLs

List of acronyms and associated URLs

(see also http://grdc.bafg.de/?3225)

2AR	Second Report on the Adequacy of the Global Observing Systems for Climate	http://www.wmo.int/web/gcos/gcoshome.html
AARI	Arctic and Antarctic Research Institute	http://www.aari.nw.ru
ACSYS	Arctic Climate System Study (WCRP)	http://acsys.npolar.no
ADIS	ACSYS Data and Information Service	http://acsys.npolar.no/adis/adis.php
ANZLIC	Spatial Information Council of the Australian Government, the New Zealand Government and the governments of the States and Territories of Australia	http://www.anzlic.org.au
AOC-HYCOS	Système d'Observation du Cycle Hydrologique de l'Afrique de l'Ouest et Centrale	http://aochycos.ird.ne/INDEX/INDEX.HTM
AOPC	Atmospheric Observation Panel for Climate of GCOS	http://www.wmo.int/web/gcos/aopc.htm
APFM	Associated Programme on Flood Management	http://www.apfm.info
ARDB	Arctic Runoff Data Base	http://ardb.bafg.de
AWG	CHy Advisory Working Group	http://www.wmo.int/web/homs/chy/awg.html
BALTEX	Baltic Sea Experiment	http://dvsun3.gkss.de/baltex
BfG	Bundesanstalt für Gewässerkunde, Federal Institute of Hydrology	http://www.bafg.de
BGR	Federal Institute for Geosciences and Natural Resources, Germany	http://www.bgr.de
BMVBW	Bundesministerium für Verkehr, Bau- und Wohnungswesen, Fed. Min. for Transport, Building & Housing	http://www.bmvbw.de
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung, Fed. Min. for Economic Cooperation and Development	http://www.bmz.de/en
Cap-Net	International Network for Capacity Building in Integrated Water Resources Management	http://www.cap-net.org
CATCH	Coupling of the Tropical Atmosphere and Hydrological Cycle	http://www.lthe.hmg.inpg.fr/WEB_Catch/Accueil_CATCH_en.html
CBS	WMO's Commission For Basic Systems	http://www.wmo.int/web/www/BAS/CBS-info.html
CEB	Chief Executives Board of UN	http://ceb.unsystem.org
CEH	Centre for Ecology and Hydrology	http://www.ceh.ac.uk
CEOP	Coordinated Enhanced Observing Period	http://www.ceop.net , http://monsoon.t.u-tokyo.ac.jp/ceop
CEOS	Committee on Earth Observation Satellites	http://www.ceos.org
CESR	Center for Environmental Systems Research	http://www.usf.uni-kassel.de/usf
Cg	WMO Congress	http://www.wmo.int
Chy	WMO's Commission for Hydrology	http://www.wmo.int/web/homs/chy.html
CliC	Climate and Cryosphere Project (WCRP)	http://clic.npolar.no
CLIVAR	Climate Variability and Predictability (WCRP)	http://www.clivar.org
CMS	Content Management System	
CODATA	ICSU Committee on Data for Science and Technology	http://www.codata.org
COP	Conference of the Parties, e.g. of UNFCCC	
CORDIS	Community Research & Development Information Service of EU	http://www.cordis.lu
CRU	Climatic Research Unit	http://www.cru.uea.ac.uk
CSD	UN Commission on Sustainable Development	http://www.iisd.ca/linkages/csd, http://www.un.org/esa/sustdev
CSDGM	Content Standard for Digital Geospatial Metadata of FGDC	http://www.fgdc.gov/metadata/csdgm
CSE	GEWEX Continental Scale Experiments	
CSRC	Complex Systems Research Center (at UNH)	http://www.csrc.sr.unh.edu

CUAHSI	US Consortium of Universities for Advancement of Hydrologic Science, Inc.	http://www.cuahsi.org
DAAC	ORNL Distributed Active Archive Center	http://daac.ornl.gov
DFO	Dartmouth Flood Observatory	http://www.dartmouth.edu/~floods
DCMI	Dublin Core Metadata Initiative	http://dublincore.org
DCP	Data Collection Platform	
DCW	ESRI's Digital Chart of the World	http://www.maproom.psu.edu/dcw
DDM30	0.5 degree Drainage Direction Map of CESR	
DEWA	UNEP Division of Early Warning and Assessment	http://www.unep.org/dewa
DGER	Database for Global Environmental Research	http://www-cger.nies.go.jp/cger-e/db/info-e/InfoDBWeb/index.htm
DGIWG	Digital Geographic Information Working Group	http://metadata.dgiwg.org
DISC	Data and Information Service for CliC (DISC)	http://clic.npolar.no/disc/disc.php
DIVERSITAS	Int. Programme on Biodiversity Science	http://www.diversitas-international.org
DKRZ	Deutsches Klimarechenzentrum	http://www.dkrz.de
DLR	Deutsches Luft- und Raumfahrt Zentrum	http://www.dlr.de
DMIP	Data Management and Information Panel	http://ipo.npolar.no/org/dmip.php
DMS	Document Management System	
DMWG	GHPs Data Management Working Group (GEWEX)	http://www.joss.ucar.edu/ghp
DODS	Distributed Oceanographic Data System	http://www.unidata.ucar.edu/packages/dods
DSS	SCD's Data Support Section	http://dss.ucar.edu
DWC	Dialogue on Water and Climate	http://www.wac.ihe.nl
DWD	Deutscher Wetterdienst (German Weather Service)	http://www.dwd.de
DWFE	Dialogue on Water, Food and Environment	http://www.iwmi.cgiar.org/dialogue
Earthwatch	United Nations (UN) System-Wide Earthwatch	http://earthwatch.unep.net
EC	European Commission	http://europa.eu.int/comm/index_en.htm
EC of WMO	Executive Council of WMO (e.g. LIII i.e. 53rd session)	http://www.wmo.int
EC-AGE	Executive Council Advisory Group on the International Exchange of Data and Products	http://www.wmo.int/web/pla
ECMWF	European Centre for Medium-Range Weather Forecasts	http://www.ecmwf.int
ECPC	Experimental Climate Prediction Center	http://ecpc.ucsd.edu
EEA	European Environmental Agency	http://www.eea.eu.int
EFAS	European Flood Alert System	http://ies.jrc.cec.eu.int/European_Flood_Alert_System.98.0.html
EFFS	European Flood Forecasting System	http://effs.wldelft.nl
EIONET	European Environment Information and Observation Network of EEA	http://www.eionet.eu.int
EMWIS	Euro-Mediterranean Information System on the know-how in the Water sector	http://www.emwis.org
EOS	arth Observation Summit	http://www.earthobservationsummit.gov
ERN	European Rivers Network	http://www.rivernet.org/ern.htm
EROS Data Center	USGS's Earth Resources Observation Systems Data Center	http://edcwww.cr.usgs.gov
ESA	European Space Agency	http://www.esa.int
ESRI	Environmental Systems Research Institute, Inc.	http://www.esri.com
ESSP	Earth System Science Partnership	http://www.ess-p.org
ESTEC	European Space Research and Technology Centre	http://www.estec.esa.nl
ET-IDM	Expert Team on Integrated Data Management of CBS of WMO	http://www.wmo.int/web/www/CBS-Reports/ISS-index.html#WDM
ETOPO2	2 Min Gridded Earth Topography Data by NGDC	http://www.ngdc.noaa.gov/mgg/image/2minrelief.html
ETOPO5	5 Min Gridded Earth Topography Data by NGDC	http://www.ngdc.noaa.gov/mgg/global/etopo5.HTML
EU	European Union	http://europa.eu.int

EurAqua	Network of European Freshwater Organizations	http://www.euraqua.org
EWA	European Water Archive of FRIEND-NE	http://ewa.bafg.de
EWFD	European Water Framework Directive	http://europa.eu.int/comm/environment/water
FAO	Food and Agriculture Organization	http://www.fao.org
FGDC	Federal Geographic Data Committee	http://www.fgdc.gov
FGGE	First GARP Global Experiment	http://www.meteo.ru/fund/pgepe1.htm
FIGCC	FRIEND Inter-Group Coordination Committee (see also FRIEND)	
FRICS	Foundation Of River & Basin Integrated Communications	http://www.river.or.jp, in Japanese
FRIEND	Flow Regimes from International Experimental and Network Data	http://www.nwl.ac.uk/ih/www/research/bfriend.html
FRIEND HKH	FRIEND Hindu Kush-Himalayan	http://www.nwl.ac.uk/ih/www/research/bfhkh.html
FRIEND-AMHY	FRIEND Alpine and Mediterranean Hydrology	http://armspark.msem.univ-montp2.fr/amhy
FRIEND-NE	Northern European FRIEND	http://ne-friend.bafg.de
FWIS	Framework for the WMO Information System of CBS	
G3OS	The Three Global Observing Systems (GCOS, GOOS and GTOS)	http://earthwatch.unep.net/data/g3os.php
GAME	GEWEX Asian Monsoon Experiment	http://www.ihas.nagoya-u.ac.jp/game
GAME-HUBEX	GAME-Huaihe River Basin Experiment	http://www.ihas.nagoya-u.ac.jp/game/hubex/www.hubex.pku.edu.cn
GAME-Sibiria	GAME-Sibiria	http://www.ihas.nagoya-u.ac.jp/game/GAME-Siberia.html
GAME-Tibet	GAME-Tibet	http://www.ihas.nagoya-u.ac.jp/game/GAME-Tibet.html
GAME-Tropics	GAME-Tropics	http://hydro.iis.u-tokyo.ac.jp/GAME-T
GAPP	GEWEX American Prediction Project	http://www.ogp.noaa.gov/mpe/gapp
GARP	Global Atmospheric Research Programme	http://www.cgd.ucar.edu/cas/tn404/text/tn404_11.html
GAW	Global Atmosphere Watch of WMO	http://www.wmo.ch/web/arep/gaw/gaw_home.html
GCDIS	Global Change Data and Information System	http://globalchange.gov
GCIP	GEWEX Continental-Scale International Project	http://www.ogp.noaa.gov/mpe/gapp/gcip
GCMD	Global Change Master Directory	http://gcmd.nasa.gov
GCOS	Global Climate Observing System	http://www.wmo.int/web/gcos/gcoshome.html
GDS	GrADS-DODS Server	http://grads.iges.org/grads/gds
GEF	Global Environment Facility	http://www.gefweb.org
GEIN	German Environmental Information Network	http://www.gein.de
GEMET	GEneral Multilingual Environmental Thesaurus of EEA	http://www.eionet.eu.int/GEMET
GEMS	UN Global Environment Monitoring Systems of Earthwatch	
GEO	Group on Earth Observations	http://earthobservations.org
GEO (UNEP)	Global Environment Outlook of UNEP	http://www.grida.no/geo
GeoMIS.Bund	GeodatenMetaInformationsSystem	http://www.geomis.bund.de
GEOSS	Global Earth Observation System of Systems of GEO	http://earthobservations.org
GEWEX	Global Energy and Water Cycle Experiment	http://www.gewex.org
GEWINET	German Water Information Network	http://www.globwinet.org/germany.asp
GHCC	Global Hydrology & Climate Center in Huntsville, Alabama	http://www.ghcc.msfc.nasa.gov, see also http://www.nsstc.org/ghcc
GHCN	Global Historical Climatology Network	http://cdiac.esd.ornl.gov/ghcn/ghcn.html
GHP	GEWEX Hydrometeorological Panel	http://ecpc.ucsd.edu/projects/ghp/ghp.html
GHRC	Global Hydrology Resource Center	http://ghrc.msfc.nasa.gov
GIS	Geographic Information System	
GISD	Geospatial Information for Sustainable Development	http://ip.opengis.org/gisd/docs/20020630_GSDI_TS.htm

GIWA	Global International Waters Assessment	http://www.giwa.net
GLASS	Global Land Atmosphere System Study	http://hydro.iis.u-tokyo.ac.jp/GLASS
GLOBWINET	Global Water Information Network	http://www.globwinet.org
GMES	Global Monitoring for Environment and Security	http://www.gmes.info
GNIP	Global Network for Isotopes in Precipitation	http://isohis.iaea.org
GOOS	Global Ocean Observing System	http://ioc.unesco.org/goos
GOSIC	Global Observing Systems Information Center	http://gosic.org, http://www.gos.udel.edu
GPA	UNEPs Global Programme of Action for Protection of the Marine Environment from Land-based Activities	http://www.gpa.unep.org
GPCC	Global Precipitation Climatology Centre	http://gpcc.dwd.de
GPCP	Global Precipitation Climatology Project	http://orbit-net.nesdis.noaa.gov/arad/gpcp
GrADS	Grid Analysis and Display System	http://grads.iges.org/grads
GRDB	GRDC Database	http://grdc.bafg.de
GRDC	Global Runoff Data Centre	http://grdc.bafg.de
GRID	UNEP's Global Resource Information Database managed by DEWA	http://www.grid.unep.ch/about/network.php
GSDI	Global Spatial Data Infrastructure	http://www.gsdi.org
GSN	GCOS Surface Network	http://lwf.ncdc.noaa.gov/servlets/gsn
GSWP-2	Global Soil Water Project	http://grads.iges.org/gswp/head.html
GT-Net	Global Terrestrial Networks	http://gosic.org/gtos/GTNet_data_access.htm
GTN-H	Global Terrestrial Network for Hydrology	http://gtn-h.unh.edu
GTOPO30	30 Seconds (~1km) Gridded Earth Topography Data by USGS	http://edcdaac.usgs.gov/gtopo30/gtopo30.asp
GTOS	Global Terrestrial Observing System	http://www.fao.org/gtos
GTS	Global Telecommunication System	http://www.wmo.int/web/www/TEM/gts.html
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit/ German Agency for Technical Cooperation	http://www.gtz.de/english
GUAN	GCOS Upper-Air Network	http://www.wmo.ch/web/gcos/networks.htm
GWCC	former GEMS/Water Collaborating Centre, now GWPO	http://www.gemswater.org
GWP	Global Water Partnership	http://www.gwpforum.org
GWPO	UN GEMS/Water Programme Office of UNEP/DEWA	http://www.gemswater.org
GWSP	Global Water System Project by ESSP	http://www.gwsp.org
HAD	Hydrologischer Atlas von Deutschland, Hydrological Atlas of Germany	http://had.bafg.de
HELP	Hydrology for the Environment, Life and Policy	http://www.unesco.org/water/ihp/help
HEPEX	Hydrologic Ensemble Prediction Experiment	
HMEI	Association of Hydro-Meteorological Equipment Industry	http://www.hydrometeoindustry.org
HOMS	Hydrological Operational Multipurpose System of WMO	http://www.wmo.int/web/homs/projects/homsp1.html
HWRD	Hydrology and Water Resources Department of WMO	http://www.wmo.int/web/homs
HWRP	Hydrology and Water Resources Programme of WMO	http://www.wmo.int/web/homs
HYCOS	Hydrological Cycle Observing Systems	http://www.wmo.int/web/homs/projects/status.html
HYDAT	Environment Canada produces a National HYDAT CD-ROM which provides access to the National Water Data Archive	http://www.msc-smc.ec.gc.ca/wsc/products/hydat/main_e.cfm?cname=hydat_e.cfm
HYDRO1K	HYDRO1K Elevation Derivative Database of USGS	http://edcdaac.usgs.gov/gtopo30/hydro
HYDRONIGER	Hydrological Forecasting System for River Niger's Basin	http://aochycos.ird.ne/HTMLF/ORGINT/HYDRONIG/INDEX_EN.HTM
IACPO	International ACSYS/CliC Project Office (WCRP)	http://ipo.npolar.no
IAEA	International Atomic Energy Agency	http://www.iaea.org
IAH	International Association of Hydrogeologists	http://www.iah.org
IAHS	International Association of Hydrological Sciences	http://iahs.info
ICOLD	International Commission on Large Dams	http://www.icold-cigb.org

ICPR	International Commission for the Protection of the Rhine	http://www.iksr.de
ICSU	International Council for Science (until April 1998: Internation Council of Scientific Unions)	http://www.icsu.org
ICWC	Interstate Coordination Water Commission	http://www.icwc-aral.uz
IFNet	International Flood Network	http://www.internationalfloodnetwork.org/index_e.html
IGBP	International Geosphere Biosphere Program	http://www.igbp.kva.se
IGFA	International Group of Funding Agencies for Global Change Research	http://www.igfagcr.org
IGOS	Integrated Global Observing Strategy	http://www.igospartners.org
IGRAC	International Groundwater Resources Assessment Centre	http://www.igrac.nl
IGWCO	Integrated Global Water Cycle Observation (see IGOS)	
IHD	International Hydrological Decade 1965-1974	
IHDP	International Human Dimensions Programme on Global Environmental Change	http://www.ihdp.org
IHP	International Hydrological Programme (UNESCO)	http://www.unesco.org/water/ihp
IHP-OHP Secretariat Germany	Former name of the IHP/HWRP Secretariat Germany	http://ihp.bafg.de
IHP/HWRP Secretariat Germany	German Secretariat of the IHP of UNESCO and the HWRP of WMO	http://ihp.bafg.de
IISD	International Institute for Sustainable Development	http://www.iisd.org
ILEC	International Lake Environment Committee	http://www.ilec.or.jp
INBO	International Network of Basin Organizations	http://www.oieau.fr/riob
INSPIRE	INfrastructure for SPatial InfoRmation in Europe by the EU	http://inspire.jrc.it
IOC	Intergovernmental Oceanographic Commission of UNESCO	http://ioc.unesco.org/iocweb
IODE	IOC's International Oceanographic Data and Information Exchange	http://ioc.unesco.org/iode
IPCC	Intergovernmental Panel on Climate Change	http://www.ipcc.ch
IPCC-DDC	IPCC's Data Distribution Centre	http://ipcc-ddc.cru.uea.ac.uk
IPO	International Project Office	
IRN	International Rivers Network	http://www.irn.org
ISCCP	International Satellite Cloud Climatology Project	http://isccp.giss.nasa.gov
ISEOS	Institute for the Study of Earth, Oceans, and Space (at UNH)	http://www.eos.sr.unh.edu
ISLSCP	International Satellite Land Surface Climatology Project	http://www.gewex.org/islscp.html
ISO	International Organization for Standardization	http://www.iso.org
ISO 19115	An International Metadata Standard for Geographic Information	http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=26020&ICS1=35&ICS2=240&ICS3=70
IUCN	The World Conservation Union	http://www.iucn.org
IWLP	International Water Law Project	http://www.internationalwaterlaw.org
IWMI	International Water Management Institute	http://www.iwmi.cgiar.org
IWRA	International Water Resources Association	http://www.iwra.siu.edu
IWRM	Integrated Water Resources Management	
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology	http://ioc.unesco.org/goos/jcomm.htm
JOSS	Joint Office for Science Support / UCAR	http://www.joss.ucar.edu
LBA	Large-scale Biosphere-Atmosphere Experiment in Amazonia	http://lba.cptec.inpe.br/lba/indexi.html
LISFLOOD	The physically based LISFLOOD model has been specifically developed to simulate floods in large European drainage basins	

LOICZ	Land-Ocean Interactions in the Coastal Zone,	http://www.loicz.org
MAGS	Mackenzie GEWEX Study	http://www.usask.ca/geography/MAGS
MDB	Murray-Darling Basin Water Budget Project	http://www.gewex.org/mdb.html
MED-HYCOS	Mediterranean Hydrological Cycle Observing System	http://medhycos.mpl.ird.fr
Met Office (UK)	Meteorological Office of the United Kingdom	http://www.met-office.gov.uk
Metadata	a term used within the computer science community to denote characteristics or quality of data	
MLIT	Ministry of Land, Infrastructure and Transport in Japan	http://www.mlit.go.jp/english
MOPEX	Model Parameter Estimation Experiment	http://www.nws.noaa.gov/oh/mopex
MPI	Max Planck Institute for Meteorology	http://www.mpimet.mpg.de
MSC	Meteorological Service of Canada	http://www.msc-smc.ec.gc.ca
NAME	North American Monsoon Experiment	http://www.joss.ucar.edu/name
NAO	North Atlantic Oscillation	
NASA	National Aeronautics and Space Administration	http://www.nasa.gov
NASA-GHCC	NASA Global Hydrology and Climate Center (see GHCC)	
NASDA	National Space Development Agency of Japan	http://www.nasda.go.jp/index_e.html
NBA	Niger Basin Authority	http://www.abn.ne/homepg.html
NCAR	National Center for Atmospheric Research	http://www.ncar.ucar.edu/ncar/index.html
NCEP	NOAA's National Centers for Environmental Prediction	http://www.ncep.noaa.gov
NESDIS	NOAA's National Environmental Satellite, Data, and Information Service	http://www.nesdis.noaa.gov
NGDC	National Geophysical Data Center of NOAA	http://www.ngdc.noaa.gov/ngdc.html
NGO	Non Governmental Organisation	
NHS	National Hydrological Service	List available at http://www.wmo.ch/web/homs/projects/homs/_hnrc.html
NIES	National Institute for Environmental Studies	http://www.nies.go.jp/index.html
NIMA	National Imagery and Mapping Agency	http://www.nima.mil
NMS	National Meteorological Service	List e.g. available at http://www.wmo.int/web-en/member.html#list
NOAA	National Oceanic and Atmospheric Administration	http://www.noaa.gov
NOAA-OGP	NOAA Office of Global Programs	http://www.ogp.noaa.gov
NOKIS	Nord- und Ostseeküsteninformationssystem - North and Baltic Sea Coastal Information System	http://nokis.baw.de
NSF	National Science Foundation	http://www.nsf.gov
NSIDC	National Snow and Ice Data Center	http://nsidc.org
NWIS	National Water Information System of USGS Water	http://water.usgs.gov/nwis
NWP	Numerical Weather Prediction	
NWRI	National Water Research Institute	http://www.nwri.ca/nwri.html
Ocean.US	National Office for Integrated and Sustained Ocean Observations	http://www.ocean.us
OceanTeacher	Online Resource of IOC's IODE Programme	http://www.oceanteacher.org
OGC	Open Geospatial Consortium	http://www.opengeospatial.org
OHP	Operational Hydrological Programme of WMO, now HWRP and HOMS	
OIT	Oceans Information Technology Pilot Project	http://www.oceans-it.net
OOPC	Oceanographic Observation Panel for Climate of GCOS	http://www.wmo.int/web/gcos/oopc.htm
OSU	Oregon State University	http://terra.geo.orst.edu
PI	Pacific Institute	http://www.pacinst.org
PIK	Potsdam Institute for Climate Impact Research	http://www.pik-potsdam.de
PILPS	Project for Intercomparison of Landsurface Parameterization Schemes	http://www.cic.mq.edu.au/pilps-rice
PLATIN	La Plata Basin Intercomparison Study	http://www.atmos.ucla.edu/~mechoso/platin

QA-QC	Quality Assurance/ Quality Control	
R-ArcticNet	Regional Electronic Hydrographic Data Network for the Arctic Region	http://www.r-arcticnet.sr.unh.edu/v3.0
R-HydroNet	A Regional, Electronic Hydrometeorological Data Network For South America, Central America, And The Caribbean	http://www.r-hydronet.sr.unh.edu
RAMSAR	The Ramsar Convention on Wetlands	http://www.ramsar.org
RBI	River Basin Initiative	http://www.riverbasin.org
RBO	River Basin Organisations, lists e.g. available via River Basin Authorities or GLOBWINET	
RCH	Regional Centre of Hydrology in Central Asia	http://www.rch.uz
ReliefWeb	Natural Disasters since 1981	http://www.reliefweb.int/w/rwb.nsf/vLND
RivDis	The Global River Discharge Database	http://www.rivdis.sr.unh.edu
RiverNet	RiverNet is a multimingual service provided by the NGO ERN	http://www.rivernet.org
SADC-HYCOS	South African Development Community Hydrological Cycle Observing System	http://www-sadchyco.pwv.gov.za/sadc
SALLJEX	South American Low-Level Jet Experiment	http://www.salljex.at.fcen.uba.ar
SAWINET	Southern African Water Information Network	http://www.globwinet.org/sawinet.asp
SBSTA	Subsidiary Body for Scientific and Technological Advice of UNFCCC	
SC	Steering Committee	
SCWR	Subcommittee on Water Resources	http://ceb.unsystem.org/Former.ACC/accswr.htm
SHEF	Standard Hydrologic Exchange Format	http://www.weather.gov/oh/hrl/shef/indexshef.htm
SHI	State Hydrological Institute in St. Petersburg	http://www.hydrology.ru
SRTM	Shuttle Radar Topography Mission	http://www.jpl.nasa.gov/srtm
SSG	Scientific Steering Group	
Sv	Sverdrup: Volume flux unit, 1 Sv = 1 x 10^6 m^3/sec	
TC 211	on Geographic Information/ Geomatics: ISO Technical Committee 211: Geographic Information/ Geomatics	http://www.isotc211.org
TEMS	Terrestrial Ecosystems Monitoring Sites	http://www.fao.org/gtos/tems
TFDD	Transboundary Freshwater Dispute Database	http://www.transboundarywaters.orst.edu
TOPC	Terrestrial Observation Panel for Climate of GCOS	http://www.wmo.int/web/gcos/topc.htm
TRMM	Tropical Rainfall Measuring Mission	http://trmm.gsfc.nasa.gov
UCAR	University Corporation for Atmospheric Research	http://www.ucar.edu/ucar/index.html
UDK	Umweltdatenkatalog - Environmental Data Catalogue	http://www.umweltdatenkatalog.de
UDRS	Universal Data Reduction Server	http://daac.gsfc.nasa.gov/CAMPAIGN_DOCS/UDRS/index.shtml
UN	United Nations	http://www.un.org, http://www.unsystem.org
UN TC	UN Treaty Collection	http://untreaty.un.org
UNDP	United Nations Development Programme	http://www.undp.org
UNECE	United Nations Economic Commission for Europe	http://www.unece.org
UNECE WC	UNECE Water Convention	http://www.unece.org/env/water
UNEP	United Nations Environment Programme	http://www.unep.org
UNESCO	United Nations Educational, Scientific and Cultural Organization	http://www.unesco.org
UNESCO	IHP Databases	http://www.unesco.org/water/ihp/db
UNESCO Water	UNESCO Water Programmes	http://www.unesco.org/water
UNFCCC	United Nations Framework Convention on Climate Change	http://unfccc.int
UNH	University of New Hampshire	http://www.unh.edu
UNH-GRDC	UNH-GRDC Global Composite Gridded Runoff Fields	http://www.grdc.sr.unh.edu
UNIDART	Uniform Data Request Interface for the access to meteorological data and products	http://www.dwd.de/unidart
US-CLIVAR	US CLIVAR	http://www.usclivar.org

USGS	U. S. Geological Survey	http://www.usgs.gov
USGS Water	Water Resources of the United States by USGS	http://water.usgs.gov
USGS WW	USGS WaterWatch	http://water.usgs.gov/waterwatch
VAMOS	Variability of the American Monsoon System	http://www.clivar.org/organization/vamos
WADI	(Dutch) WAter Data Infrastructuur	http://www.wadi.nl
WaterGAP	Water Global Assessment and Prognosis (name of a model developed at CESR, including the Hydrological Model WGHM	http://www.usf.uni-kassel.de/usf/forschung/projekte/worldwater.en.htm
Watersheds of the World	Watersheds of the World of WRI, IUCN, IWMI and RAMSAR	http://www.iucn.org/themes/wani/eatlas
WaterWeb	WaterWeb Consortium	http://www.waterweb.org
WB	World Bank	http://www.worldbank.org
WBGU	German Advisory Council on Global Change	http://www.wbgu.de/wbgu_home_engl.html
WCD	World Commission on Dams	http://www.dams.org
WCP-Water	World Climate Programme-Water	http://water.usgs.gov/osw/wcp-water
WCRP	World Climate Research Programme	http://www.wmo.int/web/wcrp/wcrp-home.html
WEBS	Water and Energy Balance Study	http://ecpc.ucsd.edu/gcip
WEHAB	Water, Energy, Health, Agriculture and Biodiversity	http://www.johannesburgsummit.org/html/documents/wehab_papers.html
WGMS	World Glacier Monitoring Service	http://www.geo.unizh.ch/wgms
WHO	World Health Organization	http://www.who.int/en
WHYCOS	World Hydrological Cycle Observing System	http://www.wmo.int/web/homs/projects/whycos.html
WHYMAP	World-wide Hydrogeological Mapping and Assessment Programme	http://www.iah.org/whymap and http://www.bgr.de/b1hydro/fachbeitraege/a200401/e_whymap.htm
WMO	World Meteorological Organization	http://www.wmo.int
WCMS	WMO Core Metadata Standard (v0-2) developed by ET-IDM	http://www.wmo.int/web/www/WDM/Metadata/documents.html
WOCE	World Ocean Circulation Experiment	http://www.soc.soton.ac.uk/OTHERS/woceipo/ipo.html
WRAP	Water Resource Applications Project	http://ecpc.ucsd.edu/projects/ghp/Wrap_web
WIR	World Resources Institute	http://www.wri.org
WSRC	Water Systems Analysis Group (at UNH)	http://www.watsys.unh.edu
WSSD	World Summit on Sustainable Development	http://www.johannesburgsummit.org, http://linkages.iisd.ca/wssd/portal.html
WWAP	World Water Assessment Programme, publishes the WWDR	http://www.unesco.org/water/wwap
WWC	World Water Council	http://www.worldwatercouncil.org
WWDR	World Water Development Report	http://www.unesco.org/water/wwap/wwdr
WWW	World Weather Watch of WMO	http://www.wmo.int/web/www/www.html
XML	Extensible Markup Language	
XSL	Extensible Stylesheet Language	
ZEF	Centre for Development Research	http://www.zef.de

Annex 13 List of GRDC Reports

Reference list of GRDC Reports

Report No. 1 (May 1993)	Second Workshop on the Global Runoff Data Centre, Koblenz, Germany, 15 - 17 June, 1992. (17 pp, annex 73 pp)
Report No. 2 (May 1993)	Dokumentation bestehender Algorithmen zur Übertragung von Abflußwerten auf Gitternetze. (incl. an English abstract in English by the GRDC: Documentation of existing algorithms for transformation of runoff data to grid cells) / G.C. Wollenweber. (71 pp)
Report No. 3 (June 1993)	GRDC - Status Report 1992. (5 pp, annex 5 pp)
Report No. 4 (June 1994)	GRDC - Status Report 1993. (16 pp, annex 34 pp)
Report No. 5 (Nov 1994)	Hydrological Regimes of the Largest Rivers in the World - A Compilation of the GRDC Database. (275 pp)
Report No. 6 (Dec 1994)	Report of the First Meeting of the GRDC Steering Committee, Koblenz, Germany, June 20 - 21, 1994. (10 pp, annex 38 pp)
Report No. 7 (June 1995)	GRDC - Status Report 1994. (12 pp, annex 20 pp)
Report No. 8 (July 1995)	First Interim Report on the Arctic River Database for the Arctic Climate System Study (ACSYS). (34 pp)
Report No. 9 (Aug 1995)	Report of the Second Meeting of the GRDC Steering Committee, Koblenz, Germany, June 27 - 28. (17 pp, annex 34 pp)
Report No. 10 (March 1996)	Freshwater Fluxes from Continents into the World Oceans based on Data of the Global Runoff Data Base / W. Grabs, Th. de Couet, J. Pauler (49 pp, annex 179 pp)
Report No. 11 (April 1996)	GRDC - Status Report 1995. (16 pp, annex 45 pp)
Report No. 12 (June 1996)	Second Interim Report on the Arctic River Database for the Arctic Climate System Study (ACSYS). (39 pp, annex 8 pp)
Report No. 13 (Feb 1997)	GRDC Status Report 1996 (25 pp, annex 36 pp)
Report No. 14 (Feb 1997)	The use of GRDC - information. Review of data use 1993/1994. Status: January 1997 (18 pp, annex 34 pp)

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web http://grdc.bafg.de

Reference list of GRDC Reports

Report No. 15 (June 1997)	Third Interim Report on the Arctic River Data Base (ARDB) for the Arctic Climate System Study (ACSYS): Plausibility Control and Data Corrections (Technical Report) (3 pp, annex 20 pp)
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